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SINO-RUSSIAN GLOBAL ENGAGEMENT MODELS IN THE CONTEXT OF DIGITALIZATION OF SOCIAL AND ECONOMIC PROCESSES

Conference Proceedings of International Research-to-Practice Conference

Krasnoyarsk, September 26–28, 2018

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The International research-to-practice conference covered a wide range of issues of the global economic and social interaction between Russia and China in the context of modern trend of transition to digital information technologies and management models. Reports presented at the conference were focused on two key themes: a discussion of the fundamental problems associated with the transition to a digital economy, and the applied aspects of the scientific research results in the field of global economic interaction between Russia and China.

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FOREWORD

The international research-to-practice conference was devoted to a wide range of issues of the global economic and social interaction between Russia and China in the context of modern trend of transition to digital information technologies and management models. Reports presented at the conference were focused on two key themes: a discussion of the fundamental problems associated with the transition to a digital economy, and the applied aspects of the scientific research results in the field of global economic interaction between Russia and China. The relevance of the conference topic has been conditioned by two global tendencies.

Firstly, digital technologies are currently becoming decisive for the development of countries and regions, for positioning national economies in the world arena and for attracting both financial and human capital.

Risks and threats arising as a result of the country's transition to new management mechanisms which are based on the widespread introduction of modern digital computer technologies require continuous fundamental research aimed at: 1) identifying the influence of the diverse economic growth factors; 2) designing new models of government, business, and their scientific support; 3) transformation of the educational environment. Secondly, the relevance of the conference topic is connected with cardinal changes in the field of Russia's global positioning in the modern world and with reforming of interstate Sino-Russian expanding economic and industrial interaction. To a large extent, the present form of cooperation between Russia and China is due to the implementation of the new Silk Road pursuing a global transport and investment infrastructure, i.e. a project of creation of a united Eurasian trade and economic space and a transcontinental transport corridor within the framework of the Chinese initiative "One Belt, One Road".

The fundamental issues discussed at the conference are centred around the development of approaches to the informational economic and mathematical models and methods for managing complex social and economic processes. These include:

- problems of mathematical modelling, computational methods and applied informatics for creating information and computational management models, complex dynamic systems and social-economic processes in the big data analytics;
- methodological problems of producing models of global economic interaction between regions and countries in terms of introducing digital technologies;
- methodological problems of digitalization of business processes for managing market positioning of economic agents and the city maintenance systems in the context of global networking;
- methodological approaches to the transformation of basic educational and training processes at universities within the digital economy paradigm.

Reports on this issue were discussed during plenary sessions and at the following sessions:

- **Session 1 "Modeling Processes of Social-Economic Development and International Cooperation Based on Digital Economy Concepts";**
- **Session 2 "Digitalization of Business Processes for Managing Market Positioning of Enterprises in Global Networking".**

The applied aspects of the considered fundamental approaches were discussed at the conference in the context of comparing existing and new models of global interaction between Russia and China along the "One Belt, One Road" initiative. These include:

- methodological approaches to modelling and assessing the consequences of rethinking Sino-Russian interstate economic and integration ties in the context of expanding cooperation with China within the framework of the new Silk Road project;

- comparative analysis and modelling of the processes of socio-economic development and global international interaction between Russia and China, taking into account the transition to digital management technologies;
- models for assessing the resource and scientific-technical potential and risks of the interregional and international integration between Russia and China;
- research tools, comparative analysis and forecasting the development of digital, technological and educational innovations in the humanitarian sphere and social-economic life in Russia and China;
- analysis of the structure and dynamics of trade relations between Russia and China.

Reports on this issue were discussed during plenary sessions and at the following sessions:

- **Session 3 "Modeling Assessment of Resource and Scientific-Technical Potential for Interregional and International Integration";**
- **Session 4 "Development of Sino-Russian Trading Cooperation based on Technological and Educational Innovations".**

The conference was attended by the researchers from Russian and Chinese universities, scientists from the institutes of the Siberian Branch of the Russian Academy of Sciences and the Heilongjiang Academy of Social Sciences.

Editorial board

SESSION 1

MODELING PROCESSES OF SOCIAL-ECONOMIC DEVELOPMENT AND INTERNATIONAL COOPERATION BASED ON DIGITAL ECONOMY CONCEPTS

SESSION 2

DIGITALIZATION OF BUSINESS PROCESSES FOR MANAGING MARKET POSITIONING OF ENTERPRISES IN GLOBAL NETWORKING

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TRANSFORMATION OF THE UNIVERSITY IN THE DIGITAL ECONOMY

The development of the economy, the sophistication and intensification of technological, social and economic processes and transformations themselves, the transition to a system of competences in which soft skills prevail, the nonlinearity of relationships between the educational institution from which the student graduates and the actual competencies of the graduate, the deformalization and volatility of the requirements for employee and the increasing formalization of the educational process, all this leads to the need to revise the role and place of the university in the educational process in the digital economy. As the digitalization and new channels of communication develop, so grows the demand for new methods of education: distant, narrow-subject, informal (training, coaching, tutoring, etc.), socially-reflective, project-oriented, formed in cooperation with specific customers (employers), etc. In this regard, the cooperation between universities and employers, synchronization of their goals and tasks, is becoming increasingly important from the point of view of personnel training.

The modern university is a complex and not always clearly identifiable structure, regarding not only the goals (and even the mission), but also the whole aggregate of resources (in the broadest sense).

We can reveal target functions of the university such as:

- Supply of education of high quality for students;
- Pursuing scientific research which ensures improvement of the quality and intensity of development of the economy through innovations based on scientific research and development;
- Formation of scientific schools, which implies not only the generation of new scientific ideas, but also, above all, the establishing of a system of knowledge transfer and the education of personnel capable of developing and establishing scientific schools;
- Execution of orders by economic agents for particular research, methodological and technological developments;
- Expert function: verification of concepts and projects offered for implementation by various actors, from lawmaking and technological projects to philosophical, political, social and financial innovations;
- Economic self-sufficiency and commercial efficiency, which minimizes the costs of the state and society for economically irrecoverable investments in higher education in relation to the university;
- Creation of a social environment (formed within the university and outside it, through the multiplication of social competences) that would ensure not only a social lift, but also social rehabilitation for individuals both involved in the educational process and communicating with the university;
- Realization of educational and moral functions through the communication of lecturers with students, the formation of social space (including the organization of events, the activities of student organizations, the generation of real and virtual communication of lecturers with students and students among themselves, project activities, etc.), which determines the priority of moral behavior over egocentric one, as well as familiarizing of students with the best practices of social and moral behavior;

- Performing the function of the center of attraction of advanced ideas, knowledge, solutions, technologies, methodologies, developments, competences, resources, as well as leaders, experts, scientists, practitioners, businessmen, teachers, bearers of moral values, as well as contacts, relationships, synergies etc.
- Performing the function of the discussion and analytical platform, where new ideas and solutions are generated and concentrated (through conferences and other events), and new knowledge (in the broadest sense) is also produced and transferred into the future;
- Positioning as a base for methodological support of innovations, ideas, discoveries, solutions and inventions that facilitates the realization of the above-mentioned innovations;
- Concentration of knowledge and sources of this knowledge regarding the accessibility of it for individuals aimed at obtaining and reflecting this knowledge.

The modern university is rather not the place where the educational standard is being realized and the educational product is being formed but the "ecosystem" in which the socio-moral and professional cultural environment is being formed, concentrating the best achievements of science and practice, including their socio-pedagogical component, predetermining the possibility of generation of innovations (from scientific discoveries to the development of technological solutions) and the cultivation of individuals with variability and adaptability of both social and professional competences.

In the conditions of transition to a digital economy the very paradigm of the development of science and education is changing from analysis to synthesis. In earlier periods science and education were rather aimed at revealing and in-depth disclosure of highly specialized knowledge (we tried to learn something deeply but narrowly), but at present there is a growing importance of compiling knowledge from various fields (science, practice, social environment, etc.) and interpenetration and intercomparison of this knowledge, both from the general theoretical and the practical points of view. Comparing and harmonizing previously disparate knowledge becomes crucial. We know so much in each of the areas that we are more likely in need to combine this knowledge into a new effect, rather than to further deepen this knowledge. The university in general, from the point of view of both scientific and educational development, lacks the synthesis of knowledge formed by different subjects (different sources). It requires an interdisciplinary reflection of accumulated knowledge. The analysis becomes meaningless in the absence of the synthesis of scientific and pedagogical knowledge from different fields.

Under the conditions of the digital economy,considerable intensification of flows of information (knowledge) and wide opportunities for access to unreliable sources of knowledge (information) that may dominate the reliable ones, there arises the problem of limitation of the possibility of reflecting this knowledge and the quality of this reflection (at least in relation to the volume of information obtained). At the same time, the growth of the intensification of economic demands for the reflection of knowledge and the producing of effective solutions increases with the growth of the volume of information (knowledge) to be analyzed and of the technological possibilities for collecting and generalizing this knowledge (information).

In this regard, the university itself must change, because not only external conditions change, but also the demands of stakeholders, the key of which are:

- Students – demanding not only the educational product and educational process, but also the social environment formed by the university, and, even more interestingly, the very motivation for their full involvement in the educational process (since the educational product cannot exist outside its recipient and in many respects its quality is determined by the latter);
- Parents of students (applicants) or payers for an educational product – predetermining ceteris paribus the choice of an institution of higher education and in postgraduate education – of an educational course, as well as the demand for educational services;

- Employers (future) – demanding specialists (university graduates), but, as a rule, not being payers (with the exception of the persons mentioned above), and evaluating not so much the educational product as its carrier (student / graduate) with taking into account the set of social and professional competences formed by him both in the university and outside the university;
- Employer's counterparties – other enterprises / organizations that are not an employer of this particular student (graduate), but depending on the quality of the graduate's competences, are faced with certain transaction costs in the process of communicating with their counterparty through these entities. They are indirectly interested in the quality of graduates of the university and make up the entire invisible "palette" of this global interest in the overall improvement of the quality of the educational process and the set of graduates' competences;
- The state – acting simultaneously as a source of funding for the educational process in general and the university in particular, as well as formulating the strategy for the development of the economy and forecasts for the development of the labor market and, as a result, the request for specialists with certain competences;
- The society that determines through the state, the market and various public institutions and socio-political and socio-economic expectations the requirements for quality of life (regarding the innovative developments and discoveries in science and technology) as well as the requirements for professional and, what is even more important for the society, social competences of university graduates as leaders of change;
- University graduates (who graduated from the university earlier) who are interested in the prestige of the institution they graduated from, as well as in the opportunity to be affiliated with the social environment that is formed by the university;
- The scientific community interested in the synergetic effect of interdisciplinary and cross-disciplinary research;
- Economic agents, demanding the results of research activity of the university.

The University can and should become (not only physically but also mentally) a point of "gathering" – the concentration and verification of innovations and competences that can not only generate but also effectively produce, transfer and multiply knowledge. At the same time, new discoveries as well as technological and socio-economic developments lie in the interdisciplinary plane. And here we must talk not only about such obvious things as biomechanics, biophysics, neuroeconomics, telemedicine, fintech, but also about the bundle of finance with socio-philosophical attitudes. Cross-functional and interdisciplinary approach, both in science and education, the breadth of views and the ability to project their mental vision into the professional specifics of the problem is a key task of modern science and the modern educational process, and therefore of the university as a whole.

The digital economy provides a significant resource potential in this regard not only for the fast search and verification of knowledge (information), but also for attracting external expert judgment to form on the principles of hackathon a solution that would maximize its effectiveness for given task parameters. For the formation of a modern university it is necessary to mobilize teachers and scientists specializing in certain areas to both create education courses and produce interdisciplinary knowledge, on the basis of comparing views from different directions. A convergence of knowledge is necessary. In these conditions, the key value of the educational and scientific process is the creative personality.

The transition to a digital economy leads the university to revise a number of basic concepts of its functioning.

1. The teacher is no longer a carrier of knowledge. He acts rather as its moderator, performs selective verification of information flow and sources (based on his professional competence and experience) and builds a system of knowledge reflection, forming in the student not the knowledge itself, but the system of handling it and transforming knowledge into thinking and professional mentality;

2. The university becomes a platform (point) of "gathering competences", located both in the university itself and outside it, as well as forms a space that predetermines the possibility of professional, social and personal growth of students;

3. There is a decentralization and "compilation" of the educational process – any student can resort to various sources, forms and methods of acquiring competences – from distant video courses and webinars to case studies, participation in roundtable discussions and conferences, project groups, trainings and any other sources of knowledge. In this context, the university remains the carrier of key professional (in accordance with the profile of the university) competences and way of thinking, as well as a site for approbation of competences and their verification in the framework of student research activities. In this respect, in our opinion, an inter-departmental and even inter-profile approach to study is very important. For example, by writing term papers at various departments under the guidance of various mentors, the student learns both core and related disciplines, significantly expanding his horizons.

4. There is a separation of the educational process from socialization. Thus, distant education can become the source of the educational process, whereas the communication with mentors in the university remains to be the source of socialization;

5. Transition from highly specialized competences to general professional, overprofessional and socioculturalones. From the point of view of expectations of stakeholders those competences that will be used by a person regardless of his further professional path are increasing in value;

6. Acceleration of the renewal of knowledge and the differentiation of its sources in favor of short-term ones. Priority of specialization will have short-term courses, focused on the latest updates of knowledge, not only and not so much available within the university, as implemented as additional education;

7. Division of knowledge into the fundamental one in the form of thinking and applied one in the form of competences. At the same time, the priority of the former remains at the university. The same will lead to an increase in the variability of competences in the educational process;

8. Separation of the point of providing of education (knowledge / competences) from the point (subject, system) of control of the knowledge acquired by the student. The university should perform the function of control of the students' knowledge, regardless of the sources and methods of its formation;

9. Virtualization of training and control. As IT technologies evolve, both the learning process and the control of knowledge will be increasingly distant in nature, providing more accuratecontrol, including procedural (permanent) one;

10. The division of education into the basic one (fundamental), not significantly affected by changes in time, and applied one, which has significant volatility.

University education will be aimed at forming in the student three consecutive characteristics: personality; generator of ideas and innovations; professional. This is possible through the development of knowledge (competences), abilities, as well as social and interprofessional skills. Looking into the future and focusing on characteristics which a graduate should have, we will quote the opinion of Patrick Griffin,Professor at the University of Melbourne[1], who conducted a survey among a large number of different employers and revealed that the essence of competences needed in the futureis actually the ability to creatively solve complex problems together. These competences include creative approach,communication, teamwork, critical thinking. But in order to develop these competences it is necessary to revise and reorganize the educational process to a large extent, and in order for the competences to be formed to be practice-oriented, considerable work is required to expand the interaction of universities and employers on a wide range of issues.

[1] URL: http://erazvitie.org/article/navyki_xxi_veka_novaja_realnost.

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SHARING ECONOMY AS THE GLOBAL DIGITIZATION AREA

The sharing economy is one of the digital economy areas. It operates using digital platforms where owners of temporarily free property place their offers, and users search for goods or services they need. The consumer pays for a temporary use of a product or service provided directly to the owner or through the digital platform, and the platform charges (usually the owner) a fee for its service.

The emergence of the sharing economy is due to practical reasons. Many private persons and organizations have movable and immovable assets used occasionally, so they can lease them, and it is more profitable to others to rent a good or service they need for a reasonable fee instead of buying it.

Since the lease of mostly expensive property can bring significant income, the most interesting sharing economy projects are related to housing and motor transport.

Expert opinions differ regarding the sharing economy subjects. Therefore, there is no well-established definition of the term. A large group of experts believe that individuals only are the sharing economy subjects. Another group of experts assumes that they are both individuals and legal entities.

Opinions differ on the scope of sharing economy too. There are two approaches, narrow and broader ones.

Experts who adhere to a narrow approach believe that the sharing economy covers the relationship between end-users, both individuals and legal entities, related to the use of temporarily free goods or services for a limited period of time without transferring ownership.

With this approach, the areas where the sharing economy functions most successfully are:

1. ***Real estate***. The most high-profile platform functioning in this area is *Airbnb*, which allows to rent housing in the private sector for a limited period of time. It offers access to millions of places to stay in more than 191 countries[1]. The international platform *HomeAway* and the American one *Guesthop* can be mentioned too.

The *hospitality networks (HN)*, which offer the possibility of finding a free short-term accommodation, also belong to this sector. The HN of repute are *Hospitality Club*, *CouchSurfing*, *Bewelcome* and *Globalfreeloaders*.

Successfully function platforms focused on circles of people with the same interests. For example, *WarmShowers* specializes in providing services to bicycle tourists, *Pasporta Servo* to Esperantists, and WWOOF to those who are looking for free accommodation and meals for work on an organic farm.

2. ***Transport***. First of all, it is a *car rental with a driver*. The most high-profile company is *Uber* (75 million riders and 3 million drivers in 65 countries, 600+ cities)[2]. *Lyft* is its main competitor in the United States, but it is behind *Uber* both in terms of traffic and the territorial scope of its activities. The lead Indian platform is *ANI Technologies Pvt. Ltd.* (commercial name *Ola*). *Grab*, better known as *GrabTaxi*, is the leader in this field in seven countries of Southeast Asia.

Unconditional Russian leaders are *Yandex.Taxi* and *Gett*. *Uber* started its operations in Russia in late 2013 but faced serious competition. Therefore, an agreement between *Uber* and *Yandex.Taxi* on business combination was signed in July 2017.

[1] Airbnb: website. URL: https://press.airbnb.com/about-us/ (accessed 11.09.2018).
[2] Uber: website. URL: https://www.uber.com/newsroom/company-info/ (accessed 12.09.2018).

In China, *Uber* was acquired in 2016 by *Didi Chuxing*, national platform for car rental with driver.

Another transport segment of the sharing economy is peer-to-peer *carsharing*, that is rent of temporarily free cars from individuals or legal entities. *Getaround* and *Toro* (USA), *Drive*, *Derways*, *Koolinar*, *Ouicar* (France) and *LTE* (Singapore) can be mentioned as platforms functioning in this area.

The Russian similar platform is *DARENTA*. As of 14 September 2018, it registered 5,970 users and 980 cars in 121 cities[1].

Ridesharing, i.e. search for fellow travelers and vehicles to hitch a ride, is another sector. Among a number of operating platforms *BlaBlaCar* is the best known. It counts 60 million members in 22 countries, including Russia, and over 18 million travelers every quarter[2].

Karzoo (operates on France, Germany, Belgium, the UK, Switzerland, Luxembourg and Austria) is another well-known international platform specializing in such service. *Carma* and *SideCar* (USA), *Advroom* and *La roue verte* (France), *Carpool* (Belgium) can be noted as national ones. *Covoiturage* provides service in French-speaking countries and Quebec, and *Dovezu* in Russia.

Parking spaces rental. This service allows drivers to find a free space for a short-term parking of the car. The *Parking Panda* platform specializes in providing such services in the US, *JustPark* in the UK, *ParkShare* in the US, the UK and Canada. *Parksharing* is Russian platform to search for free parking spaces in business centers.

Delivery of goods and belongings. The *Fretbay* platform is used in many European countries to search for vehicles to move goods. Information on cargo volume, its nature, dates of transportation and route that customers place there, allows owners of vehicles to contact them directly to arrange delivery.

MyBoxMan platform was established in 2016 to search for transport to deliver goods within nearby area.

Food delivery. Since order of dishes in restaurants delivered to home has recently become very popular, several platforms appeared, such as *UberEats*, American *Seamless*, *Postmates* and *GrubHub*, British *One Delivery* and *Food Delivery*). Some of them, for example, *UberEats*, enlist services of personal vehicles owners for such work, the others use people traveling by public transport (*Yandex.Eda*, *Delivery Club* in Russia).

3. ***Personal property***. Short-term rental of goods, equipment, furniture and other temporarily unused property is made through specialized platforms such as international *Spinlister*, American *Zilok* and *Peerby*, Russian *RENTMANIA*.

Some platforms cover several areas. For example, the *Zilok* motto is 'Rent everything'. Several platforms are focused on meeting the needs of a specific circle of people. So, people can find a place to leave pets during their absence through *DogVacay*, and rent bicycles, boards for snowboarding and surfing, skis and other sports equipment through *Spinlister*.

4. ***Entertainment, audiovisual services and communications***. With regards to the sharing economy, it is primarily the creation of films, music and computer software involving a significant number of people or attracting money of listeners and viewers, as well as the digital content sharing. Relations between the subjects are built either on a royalty-free basis or using crowdfunding.

For example, Internet projects are developed through a cloud platform *Wix.com*, and information on a wide range of issues is compiled and edited on *Wikipedia* websites. Crowdfunding is actively used for making films and in start-up projects.

The following platforms that use crowdfunding to assist artists in seeking funding for implementation of creative ideas can be mentioned: *Kickstarter* (USA), *Derev* (Italy), *Ulule* (France), *Goteo* (Spain), *Crowdculture* (Sweden), *Telecast* and *Beehive* (Belarus), *Spincast* (Ukraine), *Kroogi*, *Boomstarter.ru* and *Planeta.ru* (Russia).

[1] DARENTA: website. URL: https://darenta.ru/ (accessed 14.09.2018).
[2] BlaBlaCar: website. URL: https://www.blablacar.com/about-us (accessed 15.09.2018).

BitTorent clients and e-Mule, eDonkey2000 and Shareaza file-sharing clients, which allow individuals to exchange music, movies, games, computer software and other digital content, can also be attributed to the sharing economy.

Experts opting for a broader approach believe, that the following activities, in addition to the above mentioned, are also the sharing economy areas:

1. *Rent a car with per-minute payment*, also known as carsharing. It is most popular in the USA (*ZipCar*), Germany, Spain, the Netherlands, the UK, Italy, Austria (*Car2Go*, *DriveNow*), France (*Partage de voiture*, *Citiz*). Such carsharing is gaining increasing popularity in Russia (as of 10 September 2018, in Moscow there were 15 companies: *Delimobile*, *YouDrive*, *Car5*, *Anytime*, *BelkaCar*, *Yandex.Drive* and others).

2. *Free distribution of goods and food*. In Russia *Darudar*, *Otdam vam darom*, *Otdam tak* do this activity.

3. *Search for job and different services*. For example, *LinkedIn* allows to search for job and employees, *Handy* for 'handyman' and cleaners, Russian *NashaNyanya* for domestic assistant, nanny, nurse.

4. *Audio and video streaming services*, such as *Spotify*, where users can listen to music and watch movies online for free.

However, rent a car with a per-minute payment is a purely commercial activity, because the cars are specially purchased to make a profit from their rental, and in fact such rent does not differ from the services provided by traditional car rental companies Hertz, Avis, Sixt and others. Free distribution of goods and food is a charitable activity, especially since goods (and, of course, food) are given forever, not for temporary use. Search for job or employees does not meet the criterion of temporary use of the service. For these reasons, these activities can hardly be attributed to the sharing economy. As for the audio and video streaming, it is important who provides the service. If the files are got from another user, this exchange can be considered as a sharing economy. If they are got through a platform that has its own digital content bank, such activity should be considered as commercial.

Since the subjects of the sharing economy are people unfamiliar with each other, the basis of its functioning is trust, which is formed through assessment by consumers of quality of the goods or services received.

The lack of a clear boundary between the sharing economy and commercial activities should be emphasized, as many platforms allow consumers to receive goods and services from both individuals and legal persons that have temporarily free resources and from organizations engaged in business. For example, *Yandex.Taxi* cooperates with taxi companies and with owners of personal cars. The boundary is less clear in real estate, as many houses and apartments offered for rent through *Airbnb*, are purchased by their owners specifically to earn income.

The sharing economy is constantly changing because a good idea when it is implemented comes out often not attractive enough. For example, trip to another District of the city to pick up the rented equipment (and then to return it) is more burdensome for many people than its online purchase with home delivery. Therefore, mainly services that focus on the rental of goods and provision of services within restricted areas, such as American *Neighborrow* and *Peerby*, are successfully functioning.

Another reason is actions taken by traditional companies that lobby their interests in government, accusing digital platforms of dumping and violating competition rules. In addition, individuals who cooperate with the platforms feel socially unprotected and seek to change this situation through recourse to the court. This resulted in the introduction of some restrictions by authorities on the operation of digital platforms and adjudication of certain legal claims.

Another reason for the changes is the emergence of new digital economy areas, such as lease of aircraft by small groups of people for charter flights, especially in the high season to go to sea and ski resorts, due to lower, compared to regular flights, cost of passenger seats.

Further use of digital technologies in all spheres will contribute to the sharing economy development. According to experts, the income of companies operating in its five main areas will increase from $ 15 billion in 2015 to $ 335 billion in 2025[1], and the promotion of carsharing and ridesharing in the cities could result in a reduction in the number of cars by 80 %[2].

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INCREASING THE ENERGY EFFICIENCY OF BUILDINGS WITHIN THE FRAMEWORK OF AN INTEGRATED APPROACH TO THE "SMART CITY" MODEL

Preservation of natural resources and a favorable climate on the Earth for existing and future generations can be achieved by resolving the contradictions between the desire for a sustainable economic situation and the preservation of a healthy ecological situation.

The activities for the development of cities and settlements should be carried out taking into account the creation of conditions for sustainable development that can ensure energy-efficient economic development, improving the well-being of the population, and preserving the ecosystem and non-renewable energy resources for future generations.

The basis of sustainable development is rational nature management – a system of interaction between society and nature that meets the challenges of developing production and preserving the biosphere. Great contribution to the transition to a sustainable path of development of both countries in general, and individual cities can make energy savings.

At the present time in cities there is a sharp conflict between the needs of urban residents and the potential of the natural and resource potential of the territories. To implement the principles of sustainable development, it is necessary to revise existing approaches to the use of energy resources in cities.

The growth of information and communication technologies, monitoring and control tools also influenced the development of cities that concentrate the bulk of innovations. Their implementation contributed to improving the quality of urban management, the dissemination of new services that simplify the access of residents to urban services.

The concept of Smart City involves the use of intelligent and information and communication technologies for the management of urban property. The main goal of the concept is to meet the needs of the residents of the city. Smart City covers almost all areas of city management, including public administration, transport mobility, utilities, health, education, public safety, finance, trade, production and the creation of residential environments.

The level of "smart city" development can be determined by the number of management areas covered by intellectual technologies, by the complexity of technologies and the complexity of their operation. The implementation of the concept of Smart City, as a rule, begins with the introduction of technologies in separate, unrelated areas, including e-government systems that improve communication between the city administration, various institutions and residents. This allows the authirities to improve the collection and processing of information about the city. The development of technologies based on large-scale integrated platforms and the integration of city elements into a single system increases the efficiency of management and the development of smart services oriented to multiple groups of users.

By now, the Smart City concept has been actively developed in the US, developed countries in Europe and South-East Asia. Based on the experience of these countries, two main approaches to the implementation of the concept are singled out.

The first approach is the introduction of Smart City technologies through the design and creation of new cities. This allows you to carefully think over the infrastructure of the future city

and ensure the maximum integration of all urban systems. Examples of this approach are developed or implemented projects of cities in South Korea, the United Arab Emirates, China.

In most cases, these are relatively small, compact settlements where the infrastructure is initially created according to pre-designed, rather stringent standards. Often the development of such a city is considered as a single megaproject, which is detailed for individual projects and subprojects, and its effectiveness is initially estimated from the point of view of economic effects.

The second, more common approach, involves the implementation of the concept of Smart City in already existing cities, where on the basis of the existing infrastructure, local or complex projects are implemented to introduce intelligent technologies, then combined into systems. The leaders of this direction – Amsterdam, Stockholm, Barcelona, Singapore, being connected with the help of intellectual technologies extensive areas of urban economy, greatly improve the efficiency of urban systems and the quality of life of the population.

A wide interest in Smart City is associated with the possibility of obtaining various positive effects (economic, social, environmental). The use of information and communication infrastructure and technologies makes it possible to adapt the work of urban systems to actual needs and burdens, which results in lower costs through reduced consumption of resources, improved quality of services, and creation of new points of economic growth.

The introduction of intelligent technologies affects all areas. For the transport sector, this is an increase in mobility, a reduction in time costs, for health care – reducing costs through better diagnosis of diseases, less workload on institutions, simplifying access to medical care, monitoring the quality of services, improving public health, for education – monitoring the learning process, personalization programs, improved access to knowledge, for finance – cost reduction, increased transparency, security and simplification of transactions, development of crowdfinding, new payment systems; for the environment – management of the quality of the environment and buildings, the introduction of new efficient materials; for retail – more accurate identification of the needs of consumers, reducing time costs; for production and construction – optimization of production processes, control of resource costs. Also, the concept of Smart City increases the overall level of security, including environmental, reduces emissions and resource consumption.

Significant effects are confirmed by the experience of cities that have been working on the implementation of Smart City for a long time. The use of intelligent technologies allowed them to achieve a 30 % reduction in energy consumption, street crime by 30 %, traffic by 20 %, and water loss by 20 %. Indirect effects, resulting from the adoption of better management decisions and the development of a better urban environment, are manifested in the form of increasing economic and social activity, economic growth, increasing incomes of the population and budgetary funds [1].

The economic effects of introducing intelligent technologies consist in reducing the costs of city residents and budget expenditures, as well as in the growth of incomes of local companies. Released financial resources can be returned to the economy by the expenditures of households and companies in other areas, investments in improving services, which, taking into account multiplicative effects, will have an additional impact on economic growth. Stimulating growth can also be achieved through more efficient use of the city budget (redirecting the released costs to other areas) or reducing local taxes for companies in priority sectors of the economy.

In Russia there is growing interest in Smart City, but there are relatively few examples of projects in this direction. Significant experience is accumulated in a small number of Russian cities, the leaders in the development of intellectual systems – Moscow, Kazan and partly Skolkovo.

Initiatives to introduce individual smart services are present in other cities of Russia. The experience of applying the appropriate technologies was accumulated during the preparation of the Olympic Games in Sochi. In St. Petersburg and Tomsk, projects are announced for the introduction of smart systems in the field of ensuring security and rational management of urban municipal services, the desire to create a "smart city" is expressed by the authorities of the Moscow region. In a number of cities, it is planned to implement pilot projects to develop "smart energy" [1].

In practice, the development of intellectual technologies affects primarily cities with significant economic potential, the budgetary provision of which allows such projects to be realized, and the authorities are well aware of the advantages of a "smart city".

For the introduction of intelligent technologies in Russia the most attractive areas are where the benefits of their use are obvious. These include energy, whose modernization allows companies to achieve significant savings in resources and costs. And also the introduction of intelligent transport systems that allow to achieve complex effects – from optimizing traffic flows in the city, reducing the load on the road network to improving road safety and improving the ecological situation in the city.

Potentially promising experts also consider such areas as education, medicine, the provision of social services. The introduction of Smart City technologies in these areas allows individualizing services and controlling their quality, adjusting in accordance with consumer requests, improving security and at the same time controlling budget expenditures in these areas [2].

The development and implementation of intellectual systems should be accompanied by the involvement of all parties interested in sustainable development of the city (residents of cities, local communities, public and non-profit organizations, professional associations, representatives of large, small and medium-sized businesses). The state should act as the coordinator of such interactions, ensuring the identification of the views and interests of all these parties, as well as opening access to the management and use of data, services and infrastructure.

In Russia, where ¾ of the population lives in cities, the introduction of technologies that stimulate the economy, improve the management of urban systems and the quality of life of the population, should be one of the most urgent tasks. Together with the modernization of the infrastructure, new technologies solve the most important task of eliminating the technological backwardness of Russian cities, and the use of intelligent systems creates a basis for future sustainable development.

According to a study by the International Energy Agency "World Energy Forecast", the use of energy worldwide by 2040 will increase by at least a third. And although in 2014 almost half of the new generating capacities accounted for renewable energy sources, mankind as a whole will continue to focus on hydrocarbon raw materials. The introduction of green technologies is expensive, and they are not always energy-intensive. Limited uranium reserves and a threat to environmental safety also do not allow to see nuclear power plants as a full-fledged alternative to hydrocarbons.

Recently, the format of "smart building" ("smart houses"), based on two different approaches, has spread in Europe. The first is the construction of a house with zero consumption, that is, a building capable of covering its energy supply needs at its own expense, for example, using solar or wind power generation or low-potential ground heat, water. The second approach is "positive" houses, which generate more energy than they need, and give it to the network. One of the striking examples of the "smart building" format is the building of the R & D center in Grenoble by Schneider Electric. Elements of the "smart building" we introduced in the tower "Federation" in Moscow.

At the moment, there are a number of objective obstacles to the implementation of "smart cities" projects in Russia. First of all, this is the high cost of implementing such initiatives. The transformation into "smart cities" of already existing settlements assumes high costs for the complete modernization of engineering and utilities systems and the solution of deep structural problems of urban economy. For example, only one project to modernize the energy infrastructure in a city with a population of about 100 thousand people is estimated at more than 2 billion rubles, and the project to create an automated vehicle control system for the same city – in the amount of more than 500 million rubles [3].

Building new "smart cities" from scratch is even more costly, but more effective from the point of view of management. Currently, only two such projects are being implemented in Russia: the Innograd Skolkovo (Moscow), and Innopolis (the Republic of Tatarstan). A few

more “smart cities” in Russia are at the project stage, for example: the micro-District “Smart City” in Ulyanovsk and Innograd in the satellite city of St. Petersburg “Southern”. The project cost of construction of such cities reaches tens of billions of rubles. It should be noted that the cost of implementing the most famous foreign projects for erecting “smart cities” from scratch is at least $ 20 billion.

In a number of Russian cities, attempts are being made – often quite successful – to introduce separate “smart services”. First of all, these are projects in the field of housing and communal services, transport management, the formation of unified urban information systems of “e-government”, “safe city”.

The world trend towards urbanization and population growth, putting even more pressure on cities, necessitates the use of rational and environmentally friendly technologies in cities to overcome the consequences of population growth. In addition, the city accounts for a large share of the country’s GDP. By 2025, 600 of the world's largest cities will produce up to 60 % of world GDP. The 30 largest of them are projected to increase the world’s GDP by 20 % between 2010 and 2020. Growing urbanization (the latter in terms of, but not at all in importance) exerts environmental pressure on cities. About 70 % of the world’s carbon dioxide emissions fall on cities, which at the same time stimulate unprecedented growth in the overall level of consumption by citizens. This means that cities consume more than 80 % of the energy produced in the world [4].

Due to the growth of urbanization and energy consumption, one of the main tasks of Smart City has been the development of a technology that saves energy and receives it from renewable sources, while reducing carbon dioxide emissions.

Smart Cities should provide themselves with energy autonomously, reducing the cost of transporting energy from remote stations. A number of technologies adapted to work in Smart Cities, based on the use of renewable energy sources, can be applied. For example, the introduction of small wind generators, micro-heat power stations and heat pumps. In addition, an entire energy network should be established in which information will flow, and thus more energy efficiency will be achieved.

Russia needs to modernize buildings in all respects – heat and water supply, insulation of buildings, electrical wiring and so on. Thus, Russia faces the opportunity to use investments in environmentally friendly materials and technologies that increase the energy efficiency of buildings.

An energy efficient house is a building in which all energy losses and energy consumption are minimized. The main principle of building an energy efficient home is to achieve maximum tightness of the dwelling, the use of energy-saving technologies and the elimination of cold bridges.

In Russia, the main energy costs are for heating, so the main task is to prevent heat loss through the enclosing structures of the house – floor, walls, windows, ceilings and roof. This can be achieved with the help of modern frame construction technologies. Due to the use of heaters and special ways of skinning the frame, the presence of cracks is completely excluded.

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NUMERICAL PROBABILISTIC ANALYSIS FOR THE DIGITAL ECONOMY

The article is devoted to important aspects that characterize the problems of the digital economy. The first problem is related to the big data processing and knowledge discovery in data base. The second problem concerns the issue of the uncertainty level reducing and data variability study in the big data bases [1; 2].

A digital economy based on big data is predictive in its type: here the forecast, the plan and the fact tend to equality. Its basic tool is prognostic analytics, the main type of production is personalized to the needs of the client, and the competition goes not so much for the redistribution of existing markets, as for the formation of new ones, where no longer goods and technologies compete, but digital management systems based on digital platforms [2; 3].

Our approach is based on Big Data technologies including the data aggregation procedures for the input and output parameters and Numerical Probabilistic Analysis (NPA) [4–8].

An important feature of study is demonstration of the way how represent the aggregated data. It is proposed to use piecewise polynomial models, including spline aggregate functions. We show that the proposed approach to data aggregation can be interpreted as the frequency distribution. To study its properties the density function concept is used. Various types of mathematical models of data aggregation are discussed [5; 6].

Although there are many ways of data aggregation, including simple average, we argue that the use of piecewise linear and piecewise polynomial aggregation functions will offer a more informative representation of the variability in the Big Data, than other forms of data aggregation. Developed methods reduce the level of uncertainty in the information flow; significantly reduce the processing time and the implementation of numerical procedures [6].

Nowadays the dominating paradigms of economic theories are based on the classical mathematics and presented in terms of probabilistic and statistical methods. It should be emphasized that in applications, the probabilistic and statistical methods are often and successfully used in the synthesis with modern methods of soft computing. Now it is understood that in applications we often deal with aleatory and epistemic uncertainty [8].

There are many modern methods for uncertainty modeling developed in last decades. Generally, they are not in conflict with the traditional probabilistic approach since they deal with another (non-probabilistic) types of uncertainties.

The treatment of uncertainty in analysis, design, and decision making is going through a paradigm shift from a probabilistic framework to a generalized framework that includes both probabilistic and non probabilistic methods.

This paper discusses Numerical Probabilistic Analysis (NPA) for problems under aleatory and epistemic uncertainty [8]. The basis of NPA are numerical operations on probability density functions of the random values and probabilistic extensions. The numerical operations of the histogram arithmetic constitute the major component of NPA. The concepts of natural, probabilistic and histogram extensions of a function are considered. Using NPA approach, we construct numerical methods that enable us solving systems of linear and nonlinear algebraic equations with stochastic parameter. To facilitate more detailed description of the epistemic uncertainty, we introduce the concept of second order histograms. Relying on specific practical examples, we show that the use of the second order histograms may prove helpful in decision

making. In particular, we consider risk assessment of investment projects, where histograms of factors such as Net Present Value (NPV) and Internal Rate of Return (IRR) are computed.

Many important practical problems involve different uncertainty types. In practice, several sources of uncertainty of the required information impede optimal decision making in the classical sense.

When only uncertain information is available (which is most often the case), then the decision making require more complex methods for data representation and their analysis.

The basis of NPA is numerical operations on probability density functions of the random values. These are operations "+", "−", "·", "/", "↑", "max", "min", as well as binary relations "≤", "≥" and some others. The numerical operations of the histogram arithmetic constitute the major component of NPA.

One of the most important problems that NPA deals with is to construct probability density functions of random variables. Let us start with the general case when $(x_1,...,x_n)$ is a system of continuous random variables with joint probability density function $p(x_1,...,x_n)$ and the random variable z is a function $f(x_1,...,x_n)$

$$z = f(x_1,...,x_n).$$

By *probabilistic extension* of the function f, we mean a probability density function of the random variable z [7-11].

Theorem 1. *Let $f(\cdot,t,x_{2,...,}x_n)$ be probability extension, where t is real value, then probability extension $\mathbf{f}(\xi) = \mathbf{f}(\xi;\mathbf{x}_{1,...,}\mathbf{x}_n)$ can represent as follows:*

$$\mathbf{f}(\xi) = \int \mathbf{x}_1(t)\, \mathbf{f}(\xi;t,x_{2,...,}x_n)\mathrm{d}t \qquad (1)$$

Corollary 1. From Theorem 1 follows the possibility of recursive calculation of probability extensions of general form reducing them to the calculation of one-dimensional probabilistic extensions.

Let us consider computing of the integral (1). For simplicity, we represent (1) in the form of a quadrature. Further, for computing $\mathbf{f}(\xi;t,x_{2,...,}x_n)$ we will also use numerical quadratures and so on. In general, this is NP-hard problem and actual parallelization. In Fig. 1. the tree of parallel-recursive organization of the computational process are shown. Thus, on the lower layer, it is necessary to calculate probabilistic extensions for functions only one variable. All calculations on each layer are independent and can be computed simultaneously.

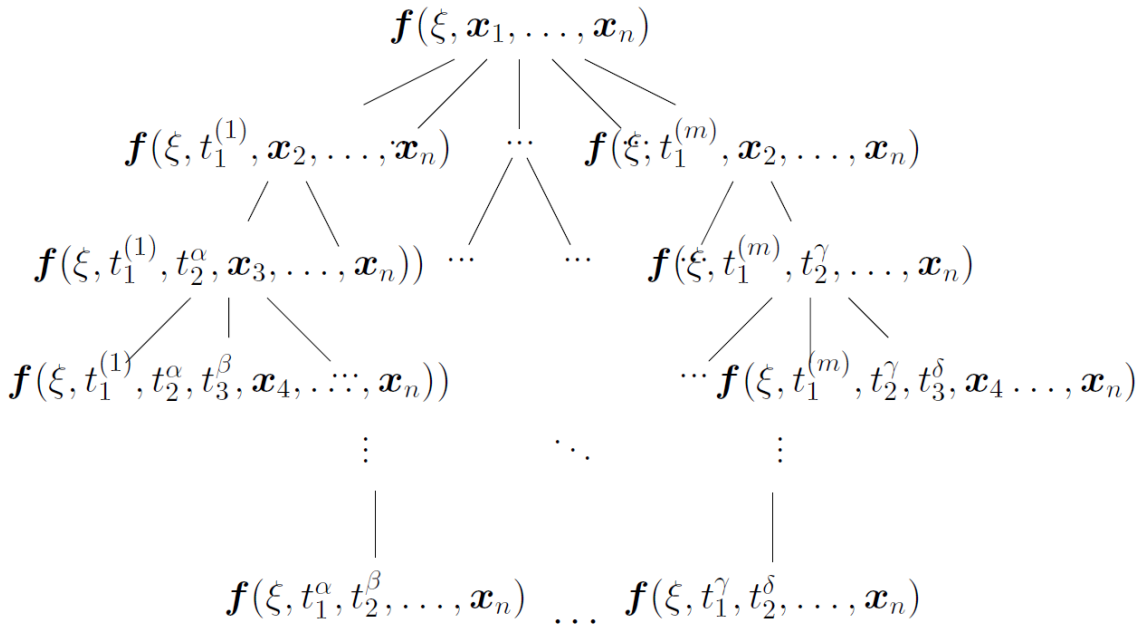

Fig. 1. The tree of parallel-recursive organization of the computational process

Let $f(x_1,...,x_n)$ be a rational function. To construct a probability density functions of random variables z, we replaced the arithmetic operation by the numerical operation, while the variables x_1, x_2, …, x_n are replaced by probability density function of their possible values $\boldsymbol{x}_{1,...,}\boldsymbol{x}_n$. It makes sense to call the resulting probability density function of z as *natural probabilistic extension* (similar to "natural interval extension").

Case 1. Let $x_1,...,x_n$ be independent random variables. If $f(x_1,...,x_n)$ is a rational expression where each variable x_i occurs not more than once, then the natural probabilistic extension coincides with a probabilistic extension.

Case 2. Let the function $f(x_1,...,x_n)$ can be a change of variables, so that $f(z_1,...,z_k)$ is a rational function of the variables $z_1,...,z_k$ satisfying the conditions of Case 1. The variable z_i is a function of x_i, $i \in Ind_i$. and Ind_i be mutually disjoint. Suppose for each z_i is possible to construct a probabilistic extension. Then the natural extension $f(z_1,...,z_k)$ would be approximated by a probabilistic extension function $f(x_1,...,x_n)$.

Example. Let $f(x_1,x_2)=(-x_1^2+x_1)\sin x_2$, and $z_1=(-x_1^2+x_1)$, $z_2=\sin x_2$. Notice that it is possible to construct probabilistic extensions for the functions z_1, z_2, and then compute $f=z_1*z_2$, which is a rational function satisfying the conditions of Case 1.

Using the arithmetic of probability density functions and probabilistic extensions, we can construct numerical methods that enable us solving systems of linear and nonlinear algebraic equations with stochastic parameter. To facilitate more detailed description of the epistemic uncertainty, we introduce the concept of second order distribution, which are defined as piecewise polynomial functions. The second order distribution can be constructed using Big Data, Intelligence Economy and intuition of experts.

Relying on specific practical examples, we show that the use of the second order distribution may prove very helpful in decision making [8].

Alternatively, efforts have been devoted to developing methods that were able to cope with uncertainties in strategic decision situations, in particular, involving calculations of the economic uncertainties. In particular, we consider risk assessment of investment projects, where histograms of factors such as Net Present Value (NPV) and Internal Rate of Return (IRR) are computed.

Let us consider risk assessment of investment projects. We use an a priori information about the probability densities of sales and product price and calculate NPV and IRR.

Net Present Value (NPV) is a formula used to determine the present value of an investment by the discounted sum of all cash flows received from the project. The formula for the discounted sum of all cash flows can be rewritten as

$$NPV(r)=Cz_1s_1\sum_{i=1}^{T}\frac{C_i}{(1+r)^i}-C_0, \qquad (2)$$

where $-C_0$ is initial investment, C_i is cash flow, T time, r is the discount rate, s_1 is cost, z_1 is expenditures.

IRR determines the maximum acceptable discount rate in which you can invest without any loss to the owner: IRR $=r$, in which the

$$NPV(r)=0. \qquad (3)$$

To provide an example of Net Present Value, consider company who is determining whether they should invest in a new project. Company will expect to invest C_0 for the development of their new product. The company estimates that the first years cash flow will be $C_i=c_i\cdot x_i$, where c_i is price and x_i is volume of sales. The expected return of r% is used as the discount rate.

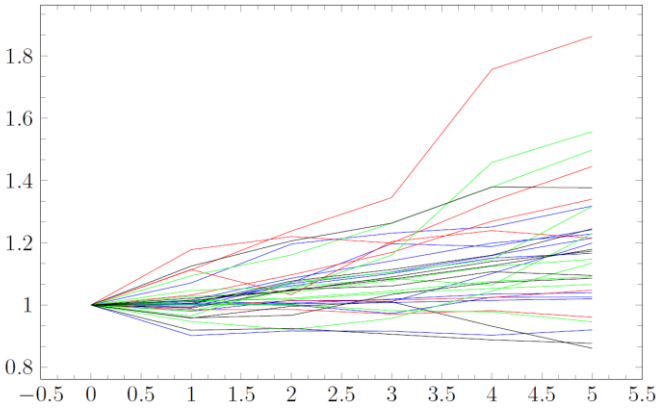

Fig. 2. The resulted volumes of sales similar firms

Using Big Date, we can build the resulted volumes of sales similar firms [12–14]. Figure 2 shows the resulted volumes of sales similar firms. Further using the procedure aggregation [5; 6], constructed cubic splines approximating the probability density of c_i, x_i, s_1, z_1.

Presence of various expert assessments can build second order distribution. Probability density function for the variables c_i, x_i, s_1, z_1 splines were presented with dimension n=4.

Using estimates of NPV and IRR density in the form of cubic splines and second order distribution, we can assess the risk that the investment project is loss-making. So, if P_{NPV} is the probability density function of NPV, then the probability P that the investment project is loss-making can be computed by the formula

$$P = \int_{-\infty}^{0} P_{NPV}(\xi)\, d\xi.$$

In our research, we have considered the representation of uncertainty information and computational aspects of its processing with the use of Numerical Probabilistic Analysis (NPA).

Relying on practical examples, we demonstrate that using the second order distribution may prove very helpful in decision making. In particular, we can apply the new technique in computation of NPV and IRR for risk assessment of investment projects.

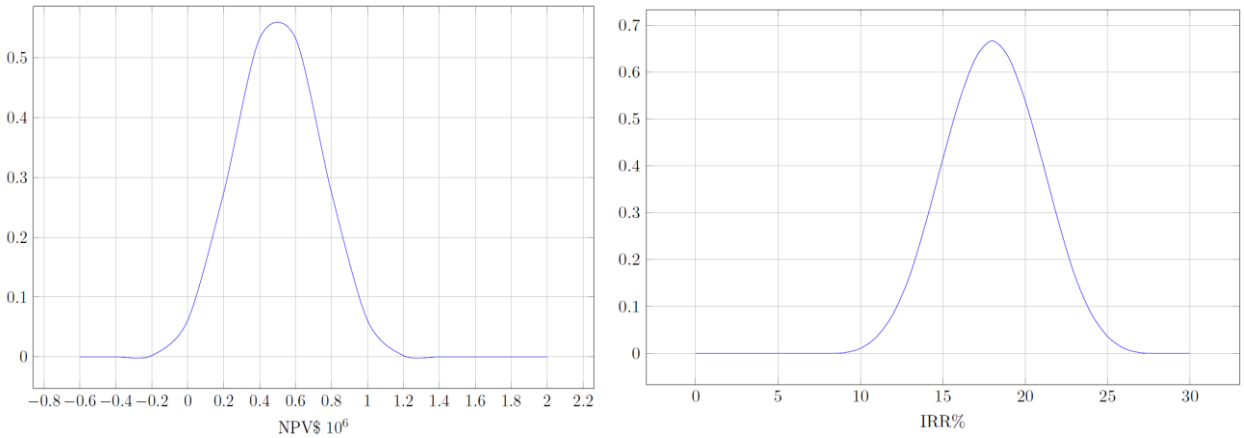

Fig. 3. NPV and IRR

Figure 3 shows the splines approximating the probability density of NPV and IRR [3]. Support of the NPV is [$ -0.704 10^6, $ 2.07 10^6] and support of the IRR is [5 %, 30 %]. Analyzing the splines approximating the probability density of NPV and IRR, one can see the possibility of both negative outcomes and considerable profits, contrary to the results of the standard analysis.

Comparison of NPA and Monte Carlo methods showed good agreement of results. For instance, for the number of samples $N = 10^6$ and spline dimension $n = 4$, four significant digits matched. At the same time, the numerical experiments demonstrate that the numerical arithmetic is more than 10^4 times faster than Monte Carlo method [4]. As the result, the approach based on NPA can be successfully applied to the solution of certain economic problems [9].

In conclusion we may say that our approach allowed us to present modelling results using the interactive visual modeling to provide the necessary data for operational decision making under remote surveillance techniques and distributed object systems.

Finally our approach is advantageous when dealing with uncertainty and big data study.

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INNOVATIONS AND DIGITAL TECHNOLOGIES IN RUSSIA'S CONSTRUCTION SECTOR

Construction in many countries, including Russia, is recognized as one of the most conservative and inertial industries with relatively low efficiency and labor productivity. One of its segments – the housing construction – is considered the most lagging and averse to innovations. Low interest of companies in innovative building materials and technologies is sometimes explained by the fact that the segments of the construction industry – residential, industrial, commercial, communal and road infrastructure, etc. are autonomous and weakly linked. In addition, the choice of new materials and construction technologies should take into account the lifetime of constructed facilities and should reduce the likelihood of their possible collapse and associated loss of life [1].

Transition of Russia's construction sector from centralized to market management has taken a particularly long time. For more than 10 years almost nothing has been built in the country, and only in the early 2000s, with the growth of world prices for oil and gas, housing construction gradually began to revive in capitals and large cities.

In the last 10–15 years, various industries have started to widely adopt big data technologies [2]. These technologies brought significant innovation into the construction industry affecting almost all of the key stages of real estate development: design (BIM-technology), construction and installation works; marketing, advertising and market analysis; corporate management of the projects and their costs; management and operation of real estate ("smart" buildings). In developed countries these technologies have long been used and are not considered innovative. In the Russia's construction industry they are just being mastered.

BIM-technology (Building Information Modeling) using the three-dimensional visualization of physical objects allows to create an understandable decomposition model of the construction site and information model of the future building with all of its characteristics. It allows to digitize the construction site at the stage of its selection and preparation, and at the design stage to "tie" the created model of the building to the site.

The building information model is a way of storing data, and at the same time facilitates easy and efficient change management in the project to improve design quality, seek the best design solutions, accelerate the creation of project documentation, and reduce the risks of errors [3].

However, BIM is an expensive technology that is available only to the largest construction and developer companies in Russia. The cost of setting up one workspace for a BIM-designer is 200-300 thousand rubles; annual maintenance of that workspace is 120-150 thousand rubles; and a salary of a specialist "BIM-manager-designer" is between 36.4 and 313.040 thousand rubles (average – 52 thousand rubles) per month. The payback period depends on the design volume. Other digital technologies are not cheap and are available only to large construction companies.

The construction industry of Russia was very enthusiastic about the adoption by the Government of the Russian Federation in July 2017 of the program "Digital Economy of the Russian Federation" [4], which aimed to coordinate the disparate efforts of different sectors of the economy, certainly including construction, the program defines the goals and objectives of the basic directions of the development of the digital economy to 2024: normative regulation,

personnel and education, formation of research competences and technical capacity, information infrastructure and information security.

Minstroy, as a participant of the Program, developed the Road Map of the Construction Program, but the most important areas, such as training of designers and managers, formation of research competences, information security, in it were unaffected. In addition, there was a mismatch in milestones: the list of necessary standards for the development of national standards for information modeling, as provided for by the BIM Roadmap (clause 14), was not pre-determined. Due to these inconsistencies construction industry practically was taken out of the Program [5].

Nevertheless, the leading construction and developer companies of the country, concentrated mainly in the two capitals, are gradually mastering the digital technologies and applying them at different stages of the construction cycle. The share of the largest construction companies, whose headquarters are located mainly in Moscow, St. Petersburg and a number of cities with population exceeding one million people, is small – less than 1 %, but their importance for the development of the industry is very important. Many of them are participants of national or regional ratings; and they determine the development of the industry. It was from these companies that the author formed a sample for assessing the scale, speed and degree of development and application of digital technologies by the Russian construction industry.

The sample of the 50 largest companies included 39 companies from Moscow, 6 from Petersburg and 5 Siberian. Most companies operate only in their own regions: for example, 25 Moscow companies build only in Moscow, Moscow Region, New Moscow and Moscow Region; 2 St. Petersburg companies operate only in St. Petersburg and the Leningrad Region. An important characteristic of the company is the year of its foundation, i.e. its age. There are 29 companies assumed "old" (created before 2000) in a sample, including 19 companies from Moscow, all 6 from Petersburg and 4 of 5 Siberian companies. Among the "young" companies created after 2000 are 20 from Moscow and 1 Siberian. The sample included 8 public companies: 5 from Moscow and 3 from St. Petersburg; 7 of them are "old", 1 is "young". All the "old" companies held an IPO before the crisis of 2008-10, with the only "young" company (GC Etalon-Invest, Moscow) after the crisis in 2011. For the purity of the experiment, the largest bankrupt companies were also included in the sample: Moscow's "Mirax Group", "SU-155" and Mostovik Omsk Infrastructure Company. Also included in the sample were "SibMost Novosibirsk" (on government support since 2017); "Morton" from Moscow (was merged with PIK with the loss of its brand in 2016); and "Sibakademstroy" from Novosibirsk (was bought with the preservation of the brand by the company Brusnika from Tyumen in 2015).

In-depth analysis showed that 9 of the sample companies actively develop and apply digital technologies.

BIM technology. Moscow's companies FSK "Leader", SMINEX, Etalon-Invest, Leader-Invest and GK "A101" and St. Petersburg's Selt Group have already implemented this technology. FSK "Leader" uses it since 2017 to detail all types of design work, including directly on the construction site. SMINEX applies BIM-technology in the design and implements the most effective IT-solutions. The company Etalon-Invest not only designs with the use of BIM-technology, but also uses it to optimize the construction process and improve safety on the construction site. Specializing in the renovation and integrated development of old industrial zones, Leader-Invest company conducted the transfer of the site with former ATS (automated telephone) stations into a digital format to fit the project into the developed landscape.

GK "A101" introduces BIM-technology in the anchor construction project of the nominal residential complex "Scandinavia". Creation of an information model that can function as a built house and allows it to be tested, shortened the documentation development time by 30 %, and the number of errors – by 80 %. Before the end of 2018 the company plans to design a number of residential buildings using BIM to get its own database of templates and families based on Revit software products. St. Petersburg's company Selt Group intergrated information modeling with

an automated system of investment control that allowed it to direct the development process at various stages and in all of its aspects – from the analysis of the cost of materials and planning decisions to risk management.

Construction and installation work using technology based on big data. To apply this technology, the company must conduct a very careful preparation: describe and digitize all construction processes on the construction site; radically change the process of interaction between managers and workers; organize continuous transfer of the work schedule from contractors to the managing center; and synchronize the interaction of the construction process with the construction materials supply planning system. In order to describe the construction processes on the site, it is necessary to distribute the tasks between the workers, determine the places of the task implementation, the sequence, technology and the timelines of implementation. Each employee – designer, cost estimator, economist, purchaser, foreman, etc. at his workplace must enter into the system all the data causing the change of the project. With continuous accumulation of the project data, the big data database keeps growing for use by company's economic services, and to automatically generate the necessary reports.

The most advanced company in this area is the Moscow's largest PIK company, that has miraculously escaped the bankruptcy in 2016 and that has recently replaced its investors. It is establishing an information center for working with data, and for that it formed a distributed network of IT divisions. Using weekly data reported by the chain of contractors company fully digitizes work schemes on the construction site in order to completely change the interaction system with workers, reducing the number of intermediaries between managers and the immediate performer. The chain of interactions, becoming transparent, is synchronized with the building materials supply system. To be able to continuously obtain data from construction sites, the company plans to supply all builders with smart bracelets that record the time of human activity, movement and physical activity.

Marketing, advertising and market analysis. In this area, PIK is again the leader. Consolidation of the whole array of information about already conducted advertising campaigns, their connection to the CRM system of the company (customer relationship management) and processing – all this allows the company to calculate the return on the ruble spent on each advertising campaign, and to build a portrait of the client in each project. In parallel, in real time, the sales department monitors the changes in the market data by using the big data technology to analyze the market conditions, the level of competition, etc. This is important for conducting investment analysis at the beginning of the project and further – in the sales process.

The company "INGRAD" uses BI-programs for market forecasts, advertising and marketing. BI-programs analyze and visualize data on concluded contracts, appraisal of the real estate market and competitive environment. The information is studied in the terms of cost, location, types, etc. The same technology is used to analyze the demand and requests through the processing of data on projects site visits, calls from current and potential buyers, call center data and other automated systems, and survey results. From the analysis of the large set of information pieces, a portrait of the buyer with his basic needs is formed, the product is formed and the price policy is built. Capital Group Company launches and extends the CRM-system to the ecosystem of Capital Living company for establishing partnership with service providers, including big data operators.

Management of real estate and operation of buildings. This is an area with great potential. Large construction holdings include their management companies in the structure of integrated information centers for managing business and real estate, while the use of big data in the operation of buildings turns them into "smart" ones. All kinds of sensors in these buildings and structures collect and transmit a variety of data to the information centers and to the management companies for monitoring the state of objects in the external and internal environment. Noting the appearance of technical defects, warning of a possible accident or occurred incident in communications systems, monitoring of the pressure, temperature, environmental parameters,

load intensity, activity of human flows and much more – all these data are important for the operating company and are very useful for the developer to plan future objects.

M.A. Maksimenko, chairman of the committee of the NP "AVOK", noted the trend "Cognitive Buildings" i.e. transition to the digitalization of security systems and building automation, the integration of technologies, networks, scenarios and interconnections in his report "Smart buildings and information and control systems" [6] at the panel "Dispatch management of infrastructure objects. The practice of automation of engineering systems in buildings" at the XI Specialized Exhibit-Forum "Advanced Technologies of Automation, St. Petersburg 2018" on June 5-6, 2018.

Among the companies actively developing digital technologies, the share of "young" (created after 2000) and public is higher than in the whole sample: 5 "young" out of 9 (in the full sample – 29 out of 50) and 3 public companies out of 9 (in the full sample – 8 out of 50). Perhaps the age of companies and their public status affects the propensity for innovation.

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FEATURES OF THE TECHNOLOGICAL DEVELOPMENT MODELS AND THE INNOVATIVE BUSINESS FORMATION IN THE DIGITAL ECONOMY

The need to study the technological development models and the innovative businesses formation in the digital economy is caused by the following reasons:

- low labor productivity of the main Russian industries in comparison to the leading world countries, despite the fact that the share of industry in the economy structure is 32,4 % (in relation to 19,5 % in the USA) – 2015;
- low share of the digital economy in GDP (3,9 % in Russia in relation to 10 % in China and 10,9 % in the USA) and the share of digitalization processes in industries where the gap is more than 60% from Western European countries.

Global trends in tech nological and economic development allow to conclude about the high dynamics in the cross-border structure of resources, which form the markets. For the last ten years (2005–2015) information as a resource has increased up to 70 % against the growth of the labor force (20 %), capital (7 %), goods 5–7 %.

Changes in the structure of market-forming resources entail changes in the business models of traditional production sectors, the elimination of some traditional markets and the emergence of new products and services based on data as intangible assets. This causes need to change the technology development vector in the direction of accelerating the transfer of production processes and resource management into digital platforms, allowing to reduce production costs, to remove unnecessary intermediaries along the entire product life cycle chain.

On the one hand, the acceleration of production processes digitalization by the transfer of business process management into digital platforms allows to diversify the structure of the economy, create new jobs, new markets, which can ensure an increase in the share of the digital economy in Russia's GDP to 19–34 % (2025) against 3,9 % (2015). On the other hand, it causes new problems of technological development, especially for the Russian raw regions:

- problems of transformation technologically harmful industries into the newly formed value chain;
- providing employment in areas remote from urban centers, and because of long distances reducing the digitalization possibility;
- interaction of the largest TNCs with the regional authorities (their physical presence) both beyond territorial and state borders.

Companies that develop digital technologies are becoming points of economic growth, providing the economy with digital resources:

- they increase the efficiency of investments, management decisions and identify new opportunities for strategic positioning in the markets;
- they change the operating business model (methods and procedure for implementing the corporate strategy in the current daily activities);
- they use innovation in all fields: production, logistics, trade.

However, despite the advantages of large digital IT-companies as economic growth drivers (about 20 companies have revenues of more than 6 billion rubles) the Russian IT-market has significant drawbacks which form barriers to economic growth:

- the IT-market is not capitalized, the share in the world economy is about 1 %;

- the investment structure is based on the own funds, the lack of which reduces the possibility of strategic financing for integration development through mergers and acquisitions;
- a small share of private investment in the digital economy (Russia – 2,2 % of GDP; USA – 5,0 %; Western Europe – 3,9 %; Brazil – 3,6 %) limits the strategic repositioning speed in commodity markets.

The ***influencing factors*** on the technological development models and the formation of innovative business in the conditions of digital economy can be the changes in the conceptual basic premises for processes management of research, project, production, market activities in world practice:

- transition from the concepts of "production management of individual goods", "local product market management" to the management concepts of "product life cycle", "management of a complex of local product (service) markets during the product life cycle chain";
- transition from the concept of strengthening competitive advantages and concentration of presence in local areas to the concept of strategic market re-positioning in new consumer segments, new geographical and commodity markets.

The ***factors-resources*** that influence the technological development models and the innovative business formation can be innovations, which types and ratio in the structure will be determined by the characteristics of the economic sector and the needs of a particular stage from the product life cycle (Tab. 1) [1].

Table 1

Innovation structure in the Russian economy sectors in 2015

Russian economic sectors	Types of innovation			
	technological	including:		marketing
		food	process	
Mining processing, production and distribution of electricity, gas and water				
Total	**99,3**	**35,8**	**63,8**	**0,3**
including:				
extraction of minerals	99,9	9,7	90,2	0,01
manufacturing industries	99,1	43,9	55,2	0,4
high-technological	98,9	64,1	34,9	0,6
medium technological	99,2	47,5	51,7	0,5
low-technological	95,9	53,8	42,1	3,6
Communications, activities connected with the using of computer science and information technologies				
Total	**99,5**	**71,5**	**28,0**	**0,1**

It should be noted that the marketing innovation share which are responsible for market positioning, promotion of products to consumers, formation of customer demand for the trade brands and growth of consumer loyalty is insignificant not only in the sector of "mining, manufacturing; production and distribution of electricity, gas and water" (0,3 %), but also in the sector of "communication and activities created by using computer science and IT" (0,1 %).

The technological innovation share in the structure of innovations is significant; it is 99,3 % and 99,5 %, respectively to the sectors of the economy. However, the sectors of the economy are characterized by the opposite ratio of innovation in the structure (product, process):

- mining, processing industries; production and distribution of electricity, gas and water – 35,8 % and 63,8 %;
- communication, activities with using of computers and information technologies – 71,5 % and 28,0 %.

The share of organizations engaged in technological innovation in the sector of "mining, manufacturing industries" is on average in Russia for 2007–2015 – 9,3 % (Krasnoyarsk region, 2015 – 9,5 %); in the sector of "communications, activities using computer science and IT" on average in Russia for 2007–2015 – 10,2 % (Krasnoyarsk region, 2015 – 6,3 %). It should be noted also that the closer the mining sector is to the beginning of the product life cycle chain, the greater is the share of organizations engaged in marketing research for technological innovation; the closer manufacturing sector, sector of computer science and information technologies are to the end of the product life cycle chain, the greater is the share of organizations implementing marketing innovations.

In this case it is evident a steady downward trend in all innovation types [3, p. 343–374].

The ***factors-resources*** that influence the model of technological development and the innovative business formation also can be the technological level of production and the size of the organization in terms of the employees [1; 3]:

- the higher is the technological level of production, the greater is the share of organizations with marketing innovation implementation (high-tech production-5.9 %, low-tech production – 2,4 %);
- the larger is the size of the organization in terms of the employees, the greater is the share of organizations making marketing innovations (with a population of more than 10 000 people – 15,4 %; with a population of up to 200 people – 1,4 %).

It should be noted that Russia has the smallest share of organizations engaged in marketing innovations – 1,4 % (2015) in comparison to Switzerland (50,5 %); Ireland (35,9 %); Germany (35,9 %). Romania has the lowest share in the world economy (6,6 %).

The degree of influence of marketing innovations on changes in the commodity market structure (new, traditional) and consumer segments is still insignificant and practically has not difference in Russian economic sectors (within 1,8–2,1 %).

As the ***factors-conditions***, which influence technological development models and the innovative businesses formation can be noted the following:

- the difficulty level of the model of participant cooperation in the system "state-science-business-society", which creates conditions for growth in the form of intellectual property, investment or innovation infrastructure (the higher is the difficulty level of cooperation models, the faster is the rate of economic growth);
- the ratio of the cooperation participants and the innovation infrastructure objects, which expand the opportunities and rates of economic growth (Tab. 2).

Thus, it is possible to distinguish the following models of technological development and innovative industry formation:

- "market pull" model ("top-down"), when business determines the order for research, training programs, but without the active participation of universities in the transfer of technology to industry (2-level spiral – model of technological development for corporations);
- "push-to-market" model ("top-down"), when universities create new knowledge, intellectual property object and the state creates conditions for business for a new product scaling in the markets (model of technological development for regional innovation system – 3-level spiral ("state-science-business"));
- model of "technological gaps' elimination", when the number of created scientific results exceed the business opportunities for their commercialization. Elimination of discontinuities due to the involvement of society in the processes of innovation infrastructure formation: platforms for cooperation, organization, brokers, co-working centers, fablab (technological development model for the national innovation system – 4-level spiral: state-science-business-society);
- model of "market formation for the innovation demand", when the number of commercialized projects exceeds the volume of demand (technological development model for the global innovation system – 5-level spiral: state-science-business-society-consumer).

Table 2

Model of participant cooperation in the system "state-science-business-society"

<table>
<tr><th>2-level spiral</th><th>3-level spiral</th><th>4-level spiral</th><th>5-level spiral</th></tr>
<tr><td rowspan="2">"market pull" model ("top-down")

University:
+scientific research
+education
-does not participate in technology transfer to industry

Business
+production of products</td><td rowspan="2">"push-to-market" model ("top-down")

university

creation of new knowledge

government

product scaling in the market

business</td><td>model of technological innovation gaps' elimination
(the number of patents exceeds the number of commercialized projects)</td><td>model of market demand formation (the solution of the trust gap problem)
(the number of commercialized projects exceeds the volume of demand)

-user communities
- accelerator networks
-internet platforms</td></tr>
<tr><td>-co-working centers
-nets of business-incubators
-interregional fablab</td><td>-co-working centers
-nets of business-incubators
-interregional fablab</td></tr>
<tr><td></td><td>-R&D at higher schools
-entrepreneurial universities
-business incubators
-transfer centers
-innovation cluster and etc.</td><td>-R&D at higher schools
-entrepreneurial universities
-business incubators
-transfer centers
-innovation cluster and etc.</td><td>-R&D at higher schools
-entrepreneurial universities
-business incubators
-transfer centers
-innovation cluster and etc.</td></tr>
<tr><td>-R&D in company
-industrial cluster</td><td>-R&D in company
-industrial cluster</td><td>-R&D in company
-industrial cluster</td><td>-R&D in company
-industrial cluster</td></tr>
<tr><td>Model for corporations</td><td>Model for regional innovation system</td><td>Model for national innovation system</td><td>Model for international innovation system</td></tr>
</table>

In the conditions of the digital economy the models of technological development from the raw materials regions depend on the factors and mechanisms of interaction between the government and large mining, industrial companies located in the region. Taking into consideration that, first of all, the large companies are focusing on their capabilities of digital production and business processes, it is necessary to form the requirements of regional authorities to implement the processes of digital modeling and mineral deposit forecasting, quality management of mining and processing of mineral raw materials, creating digital doubles of concentrating factories; digital modeling of new alloy production with specified properties; the use of geospatial information to digitalize the preparation of management decisions for the strategic development of the region; digital modeling in monitoring of water, land, biological resources, etc.

The formation of regional government requirements to the models of technological development in large companies with using the digital platforms is a necessary condition for maintaining a balance of economic interests "state-science-business-population".

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UNIVERSITIES AS THE CENTRES FOR THE DEVELOPMENT OF NEW COMPETENCIES AND HUMAN RESOURCES FOR THE CITY MANAGEMENT SYSTEM UNDER THE CONDITIONS OF DIGITAL TRANSFORMATION

The report examines the problems of transforming university education under the conditions of digital technological transition. Undoubtedly, one of the important tasks of universities is to train specialists who will create a technological and software-digital basis for the transformation of all spheres of production and management. However, the most important and complex problem of digital transition is the development of a new humanities-related behavioural component of human capital. Globally, this is the formation of digital literacy in a new environment in the context of developing and mastering basic cognitive skills. The key role of universities in the digital age is to become the centre for the formation of new professional and cognitive competencies. The reported study was funded by Russian Foundation for Basic Research, Government of Krasnoyarsk Krai Krasnoyarsk Region Science and Technology Support Fund within the research project "Methodological approaches to the classification of modern urbanization processes in the resource regions of Siberia and modeling the impact of the level of key urbanization factors on the innovation-technological, economic and socio-cultural development of the region (on the example of Krasnoyarsk Krai), № 17-12-24013.

***Keywords**: digital economy, professional and universal competencies, cognitive abilities, individualization of educational lines, project management.*

Educational sphere is one of the key and most promising sectors in the global competitiveness of states for economic power and political influence in the nearest future. The technological framework for the development and transformation of modern education will take place in the trend of digital transformation of the production and socio-political spheres. The implementation of the state programme "Digital Economy" is a new opportunity for economic growth in our country. Development should be provided not only through the automation of processes. The key role here should belong to the new business model, the creation of information products and services, the development of social relations in this environment and human capital on the basis of the opportunities that the digital economy opens.

Particular attention is paid to human resources. Training and professional development of specialists today should be quick and aimed at specific practical tasks. Therefore, it is necessary to determine the required competencies, create good educational products for them, and then connect them with the needs of organizations that operate in the IT field. The transformation of the labour market and the creation of the motivation system for mastering the necessary competences should be based on the demands of the digital economy and encourage the human resources to participate in the development of the digital economy of Russia. The education system must certainly provide the digital economy with competent human resources. Thus, according to "Digital economy" autonomous non-commercial organization survey, in the near future no less than 40 % of the country's population should have digital skills, and annually more than 1,200,000 graduates of higher educational institutions with competencies related to information and telecommunication technologies will be required at the world average level.

The term 'digitization' for a long time was on the agenda of large-scale events devoted to education. This is not surprising, since, according to "Digital Economy" programme adopted by the Government, by 2025 the education system in Russia should be organized in such a way that

it can prepare for the digital future a sufficient number of competent users of information technologies that have competencies necessary in the 21st century. In accordance with the state programme of digital economy, training of professionals should, first of all, be focused on the solution of the following tasks:

- development of a modern and safe IT structure, which would be available for everyone, transition of state authorities mainly to Russian software;
- development of a pervasive informational infrastructure;
- ensuring cybersecurity, high standards of protecting the individual's interests, interests of business and state against information threats such as payment systems, protection of personal data, prevention of cyberattacks;
- digitalization of state management and development of digital services in such fields as education, healthcare, security and services for business;
- design of the modern regulation system, development of favourable and competitive conditions for the participants of the digital sphere, as well as unified requirements to various digital operations such as identification, paper flow or data processing and storage;
- rule-making activities should stimulate intellectual activities in the field of innovations, digital sphere and ensure efficiency and investment inflow.

In this context, the role of universities becomes the key one, since digitization of the economy is not simply the transition of data and processes from the 'analogue' era into the digital form. Therefore, digitization of the education system cannot be limited to the creation of a digital copy of typical textbooks, digitization of the paper flow and access to the high-speed Internet for the entire educational institution. If we simply take and digitize a bunch of methodological materials, this does not mean that they will become a part of the digital economy. The fundamental approach itself should be changed, what and how should be taught. It should be based on the close interaction of universities with the business community, state and public institutions and, in cooperation with them, develop the strategy, methodology and formats for transforming the training of human resources. In the era of digital transformation, universities are becoming the centres for the formation of professional competencies for the new economy.

Undoubtedly, one of the important tasks of universities is to train specialists who will create a technological and software-digital basis for the transformation of all spheres of production and management. However, knowledge of information technologies and even basic models of their application is not enough for the effective work of a citizen and a professional nowadays. New competencies are required, including critical and creative thinking, initiative and responsibility, adaptability, innovation, entrepreneurial spirit and emotional intelligence.

The most important and complex problem of digital transition is the formation of a new humanities-related behavioral component of human capital. In a broader sense, this is the formation of digital literacy in a new environment in the context of developing and mastering basic cognitive skills, such as the ability to create and use content through digital technologies, including computer programming skills, searching and sharing information, and communicating with others. Researchers in this field focus on a number of elements of digital literacy, including understanding of the cultural context of the Internet environment, the ability to communicate in online communities, the ability to create and distribute content, the skills of using digital technology for self-development. Education in the field of the humanities in a way better corresponds to the new situation in the society and the economy. It forms (at least it should form) the flexibility of thinking, the ability to listen and empathize, re-learn and process new information.

Thus, for example, according to the assessment of the Moscow State Pedagogical University in the labour market, the role of the competencies of specialists has sharply increased, not only as a set of specific knowledge and skills, but also supplemented by humanities-related behavioral competencies such as: communicative competence (counseling, interaction with colleagues and

subordinates, intergroup interaction); project competencies (planning, creating project teams, organizing, launching projects, monitoring their quality and motivation); analytical competences (problem statement, work with information, data analysis and solution search); pedagogical competence (development of educational programmers, work with groups, evaluation and quality control of training). In other words, each specialist must have universal competencies: digital competencies include confident and effective use of information and communication technologies for work, leisure and communication; initiative and entrepreneurial competences are the ability to turn ideas into actions through creativity, innovation and risk assessment, as well as the ability to plan and manage projects and the ability to build intercultural network communications (social and professional), learn and improve, etc.

Therefore, the transformation of university education goes in the context of the development of existing approaches and the formation of new methodological ones: the individualization of educational trajectories; the concept of lifelong learning; mixed training through the use of the online environment that provides customization of subject content, and the redistribution of the teacher's time towards problematic discussion; focusing on universal humanities-related competencies; strengthening the project approach in teaching and development of the networked educational environment.

In order for continuous education to become the norm of life, the structure of online education should constantly develop and the attitude towards learning should change. And if the first task is directly related to the development and implementation of online platforms, software and digitization of content, the second one is connected with the development of the students' internal motivation to study. The most important task of university education is to strengthen communication with the research and development institutions and with business structures. This will ensure the production and business activity of students and teachers and allow to take this activity into account when assessing and evaluating the performance of the educational process participants.

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INTRODUCTION OF MODERN DIGITAL TECHNOLOGIES AND RESEARCH WORK IN UROLOGY DIVISION KCH (KRASNOYARSK)

The increase in the incidence of ICD in the Krasnoyarsk Territory over the past five years is at the level of 29,4 %. The reason is a significant meridional extent of the edge, which causes a variety of climatic features. On the territory of the region there are industrial hubs, large industrial enterprises, emissions of harmful substances that cause soil pollution, which leads to secondary pollution of groundwater and the use of poor-quality drinking water in terms of chemical indicators.

At present, a modern differentiated multilevel system of providing, above all, routine care to a urological patient, requires optimization. The monitoring of urological morbidity is not actively monitored, with the aim of predicting morbidity and calculating the needs of consumables.

Features of nephrolithiasis in the region – a relatively large number of concrements of high density, with difficulty giving in to remote lithotripsy. A large territory, settlements, distant from each other for hundreds of kilometers, the impossibility of the existence of large institutions with specialized care in every major settlement, in particular, the presence of a full-time urologist, urological department with all the technical capabilities of modern diagnosis and treatment. As a result – later treatment of patients for help, missed time, a large number of complications, in particular, acute pyelonephritis in nephrolithiasis.

Urolithiasis is often accompanied by severe complications and in a large percentage of cases – relapses. The importance of the problem is also due to the fact that the disease is more often found among people of working age. In the structure of disability, the share of the urolithiasis is 6 %; 7,6 % of them are patients with a single kidney, and more than 90 % of disabled people are persons of working age.

Numerous studies devoted to this problem have made it possible to identify the most important points that contribute to the development of the urolithiasis in the region. Environmental factors include the chemical composition of soil and plants, the degree of mineralization of water, climate, sex, age, production and living conditions.

The geographical distribution of patients, even within the same region, is very heterogeneous. By now, there has been a tendency to believe that for each geographic region or a single locality in a given set of potential etiological factors, there are one or several leading priority risk factors that serve as the trigger mechanism for the development of the urolithiasis in the population living in this area.

Renal stone disease is one of the frequent causes of chronic renal failure in urological patients. The development of the most severe complication – acute calculous pyelonephritis – creates an urgent situation. Serous acute pyelonephritis becomes purulent, which develops in almost 1/3 of patients. The severity of the clinical course of acute purulent pyelonephritis is determined by a violation of the functions of vital organs. The most formidable clinical manifestation of an acute purulent process is the development of bacteriotoxic shock.

Treatment of nephrolithiasis has two main directions. One of them involves various methods of removing urinary stones – these are symptomatic treatments for the urolithiasis. The second direction includes methods for treating nephrolithiasis itself, taking into account its diverse etiological factors and complex pathogenesis. Conservative treatment is possible in the presence

of risk factors for stone formation for preventive purposes, for crystalluria and stone formation, but it is especially important after removal of urinary stones by any method as a metaphylaxis in 100 % of cases.

The aim of the study is to determine the intraterritorial factors contributing to the development of urolithiasis to determine the digital model of the patient's ecology.

Main goals:

1. Computer analysis of climatic and ecological features of the territories of the region.
2. Computer analysis of the questionnaire to determine the regional model of human ecology with the urolithiasis.
3. Development of digital diagnostic criteria for the urolithiasis with the definition of a patient-oriented routing algorithm.
4. Selection of general metaphylactic measures based on the results of complex numerical analysis of the chemical composition of stones.

Thus, the main content of the urolithiasis research:

1. Identify the factors that contribute to the formation of stone based on the state report on the Krasnoyarsk Territory, the results of the study of soil and water quality.
2. Formation of a database on patients' appeal.
3. Development of a digital questionnaire.
4. Computer analysis of preliminary diagnosis with the first established clinical diagnosis.
5. Creation of the algorithm for the diagnostic stages.
6. Implementation of the algorithm for the diagnostic stage.
7. Computer analysis of groups of patients who underwent surgical treatment, taking into account the implementation of the phase sequence algorithm.
8. Selection of general preventive measures based on the results of a comprehensive analysis of environmental data for each region of the region.
9. Development of postoperative metaphylaxis, taking into account the numerical analysis of the chemical composition of stones.

As a result, it will be achieved: ensuring accessibility and uniformity of the approach in the diagnosis and treatment of the urolithiasis; ensuring uniform quality criteria; control of quality criteria; change the approach to diagnosis and treatment of urolithiasis, which is associated with the introduction of modern digital methods of early diagnosis, as well as subsequent metaphylactic.

In 5 Districts of the region (Norilsk, Lesosibirsk, Achinsk, Minusinsk, Krasnoyarsk): the incidence of the population in the ICD; level of air pollution, drinking water, climatic conditions; Routing of patients with optimization of the latter; the volume of diagnostic measures according to the stage of routing; chemical composition of extracted calculus. The obtained results were analyzed to reveal regional features of the urolithiasis [1–9].

At present, X-ray studies are performed on a Siemens apparatus and include a urinary tract survey, excretory, retrograde and / or antegrade (according to indications) urography. For the diagnosis of urological diseases, including urolithiasis, multispiral computed tomography (MSCT) is used on the multigrid computer tomograph BRIGSPID produced by GENERAL ELECTRCS. The advantage of the method is non-invasiveness and high informativeness – the ability to receive information not only about the structure of the cup and pelvis system, but also about the angioarchitectonics of the kidney (the presence of large segmental vessels in the puncture zone), the condition of surrounding tissues.

Studies on the program “TissueVolume” helped to determine the exact location, size and density of the stones to be removed. This information, combined with traditional methods of diagnosis, allows you to carefully plan the forthcoming surgical intervention, especially with percutaneous nephrolithotripsy.

Among non-invasive methods for the study of nephrolithiasis, the most widely used ultrasound scanning is performed on the ultrasonic device ALOKAProSoundSSD3500 (Japan). DEKT was used as a definition of the constituent composition of the in viva stone,

and the method of ion chromatography was used to control the effectiveness of metaphylactic.

It should be noted that the research uses data from space vehicles that monitor the state of the environment, in particular, determines the level of air pollution in various parts of the region.

Thus, the main content of the study of urolithiasis: the identification of factors that contribute to the formation of stone, the study of the quality of soil and water; formation of a database on the treatment of patients; development of a digital questionnaire and computer analysis of preliminary diagnosis with the first established clinical diagnosis; creation of an algorithm for diagnostic stages and analysis of groups of patients who underwent surgical treatment, taking into account the implementation of this algorithm; the choice of general preventive measures based on the results of a comprehensive analysis of environmental data for each area and the development of postoperative metaphylactic, taking into account the numerical analysis of the chemical composition of the stones.

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IDENTIFICATION WITHOUT CONCENT

Advertising agencies, search engines, social networks and many other Internet sites have long been gathering information about visitors. And neural networks know how to handle them. Thus, in the conditions of a legal vacuum, the market for big personal data (BPD).

Corporations do not hide how using cookies (give impersonal information about site visitors – used for statistical tracking of device models, location, traffic, user interests) personalize offers. Users are guaranteed privacy and even the opportunity to escape from the focus of advertisers.

Depersonalized data on the interests and habits of people on the Internet are collected by all who are not lazy. Social networks, a variety of counters on sites, cameras, search engines, fitness trackers ... Experts ironically say that intelligence agencies no longer need to monitor people – to get the right information it is enough to connect, for example, to a medical gadget.

Recently, the technology for processing data on customer behavior was acquired by Sberbank [1]. The Segmento platform will allow the credit institution to use the biggest amount of data on consumer behavior in the Russian market.

In a legal vacuum, there is a leak and resale of big user data abroad. Indeed, in the US in 2017, a law was passed on the free sale of BAP by operators. The Internet profile of an ordinary citizen is estimated at $ 10-20. The final buyers of data are unknown, which creates risks for millions of citizens. Experts believe that BPD – although they are raw information, but allow the calculation of personal data (PD). Information from different sources gives analysts the opportunity to identify repetitive patterns in processes, which can not be achieved in a one-time study.

Thus, with the development of the Internet of things, data on which it is possible to uniquely calculate a person can not always be qualified directly as personal [2]. It should be noted that the issues of regulation of “digital traces” of users are included in the state program “Digital Economy” [3]. In particular, the document refers to the adoption of national standards for processing big data arrays and much more.

So far, both in Russia and in the world, “big personal data” is a rather abstract term for data that does not formally fall within the definition of personal data. But characterizing a particular user of the Internet, a mobile subscriber whose location is known. This person may not have been identified by the operator, but the operator distinguishes him from other site visitors, shoppers and so on.

If you collect data from various sources and bring them together, the person who can do this will become aware of the person much more than he imagined visiting the site or entering the metro.

Undoubtedly, the new reality, in which the digital personality lives, strictly speaking, not known, not verified and not identified by the owner of the Internet resource, will eventually require legislative and regulatory regulation. To do this, you will have to solve a lot of questions – is the user account of a social network with an unconfirmed name, with unknown to whose photo or user that is present on the network under the nickname, his personal data, what is contained in the cookies is personal data, no.

The question of big personal data, in fact – is a question of personal data of one person, but with a scale effect.

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USE OF SOCIAL NETWORKS IN ADDITIONAL EDUCATION OF ADULTS

High socio-economic dynamics of society, the globalization of the economy, the appearance of new technologies and industries, increased competition, demographic changes, increasing the amount of leisure time, the growth of general education of the population-these and many other determinants actualize the need for continued additional adult education.

When organizing additional training for adults, the following features should be considered:

- having life experience as an important source of learning;
- awareness of the process of their learning, acceptance of responsibility for the results;
- the need for meaningful learning (for solving an important problem and achieving a specific goal), which provides motivation;
- the need for independence;
- the practical orientation of training, the desire to apply the acquired knowledge, skills and habits;
- the impact on the learning process of professional, social, domestic and time factors. The adult person, as a rule, has a lot of family and social duties, therefore he learns without interruption from the basic professional activity;
- the need to maintain self-esteem, increase self-esteem.

The adult "student" acts as a co-author of the process of his own learning, while the teacher plays the role of the process coordinator, the "architect" designing new forms, methods and possibilities.

Social networks can become an extremely effective tool that effectively complements traditional presentations, seminars, business and role games, case solutions, project implementation and increasing the effectiveness of their application.

A social network is called a platform, an online service or a website designed to build, reflect and organize social relationships on the Internet [1].

This is a community of people connected by common interests, common cause or having other reasons for communicating with each other. Today the most popular social networks are Facebook, Twitter, YouTube, Google+, LinkedIn, VKontakte, Odnoklassniki, My World. Social networks differ from each other in a general direction, different capabilities for users, different requirements and interface. However, there are common features inherent in many social networks:

- popularity, wide audience coverage (most students are registered in one or more social networks);
- free resources, and, at the same time, significant functionality;
- unambiguous identification, individual profiles with personal information that can be opened (or restricted) for universal access;
- the ability to add other users to "friends" and track their updates;
- Communication through both personal messages and communication in groups, chats, communities, microblogs, comments;
- distribution and exchange of all types of information, convenience of distribution services and notification of information;
- Communication through both personal messages and communication in groups, chats, communities, microblogs, comments;

- distribution and exchange of all types of information, convenience of distribution services and notification of information [2].

Social networks have a huge potential that can be used in the additional education of adults:

1. Support for learning in the social services environment allows not only to limit oneself to formal classes in the classroom, but to expand the educational space, providing pedagogical support in out-of-audit time.

2. Learning activities in social networks contribute to the development of learning motives related to self-realization, self-expression, fear of failure, motives of prosocial behavior, etc.

3. Multimedia capabilities of video, audio, interactive social services allow you to significantly diversify the presentation of educational material.

4. All versions of documents in the social network are available simultaneously to the teacher and the student, which solves the problem of backup and the absence of problems with the loss of the electronic version of the reports.

5. Social networks allow to establish direct effective communication both between students and between the teacher and the student. In addition, the possibility of direct contact of the student with experts in a topic of interest on a global scale is very important. This allows you to collaborate in group assignments, joint projects (even if classmates are scattered all over the country or the world). Social networks allow you to find like-minded people, support the exchange of ideas, personalize and continuously enrich and expand their experience. Communications in social networks are carried out through messages, communication in groups, chats, communities, micro blogs, comments [3].

6. The organization of the research process is facilitated, since social media offers tools for monitoring the opinion of the target audience of educational projects or the attitude of experts to the topic of interest to students. In social networks, there are valuable knowledge, such as analytics and ideas on various topics or issues of learning. Students can use online tutorials and resources that are distributed through social networks and LMS.

7. The functional of social services allows not only to store, but also to create, and also to share digital content. That is, students directly participate in the process of creating and sharing knowledge.

8. Social networks have great potential in forming a reputation, building a personal brand, positioning themselves as a competent specialist, an expert in a certain field, developing on the basis of this career.

9. Social networks allow students to independently track progress in learning, personal progress.

10. The opportunity to create conditions for students who for some reason absent at the class, they have the opportunity to observe the training activities and even take part in it directly online [4].

In the real educational process, the authors use the following approaches. On the Facebook network [5], students of the program maintain their own pages, organize self-presentations (15-second videos on Instagram). Some of them start and run personal thematic blogs. The next step is to add each learner to the “friends”, allowing you to set up a trusted atmosphere and communication. Further, the teacher creates a common closed group of listeners of one program, participants are invited, rules for online communication are created together, an administrator responsible for their compliance is selected.

This group organizes informing students, exchanging materials in .doc, .xls, .ppt, .pdf, video files, audio files, links to Internet resources. Polls and questionnairs are being created (for example, about a topic that the listeners would like to repeat or study in more detail). The group in the social network at the same time becomes a kind of “piggy bank” of knowledge, and many suggestions for additional interesting materials come from the students. Since all users are equal in status, communication in the group becomes open and easy. The student can ask the teacher without any fear and difficulty a question about the topic covered and get a full answer [6].

The fulfillment of the training tasks is also carried out electronically, the results are put into the group for verification and their discussion is organized in the comments. At this stage it is possible to simulate the procedure of self-evaluation and mutual evaluation by means of "likes".

Monitoring of the learning of knowledge also occurs in the general group, through discussions of works, tests and online surveys. As a result, continuous rating is carried out in Google spreadsheets.

The possibility of integration with other applications has a great positive effect: students can discuss their group projects with Google Hangouts, share resources and participate in discussions possible via Twitter, create shared calendars and file sharing services, Dropbox allows, project management uses such applications, as Trello. Conference calls can be quickly coordinated using ConferenceCall.com. Also, the experience of using the authors Linkedin, Real Time Board, Snapchat, Vine, Tumbler has shown a positive effect for solving a number of educational problems.

As a conclusion, it should be noted that social networks in education contribute to the faster creation and wider dissemination of knowledge, not only by overcoming geographical or other boundaries, using digital multimedia content, but also through new pedagogical strategies for learning in the context of adult supplementary education. The identification of conditions for improving the effectiveness of the use of such models is the goal of our further research.

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INSTITUTIONAL INFLUENCE OF THE SMART-CONTRACTS' SYSTEM ON AGGREGATE REGIONAL INDICES

The conception of the smart-contract was offered by Nick Szabo in 1994 [1]. However at that time there was no technological approach supplying his functioning. Occurrence in 2008 of the Bitcoin [2], and in 2015 Etherium ecosystem [3], provided a practical implementation Szabo's ideas.

The conception of smart-contracts is currently attempted in various social and economic projects in different social relations. Smart-contract is really capable to solve some institutional problems of contraction control, to reduce transaction costs, to ensure a high trust level of the contract participants.

It is worth to admit that serious limitations exist. First of all, it has determined technical difficulties in practice implementation, secondly, there is no sharp understanding, how the system of smart-contracts is capable to affect macro-economic indices of a region and country as a whole.

Within given research we will be concentrated on analysis of macroeconomic problem aspect. To this end, we will assume that technical and legislative problems of the spelling and implementations of smart-contracts have been already resolved.

To produce the macroeconomic results we will conduct analysis of the system of smart-contracts on the microlevel, we will try to aggregate further results and to generalise it.

There are many approaches to the smart-contract definition, within the research we will not pay serious attention on their analysis, comparison, search of benefits and demerits, as all of them have approximately an identical value. The smart-contract will be defined as a computer algorithm recorded to blockchain, independently making determined operations incorporated in his code.

We will allocate the advantages of transactions committed with smart-contracts' using:

- accuracy and autonomy;
- security;
- transparency;
- resistance to the opportunism;
- high speed of performance, due to automation.

This is by no means an exhaustive list of advantages of the smart-contract, but it's quite enough to understand, how the reduction of transaction costs, which make difficult functioning of market mechanism and create "friction" in economy, takes place.

We will consider the main limitations which smart-contracts have:

- transparency is not always advantage, because provides access to confidential information;
- the "oracle" problem (adding in blockchain the information that is not contained there, but is needed for performance of the smart-contract);
- expenditures to performance of the smart-contract (blockchain's validator fee) can be different depending on the smart-contract size and chosen platform;
- the low scalability of blockchain technology for which smart-contracts derived (a few tens of operations per second).
- error in the smart-contract shouldn't be corrected, if this function did not foresee beforehand. But if we provide it, then opportunity of handling emerges by his performance [4].

Considered smart-contract limitations touch mainly it technical part. However if we focus on the last remark about relative impossibility of the errors correction, we need to analyze smart-contracts from the "theory of contracts" approach. Such approach in the most overall view determines complete [5] and incomplete contracts [6].

Complete contract is contract which installs absolutely accurately all rights and obligations of parties in the future, as well as distributes benefits and costs at all possible outcomes. Presented algorithm could lie to the base of the smart-contract code and to work effectively in economic processes. However by imperfect information, bounded rationality and limitation of computational ability of economic agents, as well as in the conditions of high level of entropy, to make a complete contract in practice it is not possible. Therefore the field of the smart-contract application is considerably limited.

It is thus useful to talk about regulation through the smart-contract of separate relationships within contract (make a "subcontract").

The greatest prospects of the smart-contracts' application has financial part of transactions, as well as parties' relations deal with the contract terms (benefits, costs, damages). It becomes possible to automate immutable process of money transfers, as blockchain technology, that allows to realize smart-contracts, provides to control users' wallet. Creation of the escrow services takes place which minimizes the opportunism of the transaction participants, as the facts of implementation of the commitments and their payment, are the key parameters of any contract (Figure).

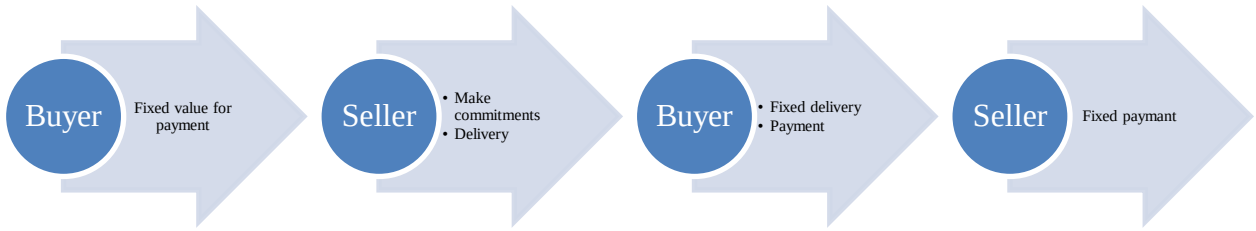

Figure. Minimizing of opportunism with smart-contract

It's visible on Figure that at the beginning Seller has a total warranty of fulfillment of financial commitments on the part of Buyer, in the case if he doesn't infringe delivery dates and requirements to quality of the goods. After Buyer acknowledges the receipt of goods, money by the smart-contract are transferred to Seller.

Given outline of interaction of the contract participants considerably decrease their opportunism on behavioral level. The seller is interested in observance of terms and commitments performance quality, Buyer makes a payment timely and had no ability to block or to delay acceptance of the goods. Besides damages incorporated to smart-contract will automatically charge and stimulate both parties to execute contract maximally.

If we will use the chain of such smart-contracts at production of high-technology goods, it receives an additional stability and efficiency due to reduction of entropy and participants opportunism. On the other hand, having enough long size, the smart-contract chain affects an negative to situation of it first sections. As performance of financial commitments by it second and each subsequent participant will depend on actions of third and all other subjects of chain transactions. Thus, inspite of the reduction of the opportunism in all system, significant cash breakages can arise at the organizations that participate in the smart-contracts chain.

This problem has a simple decision by means of financial institutions (now these are banks) which are capable to remove arising deficiency of liquidity. At the same time, due to the system of "subcontracts" (smart-contracts in financial part of prime contract) financial intermediaries minimize their risks regarding nonpayment on given credits.

Apart from industrial part of economic activity, smart-contract can be effective in consumption too. Tripartite relations between manufacturer, consumer and financial institutions

based on the smart-contract, increase transaction transparency and reduce opportunities to opportunism for all participants. Thus the expansion of consumer crediting, as well as the reduction of interest rates (owing to reduction of the risks), consumption of goods and services made by the economy of the region or country will grow.

Smart-contracts are capable to increase consumption not only of private, but also social and partially-social commodity. Creation of that commodity, increased by transparency, will stimulate formation of craudfunding mechanisms their financing, particularly it concerns communal housing services.

To evaluate possible directions of smart-contraction influence to the regional economic system, we will consider the rating of gross regional product (GRP). For it evaluation we will take advantage of GDP calculation formula (1):

$$Y = C + I + G + Nx\ , \qquad (1)$$

where ***Y*** – size of the GRP, ***C*** – region consumer expenditures, ***I*** – size of regional investments, ***G*** – size of government expenditures in the region, ***Nx*** – net regional export, in that case trade turnover with other regions.

Component analysis of the formula (1) allows to point the main sources of GRP growth. We will begin from analysis of investment potential. Smart-contract allow to improve the structure of enterprises' balance, at the expense of reduction of size of overdue accounts receivable, increase of the revenue, the reduction of entropy in the field of short-term debts. It will result in increase of the company's creditworthiness, and due to reduction of the bank rates, to increase the investments in production capital funds and reserves.

Consumer expenditures will have two sources of growth. First of all increase of the national incomes at the expense of production growth and additional opportunities to consumer credit. At the same time increase of private and social commodities consumption will be observed. Effective demand and additional national incomes (through saving with bank multiplier) will stimulate a new extended wave of investments which will provide the next growth of the income, consumption and saves. The process will carry a cyclic nature. Investments will stimulate growth of production, hence in "foreign trade" balance of the region the export share will be increased. So rate of the net export (***Nx*** from formula (1)) will be added as well.

Held analysis shows that the system of smart-contracts is not capable entirely to replace the contraction system, due to incompleteness of all existing contracts. However their implementation to financial part of transactions is capable significant positive influence to macroeconomic indices, at the expense of transparency increasing, the reduction of entropy rate and minimization of the opportunism costs. On the basis of this research furthermore construction of macroeconomic model of the smart-contracts system that influence to GRP creation is considered. The model allows to evaluate quantitatively scales of process investigated in paper.

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SMART CITY AS A TECHNOLOGY OF THE FUTURE AND PRESENT

***Keywords**: Smart City, communication, technologies, problems, concept, organizational, replacement, innovations.*

INTRODUCTION

The growth of information and communication technologies, monitoring and control tools influenced the development of cities that concentrate the bulk of innovations. Their implementation contributed to improving the quality of urban management, dissemination of new capabilities that simplify the access of residents to urban services.

Today, a city is undergoing a global transformation. The development requires the infrastructure development based on intelligent networks. Technologies should become a basis for new cities and integrate restrictively into the existing ones. It is possible to solve these problems with the concept of the integrated approach to Smart City [1].

Nowadays Smart City is one of the key urban trends. The possibilities of using intellectual, information and communication technologies to manage city property created great opportunities for transforming the usual urban space. The main goal of the smart cities concept is to meet the needs of residents of any city. Smart City covers almost all areas of city management including public administration, transport mobility, utilities, health, education, public safety, finance, trade, production and the creation of residential environments. An important element of this concept is intellectual innovation based on the information technology and data mining. They affect the economic landscape, create new fast-growing areas, or fundamentally change the existing ones. At the same time, the data of the innovation generation process can come through two channels: from automated accounting systems that capture various parameters of urban systems to city residents who develop formalized requests for changes.

The concept of Smart City was intended to solve problems that arise when managing any large city, especially if it is a global city. “Broad urbanization is a feature of modern society. The urban population exceeds 50 %. In Russia, 73 % of the population lives in towns and cities of various sizes. In response to increasing pressure on urban infrastructure, a concept of “Smart-city” was introduced as an united urban management system based on energy-saving and energy-efficient technologies, computerization of production processes”.

Therefore, a concept of Smart City is a set of technical and organizational solutions implemented in the city in order to improve the manageability of the entire urban space. At the same time, the implementation of the concept turns the very space of the city into a source of resources for all people who visit this city. “Thus, a meaning of the term” Smart city “indicates the investigation and implementation of reasonable solutions that help the city to improve its own productivity in a qualitative and quantitative way” [3].

In Europe the authors of the Smart City investigation identified six peculiarities that are the most important for a particular city to implement the concept of Smart City:

- Smart economy that includes entrepreneurship, ability for transformation, flexibility of the labor market, etc.
- Smart people, human capital that recognizes the rights of all communities, openness of consciousness, cosmopolitanism, etc.

- Smart management, smart government that involves the population in the decision-making process, creates strategic development plans, sets strategic tasks.
- Smart safe transport and information infrastructure that allows the city and its areas inside it to be accessible to individuals from outside, etc.
- Smart attitude to the environment that involves the conservation of natural resources, as well as the orientation towards sustainable development and the fight against environmental pollution.
- Reasonable organization of the life in the city. It includes the presence of cultural objects, health facilities, educational centers, etc. [2].

RESULTS

It is possible to implement some innovative technologies in Krasnoyarsk city based on the proposed peculiarities. One of these technologies is a project for creation special modules from recycled plastic and garbage for construction of highways.

This technology involves the replacement of the usual asphalt sheet with new modules that have some advantages. They can withstand the same load as asphalt but due to their low weight they can be easily transported, collected and maintained in proper condition. The soil is less inclined to subsidence.

The plastic roads project has many advantages such as:

- The duration of the installation of the blade in comparison with asphalt
- Wear resistance
- Reducing carbon dioxide emissions to the atmosphere
- Utilization of plastic debris.

Thus, the implementation of this project in Krasnoyarsk will serve as a push in the fight against environmental pollution, the most significant problem in Krasnoyarsk at the moment.

CONCLUSION

A city with the integrated concept of Smart City is a more flexible and modern city. It is able to react to natural phenomena and effectively use available resources. It ensures the rational land use, as well as cooperation with citizens in determining current activities to improve their quality of life. It keeps knowledge of its activities and state policy; it becomes more resistant to negative impacts including those related to climate change. Smart City allows to increase the attractiveness of the city for business and to simplify the introduction of innovations.

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CHALLENGES AND OPPORTUNITIES OF BIG DATA IN HEALTH CARE: A REVIEW

The potential to use big data sources for public health increases with the broadening availability of data and improved methods of analysis. Whilst there are some well-known examples of the opportunistic use of big data, such as GoogleFlu [1], public health has not yet realised the full potential of such data sources. A literature review was undertaken to identify the potential of such data collections to impact public expenditure, and to identify what challenges are currently limiting this potential. The potential include improved real-time analysis, research and development and increase efficiency in healthcare. However, challenges listed are poor universal standardisation and classification, privacy and security, as well as current inadequate platforms and tools for analysis. Without such reviews, limited understanding will hinder the rate of advance in utilising such data to improve the health status of population in public health.

There is an expectation of big data to be able to provide strong input that can be accessed, analysed and put into action. If used creatively and effectively, big data can improve the efficiency and quality of public health. Literature suggests that big data can potentially provide strategic agility in the public health domain [2]. Strategic agility refers to capacity in capitalising prospects and avoiding threats with speed and assurance. Strategic agility is the ability to continuously adjust and adapt the direction of core functions and changing circumstances to create new services, models and innovative ways to enhance health. Sensitive perception, swift decision making, the fluidity to configure systems and manage resources are other key enabling capabilities in strategic agility. This paper is a literature review of current views of the potentials and challenges in using big data in the public health domain. The paper will also discuss the methods that will overcome the challenges faced, and the prospects that big data holds for public health.

This paper reviews the dimensions of potentials that big data can contribute to the public health domain. Potential include real-time data analysis, a more rigorous research and development arena as well as valuable information from genomic studies. However there are areas of concern and challenges in applying big data to public health. These challenges include the current lack of universal standardisation and classification that may render big data to be of poor use. There are also privacy and security concerns where individuals will lose the right to their private information, leading to a future with no secrets. Another challenge is the need for platforms and powerful tool to analyse the large and rapidly growing amount of data. However, these challenges can be overcome with good leadership, training, specialisation, advocacy and contemporary policies to support the development of public health informatics. The use of big data in health care differs from its use in other industries such as marketing or product development. These differences can be seen in the need for regulations, ethical standards, privacy boundaries and some form of standardisation in the diversity of data sources and in their differing goals. There is a need for more skilled health care informatics professionals and leaders to deal with big data confidently and to address the challenges that arise from the use of big data.

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LEGAL REGULATIONS FOR CRYPTOCURRENCY PROPERTY TURNOVER: COMPARATIVE ANALYSIS OF THE EXPERIENCE IN THE RUSSIAN FEDERATION AND PEOPLE'S REPUBLIC OF CHINA

Dealing with the challenge of digital economy building requires sufficient legal formalization and framing since the efficiency of social and economic transformations directly depends on the efficiency of legal regulations for new groups of social interactions. Among the most controversial issues related to currency circulation digitalization is the matter of legalizing the cryptocurrency, being the open-type (convertible) virtual currency. For quite a long period of time cryptocurrencies have stayed outside both national and international law that in the context of constantly increasing popularity of settlements making using virtual currencies has led to committing multiple offences related to different cryptocurrency types creating and using.

Various estimates suggest that the People's Republic of China and Russian Federation rank second and fifth as to the number of users choosing cryptocurrency to make various settlements. At the same time both states lack for a special standard act providing for cryptocurrency's legal status that in the context of social interactions dynamic development in this sphere is deemed a significant gap in law. During several previous years Russian and Chinese government authorities have attempted a number of measures aimed to control cryptocurrency turnover, and our report offers a brief summary of such measures.

At present there are three conditional models for the legal regulation of cryptocurrency turnover: permitting, restricting and prohibiting. The Russian Federation and People's Republic of China at present shall be referred to the supporters of the restricting model of cryptocurrency using, however national legal structures of these states have substantial variations evidencing different approaches to such institute's legal regulation.

When it comes to cryptocurrency legal regulation, the principal challenge is the impossibility to use available conceptual framework. The key features of most cryptocurrencies (anonymity, decentralization and high volatility) prevent them from being declared the money both in economical and formal and legal interpretation of the term. Cryptocurrency does not meet the criteria for securities, however, taking into consideration the principal goal of virtual currencies creation and functionality, academic literature more often draws the conclusion that cryptocurrencies may be referred to quasi cash [1]. Subsequently the controller's position was adjusted and cryptocurrency was declared "*an unreliable payment means not guaranteed by the Bank of Russia, and all transactions with cryptocurrencies are made outside the legal environment"* [2]. Such Bank of Russia's strategy aimed to freeze cryptocurrency out of the legal environment failing to ensure it sufficient legal qualification may hardly be deemed successful that is confirmed by the constantly rising number of transactions made using bitcoin and other virtual currency kinds.

In the absence of adequate standard legal framework law enforcement authorities suffer from much greater load, and first and foremost this refers to Russian judicial agencies whose acts are of particular interest in the scope of our research.

The absence of any direct prohibition to acquire, store and dispose of cryptocurrency we are facing the following challenge: may cryptocurrency be the object of civil law rights? Taking into consideration the provisions specified in Clause 128 of the Civil Code of the Russian Federation

offering an open list of the objects of civil law rights, cryptocurrency may be referred to the category of "*other property"* since it has certain economic value as it may be converted into money. Cryptocurrency withdrawal from the list of the objects of civil law rights could result in greater uncertainty as to its legal status providing to disreputable subjects of economic turnover an ability to conceal monetary assets. Truly revolutionary is the Definition of the Ninth Arbitration Court of Appeals acknowledging the possible legal qualification of cryptocurrency as *"other property"*. The court notices that "*taking into consideration the present-day economic realia and the level of information technologies development, we admit the widest possible interpretation"* of the category of "*other property"*, and since the economic cryptocurrency value does not cast any doubt, it shall be included to the debtor's property and is subject to enforced seizure being included to the bankruptcy assets in the course of bankruptcy proceedings [3].

However, in the absence of complete statutory regulations of cryptocurrency turnover the conclusions made by the court of appeals of the first and/or second instances are not deemed binding for other judicial agencies, and owing to this fact, it is merely impossible to provide for judicial practice uniformity at present. This goal shall be solved by Federal Act "On Digital Financial Assets", whose draft was adopted by the State Duma in the first reading in the May of 2018.

In the People's Republic of China the most common cryptocurrency is bitcoin being the subject of a joint notice entitled "About Preventing Bitcoin Risks" (hereinafter referred to as the Notice) adopted in 2013. [4] In this Notice, bitcoin is defined as a virtual product having no legal status that may not be distributed on the exchange market. There is a prohibition for financial institutions to provide services in bitcoins, to participate with bitcoins in private trade, use it as a payment instrument. The Notice poses a challenge for the state to control bitcoin circulation. Web-sites providing various services in bitcoins shall be registered by administrative authorities. The PRC's policy is aimed to prevent money laundering and other risks, this is why web-sites have to verify the identity of persons using bitcoins, check their documents and other information. After adopting the Notice a lot of web-sites were closed in the PRC failing to comply with the requirements made by the state.

Cryptocurrency turnover in the PRC was substantially restricted upon issuing a joint Notification entitled "About the Measures to Prevent Risks Related to Cryptocurrency Issuing to Arrange Financing" by seven public authorities led by the People's Bank of China [5]. This document notes that "*coins or "cybercash" used as cryptocurrency"* are not issued by any statute-established issuer within the PRC, have no features of a legal tender currency and are not to be bindingly accepted, do not have the same legal status as the currency and may not be used as circulating assets in the market environment. This deed de jure prohibited ICO within China, and the companies having initially issued tokens before such Notification adopting were ordered to take appropriate measures to ensure investors' rights protection including returning of the earlier raised monetary assets. Upon such Notification issuing not only bitcoin, fiat money and tokens interchange was prohibited leading to the majority of cryptocurrency exchanges closing but also tokens (ICO) initial disposal.

Thus, we may draw a conclusion that the PRC has chosen the model of cryptocurrency moderate prohibition. This position is as close as possible to present-day Russia, however, the substantial difference of the regulation in China is the availability of official documents providing for bitcoin position, the system of requirements and restrictions for using thereof being much stricter to the suggested measures than those in Russia. At the same time, some Chinese analysts (for instance, professor of the People's Chinese University Yang Chen Zheli) [6] note the necessity of developing and adopting a more appropriate legal act governing cryptocurrency status in civil law.

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THE ROLE OF DIGITAL TECHNOLOGIES IN ENSURING STABILITY OF ECONOMIC GROWTH: CHINESE EXPERIENCE

In the course of the reform to create a mixed form of development, the basis of which was formulated by Deng Xiaoping, China achieved impressive results. However, a slight increase in GDP, which affected the rise in the standard of living of some sections of the population, did not solve the growing social, political, and spiritual problems of society. The search for a development model and tools for the implementation of new goals continued – this was reflected in the orientation towards exports, maintaining high growth rates due to the exploitation of millions of people, environmental degradation, differentiation of the country's regions according to the level of development, and the slow development of the social sphere.

There was an inertial economic variant of development along an extensive path that has growth limits. This led to a slowdown in GDP growth, exacerbated by a drop in demand for Chinese goods abroad. It was required to develop measures aimed at changing the development model and setting new strategic goals and determining the time frame for their achievement. These changes began to be implemented from the Third Plenary Session of the 18th CPC Central Committee in November 2013.

It is clear that the emerging of the new developmental program became possible due to a huge role played by Chinese economists, whose names are not so known to the world as Western researchers. The development of modern China thanks to these scholars is based on achievements in the intellectual sphere. National research centers worked on new significant innovative discoveries which gave new grounds for development in various sectors of the economy.

China produces and exports high-tech products. The country holds the second place in the world in investments in scientific developments and in the production of scientific journals devoted to the most important areas and discoveries in new fields of activity, as well as in education. According to the data of the world educational network, the country holds the first place in terms of the level of education (the USA is 8th-9th).

The “One Child Policy” contributed to the fact that one child received increased attention in families, which led to an increase in the awareness of children, which was also fueled by the fact that schools had large groups (classes) of pupils (60-70 people) with high motivation for the best result.

China’s social system is geared towards all citizens who seek to contribute to social progress and development. Government strategy is designed primarily to increase wealth, and then to increase profits. An analysis of the Soviet education system, which was introduced in China in the 1950s, revealed its shortcomings: examinations focused on cramming answers were replaced by an individual interview, which made it possible to identify capable students.

Due to the increase in the level of education, the transition of the main industries requiring unskilled labor to high-tech industries with advanced technologies is carried out. The development is based on improving the skills of workers, which raises labor productivity and increases the competitiveness of goods. The program of professional development and stimulation of invention increases the number of scientific and technical enterprises-incubators (innovations).

So the State Council in 2016 adopted a program to promote the transformation of the achievements of science and technology to productive forces. Attention is drawn to the need to

enhance the role of science in the development of the market, as its applied value strengthens science and its achievements (for example, in this connection little is done in Russia at the state level and not always effectively).

In China, the number of young people is not enough and youngsters do not want to work for low wages. Under these conditions, robots, automated devices based on digital technologies are becoming an alternative to employment in traditional areas. The population with low qualifications becomes an impediment, a barrier to social development. Therefore, the level of education in the country is the main factor for increasing its competitiveness. However, globally information about Chinese achievements in the field of science and technology, Russia is not an exception, spreads very little, slowly and inefficiently, which does allow us to really assess its level. In China itself, rating and analytical agencies keep statistics on achievements that indicate an insufficient level of scientific and technical innovations and an extensive type of development in certain areas that give rise to a gap between urban and rural areas. Despite this, according to experts, China has approached the sixth technological order earlier than other countries. For example, one of the progressive journals on world biosystems has become completely Chinese.

China's experience shows that a close relationship with the state and its political openness, stimulating the development of science, patent relations with enterprises, the grant system in education allowed the country to modernize the old economic model based on innovation without retreating from its strategic goals. This model was called “New Normality” in which the main “norm” is the use of Chinese science to improve the life of the majority of the people.

Research and digital technologies for a multi-million population are moving more efficiently and faster: Internet retail, banking, online ecosystem and other Chinese projects that expand the electronic commerce format allow you to consistently and quickly conduct transition from physical retail formats to online trading, which contributes to the accelerated spread of online financial services that compensate for the underdevelopment of financial institutions and banking infrastructure [1].

Chinese digital economy is estimated today by experts at the US level. On the one hand, the country successfully identifies and implements promising digital solutions; on the other hand, it develops its own digital projects related primarily to commodity exports (Huawei, Aljbaba, etc.).

The national strategy “Internet Plus” and the program “Made in China – 2025”, adopted in 2015, outlined the key directions for the development of the digital economy and digital technologies, focused primarily on the manufacturing industry, the agro-industrial complex, medicine, finance, and government.

In the manufacturing industry, digital technologies serve to transform (or reform) the traditional mode of production through mobile Internet technologies. They fundamentally change the manufacturer by installing hardware and software for household appliances, accessories, cars and other industrial goods, which accelerates the development of remote control functions, automatic collection and analysis of collected data. In 2017, China approved the National Plan to stimulate technological developments in the field of artificial intelligence [2].

Four departments manage the development of digital technologies: the National Commission for Development and Reform, the Ministry of Industry and Information Technology, the Ministry of Science and Technology, and the Ministry of Education. As other initiatives are being introduced to digitalization, other structures are taking part in these initiatives [3].

There is no single ministry and department responsible for the digital economy of the country, but the supreme agency coordinating the interaction is the Lead Group on Cybersecurity and Information, consisting of ministers and heads of government agencies. The key system tools for state support are tax regulation, public financing, the development of common standards and the implementation of pilot projects. The state has created a fund to support R & D and the development of applications and services through the issuance of grants, subsidies, concessional loans, which in 2015 alone amounted to $ 1.6 billion.

China pays special attention to standardization, where the country plays a leading role. The development of common standards for the Internet of things in the world and the creation of an

international association of standards in this area has become a priority project, and the example of a pilot implementation of these ideas was the city of Wuxi, where the state created a special area for the development of Wuxi National Hi-tech District technologies (supporting business to improve his activities).

The world-famous "one-stop" technology, interaction with the state, in China manifested itself in the creation of an "authorized civil servant-coordinators" service, working with each company to implement the initiative to identify and retain talents.

Another direction is attracting the first few dozens of companies to create a cluster to work "for itself": subsequent participants joined in as they became interested in the neighborhood with highly secured technologies and organized players. As a result, today the city of Wuxi is a new technologically developed center of the Internet of things, a place of attraction for both Chinese and large international companies (Alibaba, Amway, Cloud, AstraZeneca and others). In the future, the city made a proposal to organize a world-class exhibition World Internet of ThingsExpo (WIOT), which indicates its status as a leader in this field and raises the attention of major players in this market.

This is confirmed by the indicators achieved in this city: an eightfold increase in the number of companies in this segment of the IoT market (248 in 2009 to two thousand by the end of 2016); 30 % increase in the annual volume of the Internet industry in the city; revenue growth to $ 31.9 billion [3].

For the further sustainable development of China and the implementation of the "Chinese dream", a favorable environment is needed, building relations with neighbors and other states based on mutually beneficial cooperation conditions, parity of national interests, unity of approaches to the use of scientific and technological achievements.

The achievements and plans for further development presented at the 19th CPC Congress confirmed the continuity of the ideas of transition to innovative forms, the need to reorient the economy to the domestic market, to meet domestic development needs and, on this basis, to improve the population's well-being and to harmonize the levels of urban and rural areas [4].

In recent years, the questions of "Chinese leadership", drivers of the development of the Chinese economy and "harmony" of combining many factors of economic growth (in the economic sense, their complexity and systemic nature) have become obvious to the world community. Moreover, since the mid-2000s, China has established a socio-economic doctrine on building a "harmonious society" within the country and a "harmonious world" [5] beyond its boundaries. This is especially important for the formation of the "economic leap forward" proclaimed in Russia, since "throwing from side to side", rejection of previously adopted settings, a sluggish process of finding one's own way became a distinctive norm of development for a certain period.

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SYSTEM OF DESIGNING ENERGY-SAFE HOUSE IN SIBERIA

The provision of electricity is realized through traditional and non-traditional (alternative) energy sources (AES).

In Russia, the use of AES takes a hundredth of a percent of the total installed and produced capacity of all electricity in the country. This is due to a number of reasons. One of them is a low level of awareness of the possibilities of using AES. Nevertheless, the use of traditional sources, prevailing in Russia, is accompanied by environmental problems, as well as the looming problem of the exhaustibility of natural resources.

Nevertheless, the use of AES in private households in the country can solve a lot of problems. For example: lack of access to traditional sources of energy, interruptions in energy supply, high cost of electric power kilowatts, raising the level of ecology and others.

The current state of alternative energy in Russia and the Krasnoyarsk Territory can be considered below satisfactory. Having huge potential for renewable resources in the territory of the country and the region, the destruction of non-renewable resources, such as oil, gas and coal, continues, thereby increasing emissions of harmful substances into the atmosphere with current environmental problems. Alternative energy accounts for 0.04 % of the total share of electricity production in Russia [1], while many countries in Europe and Asia, as well as the United States, provide alternative sources of 20 to 90 % of all electricity needs [2].

Analyzing the geographic location of the Krasnoyarsk Territory, it was found that most of the region is suitable for the use of alternative sources, such as solar energy [3], wind power [4] and small hydropower [5].

The analysis showed that it is now possible to use the energy of alternative sources in private households in the Krasnoyarsk Territory. The use of solar energy is promising for households in the central and southern parts of the region; the use of wind power will bring greater efficiency in the northern part of the region on a large scale and in the central part for private households. Thus, solar power plants have the greatest potential in the most densely populated municipal Districts of the region.

Before households begin to implement solar power plants for their own power supply, it is necessary to determine the composition of the power plant equipment and the cost-effectiveness of introducing such a station.

Autonomous solar power plants consist of solar modules, charge controller, inverter and batteries. Currently, such installations are used for both space and civil purposes.

To avoid problems with the installation and operation of the solar power system for private purposes, it is necessary to make a large number of calculations: total energy consumption per day; peak power of domestic and any other equipment in the house; It is also necessary to take into account the geographical position in terms of and the number of hours of sunshine in the territory where the location of the solar energy system is expected. Moreover, it becomes necessary to select the characteristics of equipment not only by external indicators. The characteristics of each element of the system directly depend on the characteristics of the other element. So, for example, the voltage and the connection circuits of solar modules and batteries depend on the voltage of the inverter, depending on the idling voltage of the solar module, an inverter is selected, and so on.

Incorrectly calculated characteristics and, as a consequence, improperly selected equipment threaten inefficient operation of the system, or even the inability to generate electricity. To avoid

such situations, the calculation must take into account a number of parameters, both independent of the system, and within it.

The task of selecting equipment is quite complex, involves many factors, and, as mentioned earlier, takes a long time. For this reason, it was decided to develop a decision support system for calculating the composition of alternative energy sources.

Previously, before the development of DSS, a mathematical algorithm was developed, in which all the conditions that should be taken into account when calculating a solar power plant were displayed. Further, the software implementation of the DSS was carried out, which solves the above problems and accurately calculates the equipment characteristics and the selection of this equipment from the existing database.

Thus, the decision support system allows to calculate the characteristics of the solar power plant equipment, to equip the station from the available goods, to calculate the payback period of the station with respect to traditional energy sources.

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METHODOLOGICAL APPROACH TO MODELLING URBANIZATION IMPACT ON SOCIOECONOMIC SPHERE OF SIBERIAN REGIONS IN THE CONTEXT OF DIGITALIZATION

The article describes the main results of interdisciplinary study aimed to develop methodological approach for typologization of urbanization processes of small and medium-sized cities in resource regions of Siberia, as well as modelling the impact of key urbanization factors on the innovative technological, economic and socio-cultural development of these regions. *The reported study was funded by Russian Foundation for Basic Research, Government of Krasnoyarsk Krai, Krasnoyarsk Region Science and Technology Support Fund, research project № 17-12-24013.*

***Keywords**: urbanization processes differentiated territory policy, professional composition of settlement, group behaviour, self-feeling.*

INTRODUCTION

Migration flows continue strengthening the urbanization processes in Russian Siberia. Siberian cities traditionally grow and develop mainly due to migration inflow. According to Krasnoyarsk Statistics Bureau, 67.3 % of the population growth was due to migrants in 2016. The main reason for intraregional migration were professional education (28.1 % of migrants indicated this reason). Migration from the former Soviet Union countries is mainly due to working options (44.1 % of migrants) (Vorontsova et al., 2017)

Migration structure and socio-demographic characteristics of migrants are key factors of city development. As data provided by Krasnoyarsk Statistics Bureau suggest, in recent years migration inflow does not compensate migration loss of Krasnoyarsk population. Among those who arrived, the proportion of persons younger than working age, persons with higher, vocational and general education degree is decreasing, and among those who left the city, it is growing. At the same time, Krasnoyarsk displays some of the highest statistically measurable indicators for the quality of life among Siberian Federal District regions.

Migration brings many potential problems to the city development process rather than improves the population quality of life. We assumed that the migration growth of the city reduces its safety level as perceived by its inhabitants. Consequently, it causes the migration outflow of investment-potential population groups. That leads to settlement professional composition being non-corresponding to the challenges brought by economy digitalization.

The task of the research project presented hereafter was to develop an interdisciplinary approach to measure and assess the quality of life of the population in order to describe professional composition of the region-settlement prevailing in the territory, which contributes to or hinders its innovation development.

METODOLOGY

The approach is based on the researchers conducted by Blomquist G.C. & Berger M.C. & Hoehn J. P. (1988), Cramer V. & Torgersen S. & Kringlen E. (2004), Subetto A.I. (2004), Nagimova A. (2010, 2017), Grishina I.I. & Polynev A.O. & Timonin S.A. (2012), Jie Li & Qian Liu & Yao Sang (2012), Ballas D. (2013), Khasan B.I. & Novopashina L.A. (2015), Human Capital in Digital Economy International Conference Proceedings (2018).

We developed statistical and socio-psychological methods and collected data on statistic indicators of population quality of life in Krasnoyarsk Krai in terms of safety (Vorontsova et al., 2017)) and self-feeling. The research was conducted according to methodological basis described above: data from Krasnoyarsk Statistical Bureau was used altogether with socio-psychological survey undertaken in Krasnoyarsk Krai settlements among young people aged 18 to 25 (convenience sample consisted of 206 respondents).

RESULTS

The following results are obtained:

1. Methodology for typologization of urbanization processes of small and medium-sized cities in resource regions of Siberia. The study of the problems of the cities of the Krasnoyarsk Krai as a model region of Siberia, as well as the analysis of the interrelation of urbanization processes with the uniqueness of socioeconomic development in innovative technological, socio-cultural and economic contexts, made it possible to clarify the methodology, that is, the approach to the typologyzation of urbanization processes small and medium-sized cities in the resource regions of Siberia. The relevance of migration as a key factor in the formation of Siberian cities is increasing, but its nature and vector of influence on the development of the territory is changing. Without denying the financial and economic foundations of innovation and technological development of Siberian resource regions, it should be recognized that socio-cultural factors take leading position in their contemporary socio-economic development. Migration not only contributes to the improvement of the quality of the population, but also brings up potential problems. The migratory growth of the Siberian cities reduces their safety level (as perceived by their population) and “warms up” the outflow of investment-potential groups of the population. From the standpoint of resources for the development of Siberian territories, a key investment-active (in the socio-labor context) group of the population is young people aged 18 to 25 years.

Decreasing level of social and economic security of the territory increases the outflow of investment-potential groups of the population, which in turn reduces the rate of economic growth of the territory and limits the development of the urban way of life. Thus, the approach we propose to the study of the processes of urbanization of Siberian resource territories, taking into account their actual specificity, is based on a comprehensive analysis of the population's safety in aspects: the statistically measurable quality of life of the population and the subjective perception of the safety of urban environment. The experience of safety or threats to self-feeling plays key role in how and in what ways citizens interact with city space and make decisions on keeping or changing a place of living and, therefore, contributing to city population growth or decrease.

2. List of indicators of the level of urbanization. The typology of modern urbanization processes for Siberian resource regions should be based on a set of criteria that are united by the idea of urban space safety from the perspective of a key population group. As criteria for the safety level of urban environment from the position of statistically measurable indicators of the quality of life on the basis of multidimensional economic and statistical analysis, we have identified indicators in the context of groups of factors: Life and Health; Employment and earnings; Housing and infrastructure. From the position of behavioral characteristics – perception of natural obstacles-shelters, signs of the decivilization of spaces. The ranked list of statistically measurable indicators for safety level of large Siberian cities and agglomerations has been developed (in descending order of importance): 1) Life and Health factors: a group of indicators, conditioned by nature, climate, ecology, e.g. air pollution, seismic activity; 2) employment conditions: rates, income level; 3) Housing and infrastructure factors: provision of housing; 4) Life and Health factors – crime rates. The same ranked list for small and medium-sized Siberian cities slightly differs (provided hereafter in descending order of importance): 1) Housing and infrastructure factors: the level of transport connectivity with the central regions of the region, the quality of engineering and telecommunications, the quality of housing; 2) Life and Health factors: availability of medical services, natural and climatic conditions; 3) Employment

conditions. As integral indicator of the level of urbanization of the territory, we determined safety level of urban environment as perceived by youth.

3. Methodology for modeling the impact of behavioral characteristics on the level of urbanization. While conducting the study, we assumed that the dynamics of the investment (in the socio-labor understanding) behavior of young people determines the current processes of urbanization and allows assessing the effectiveness of state and municipal management decisions. Major part of the research project was dedicated to studying the interconnections and finding correlations between intentions of the youth to stay at the their settlements or to move somewhere else (to bigger or smaller settlements of the same or different region/country) and their perception of the current place of living in terms of personal importance of key quality of life factors, its availability there and personal satisfaction with these factors. The data shows that personal perception of a territory in terms of its potential and resourcefulness is closely related to the said intentions of young people aged 18 to 25.

More closely, intentions to move to other settlement (therefore, contributing to migration) are correlated with the following factors: importance of a person's own profession for the territory; educational and health care options (closely interrelated one to another); general perception of high perspectives in friendship and relationship (while the actual level may be assessed as relatively low compairing to the perspectives). The general finding follows a pattern: if perspectives are assessed higher than actual situation, a subject reports an intention to stay at the same place of living or to move for educational purposes and return to the 'hometown".

The developed questionnaire can be used as a monitoring tool to predict the behavior patterns of the target group based on their assessment of living territories and, consequently, the migration inflow/outflow to the cities of the region minding youth as the key group of population with high investment potential.

The main result of the interdisciplinary study is the typology of settlements in Krasnoyarsk Krai in accordance with the indicators of the self-feeling of the population. Krasnoyarsk Krai is considered typical Russian resource region.

CONCLUSION

The influence of the key factors of urbanization on the innovative technological, economic and socio-cultural development of the natural resource regions of Russian Federation is cumulatively expressed in the features of settlement professional composition. Professional composition of a settlement is considered a main resource of digital economy.

Measurement and assessment of population quality of life in safety and self-feeling aspects (as urbanization drivers that define settlement professional composition parameters), when it is fully incorporated into state and municipal public administration practices, will help improving efficiency of global interactions between regions and countries, taking contemporary trends of digitalization in economic and social spheres into account. Processes of rapid settlement growth and increasing urbanization level displayed by Asian countries in past decades make the monitoring tool of the study potentially applicable to other Asian natural resource regions.

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INFORMATION TECHNOLOGIES AS A TOOL OF INCREASING THE MEDICAL SERVICES QUALITY

Strategy of the Information Society Development in the Russian Federation for 2017–2030 [6] is a kind of breakthrough, since for the first time it concerns the issues of quality of life and the development of social sectors together with the development of the digital economy. The purpose of creating a new technological support for the social sphere development is to improve the life quality of the whole population on the basis of the widespread use of made in Russia new information and communication technologies.

The introduction of information and communication technologies in healthcare began with the start of an innovative direction in the organization and provision of medical help to the population, i.e. telemedicine. In Russia, telemedicine as a new information and communication technology emerged in the early 21th century. Currently, the Internet facilities are being intensively applied in the high technological medical care.

Meanwhile, the development of modern technologies that has led to the formation of a digital society requires their application in the daily routines of medical organizations for the implementation of the strategic goal, which is to raise the life quality of the Russian population. A new strategy for the information society development in Russia for 2017–2030 confirmed the steady trend of Russian society, that is information systems and social networks have become a part of people's ordinary lives, so the introduction of adaptive modern technologies in health care is an essential task.

Recently, the medical organizations have started to use information technologies in their work to realize the task of assessing the quality of medical services for their perfection. However, common practice of assessing the quality of services provided by the health organizations under the aegis of the Ministry of Health and based on the use of information technology often comes down to using the Internet to question patients about the medical services quality. The survey is conducted on a special site devoted to the independent evaluation of the RF Ministry of Health. Yet, our study revealed a contradiction between the increasing demands of patients for the medical services quality and their low activity in the process of assessing this quality with no feedback from organizations. For example, in 2016, the Krasnoyarsk Regional Department of the All-Russia People's Front and the Public Council at Krasnoyarsk Krai Ministry of Health checked the practical and real work on assessing the quality of services in the Krasnoyarsk InterDistrict Clinical Emergency Care Hospital and found that only 14 of the more than 1,000 patients in the hospital filled in the electronic questionnaire [7]. The insufficient patients' activity in assessing the medical services quality was proved by our study conducted in 2017 in the same hospital: there was an all-encompassing survey of patients, but the proportion of respondents who answered all the questions was only 24,6 % [2].

At the same time, the analysis of open sources has shown an increase in the activity of those who use medical services both of private and budgetary medical organizations. They used social networks and information portals as technological platforms for a dialogue between healthcare consumers, who assess the quality of health services and discuss reasons for their poor quality [3–5]. In our opinion, this discrepancy can be explained by the opportunity to express one's point of view freely and by the lack of restrictions in the answers as opposed to the options formulated

by the developers in their questionnaires. It is social networks that ensure the principle of independent evaluation of the medical services quality.

The growing activity of people in social networks in the process of assessing the medical services quality has begun to be used by regional authorities to make decisions on upgrading health services based on the involvement of consumers not only in evaluation but also in the development of proposals. So, in Moscow, there appeared a crowdsourcing project "Moscow Polyclinic" aimed to achieve the goal of improving the work of city polyclinics based on complaints and wishes of a wide range of Muscovites. This project took an advantage of volunteer citizens' creative abilities, knowledge and experience and relied on the information and communication technologies [8]. Such projects enhance the implementation of the information society development formulated in the strategy signed by V. Putin for Russia for 2017-2030. The main tasks of the strategy are applying information and communication technologies for the social sphere development, as well as the interaction of citizens and the state in particular projects to improve the availability of high quality medical services [6].

Nevertheless we shall note that the introduction of information technology in the process of assessing the medical services quality does not increase this quality by default. The main challenge for the transformation of IT into an effective tool for improving the quality of services is the introduction of evaluation results in the daily practice of medical organizations. As most patients admit, their reluctance to answer the questionnaire is determined by the lack of confidence that the survey results will not be used to take measures to improve the quality of services. This is consistent with the existing practice of management in medical organizations, oriented in their solutions to improve the medical care quality on their own vision of problems, as well as on material and financial opportunities, besides, there is also internal resistance of the staff to any new activity.

Therefore, the issue of effective administration of the process of IT assessing the health services quality should be addressed more broadly, first, by expanding the range of tools in this quality assessment, and secondly, by integration of the assessment procedure in the process of improving the medical services quality.

In our opinion, the use of social networks as a quality assessment tool should not only become a "fashionable" technology in the context of the digital society development, but an effective tool for supplying management of medical organizations with information about the real attitude of the population towards the quality of the medical services provided. However, there are problems hampering the use of social networks and information platforms in the process of improving the medical services quality. These include the lack of legislative and prescriptive decrees for the budgetary organizations released by the Ministry of Health, which would be focused on introducing the assessments of the medical services quality made in social networks in the activities on perfection. The private medical organizations experience the unwillingness to engage in laborious process of evaluating medical services quality that even does not bring most often objective information, and moreover, they demonstrate ignorance of the newly appeared assessment technologies.

In addition, the issue of integrating new technologies for assessing the medical services quality in the process of their provision is becoming more and more topical in order to solve the problem of isolation of the assessing process from real treatment of patients. The search for such technologies would not only solve the existing problem but also significantly improve the effectiveness of information technology application in the process of providing high-quality medical services. The analysis of literature attests to the fact that at present there prevail approaches to describing and analyzing the process of providing services from the client's point of view.

One of the latter is the Customer Journey Map approach, which uses a graph that displays the customer's path in the process of consuming a service with possible points of contact between consumers. Thanks to this tool, it is possible to record as completely as possible all interactions of

customers with the service before, during and after the service has been offered. In our opinion, the Customer Journey Map allows us to reduce the gap between the desired and the real level of healthcare quality provision. Consequently, this technology can be used in medical organizations, especially in private and highly specialized ones.

Analysis of the practice of some private medical clinics in Krasnoyarsk ascertained that a certain organization, administrative management resource of medical organizations and the use of the Customer Journey Map will enable these institutions to increase and provide efficiency in the field of quality assessment and to improve the medical services quality [1]. This was demonstrated by the results of our introduction of the Customer Journey Map in the quality management system for one of the Krasnoyarsk private clinics.

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RESEARCH OF INFORMATIZATION OF THE RESUSCITATION UNIT IN KRASNOYARSK REGIONAL HOSPITAL

The functioning of intensive care units and critical care resuscitation units is determined by the severity of the treating patients' conditions. Numerous patients require continuous monitoring of the major systems of the body and continuous evaluation of vital parameters. Access to relevant information about the patient is important for recovery of the intensive care patient. An intensive process of informatisation in the health sphere, high level of hardware and software development, widespread use of personal computers by physicians necessitated the creation of a unified information system of the resuscitation department. The most important task is providing intellectual support for physicians in the emergency department. A doctor when making decisions uses the tools that objectify the disease severity of intensive care patients and advances diagnostic algorithms for syndromic disorders. The analysis of the results of the informatization in the intensive care unit software tools is presented for conventional medical offices. Causes of their ineffectiveness are identified, due to the limited execution time. Solution of problems in the medical information system (QMS) is given.

***Keywords**: Informatization of healthcare, automation of business processes in intensive intellectual support of the doctor.*

Emergency care is provided to patients in the intensive care unit. In Krasnoyarsk Regional Hospital anesthesiology and resuscitation services are included in thevascular, purulent-septic, burn centers.

The Department of Anesthesiology and Reanimatology № 3 is a subdivisionof the purulent-septic center. It is the leading regional institution in the resuscitation, intensive care and anesthesiology patients with severe surgical infection and sepsis. That's why it carries out scientific and methodological guidance and provides practical assistance in detection, diagnosis, treatment and rehabilitation patients with purulent surgical infection and sepsis, as well as for prevention suppurative postoperative complications. In the resuscitation department in the year of treatment there are more than 800 patients with severe purulent-septic pathology surgical and therapeutic profile.

Introduction of multifunctional medical system QMS allowed to automate the main medical business processes, many department of hospital, laboratory. It provides the maintenance of an electronic medical history of the patient. Automation of business-processes in the resuscitation unit partially is implemented.

Treatment and care of patients is a continuation of the intraoperative stage or independent component of patient therapy not requiring operational interventions in critical condition. It represents complex activities on which depends the outcome of the disease.

Informatization of the resuscitation unit by software for of ordinary treatment units is ineffective. Business models are similar but Informatization of the Department of Anesthesiology and Reanimatology requires a special approach and special software solutions. Most business processes who need information support are time-critical [1].

The central document is the resuscitation card which is needed for therapeutic and diagnostic process. The reanimation card of the established form has the format A3.

The card shows the conduct of treatment activities with preoperative training, postoperative curing and in other situations requiring anesthesia and resuscitation [2].

In the graphs of the card with an interval of 15-30 minutes (more often during resuscitation activities) are registered treatment activities, the dynamics of changes of cardiovascular system,

respiration, temperature, concentration in the respiratory circuitin artificial respiration apparatus, oxygen saturation of the blood and so on. At least 1 time a day (for heavy patients 4-6 times summing up infusion, transfusion support, allocated fluids [3].

Technical and software solution for the implementation of the electronic version of Reanimation card is complicated by the following factors:

- high requirements for the availability of information on the reanimation card;
- limited reliability characteristics of the means used informatization:

1. level of technical facilities (power supply, computer equipment),
2. system software
3. medical information system software
4. composition and qualification of IT staff.

- connection of resuscitative monitors and other reanimation equipment to medical information system
- High requirements for the speed of information input by the user of medical information system
- need for a structured input of a large different information.

The paper reanimation card must be completed in 5–7 minutes at volume:

- 10–15 preparations with different methods of drug administration
- 3–5 appointments of instrumental diagnostics
- 3–5 prescriptions of laboratory diagnostics with specification of test volume
- 3–5 procedures and manipulations, etc.

At the moment resuscitation card, list of prescriptions of medicinal drugs is filled in the paper version, evaluation of dynamics (Fig. 1), the diary resuscitator (Fig. 2), an anesthesia protocol is filled in medical information system QMS.

Intensive process of informatization of the healthcare sphere, high level development of hardware and software, using personal computers for professional purposes, the need to create unified information system of intensive care unit allowed to optimize the solution of many tasks related to the provision of medical assistance in the resuscitation department [4].

However the implementation of this project is hampered by the above features of business processes in the resuscitation unit and involves the connection of resuscitation monitors and other resuscitation equipment, which is not always easy to do with nomenclature and interface capabilities of equipment.

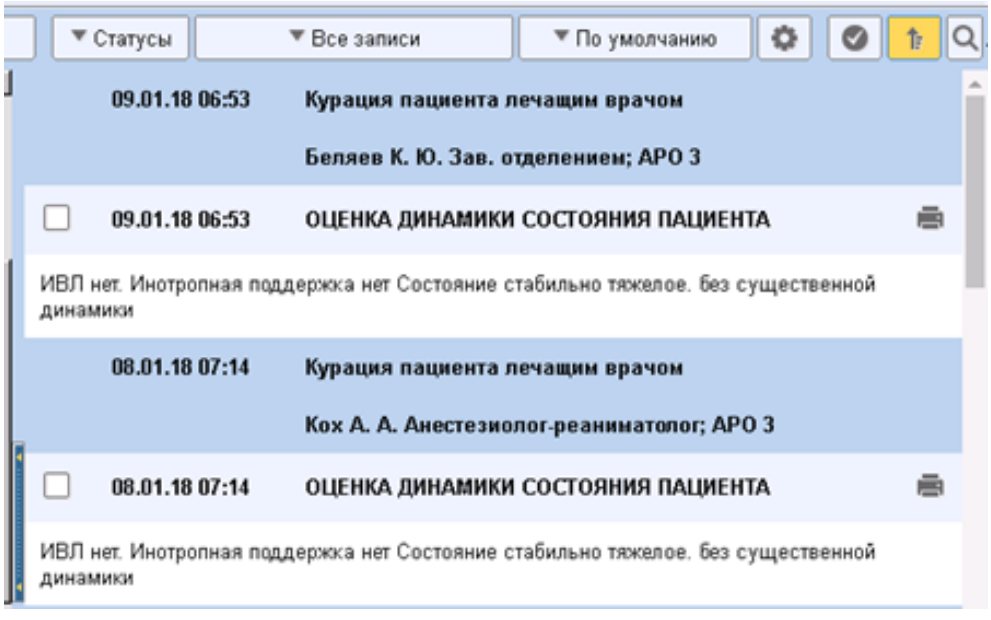

Fig. 1. Evaluation of dynamics

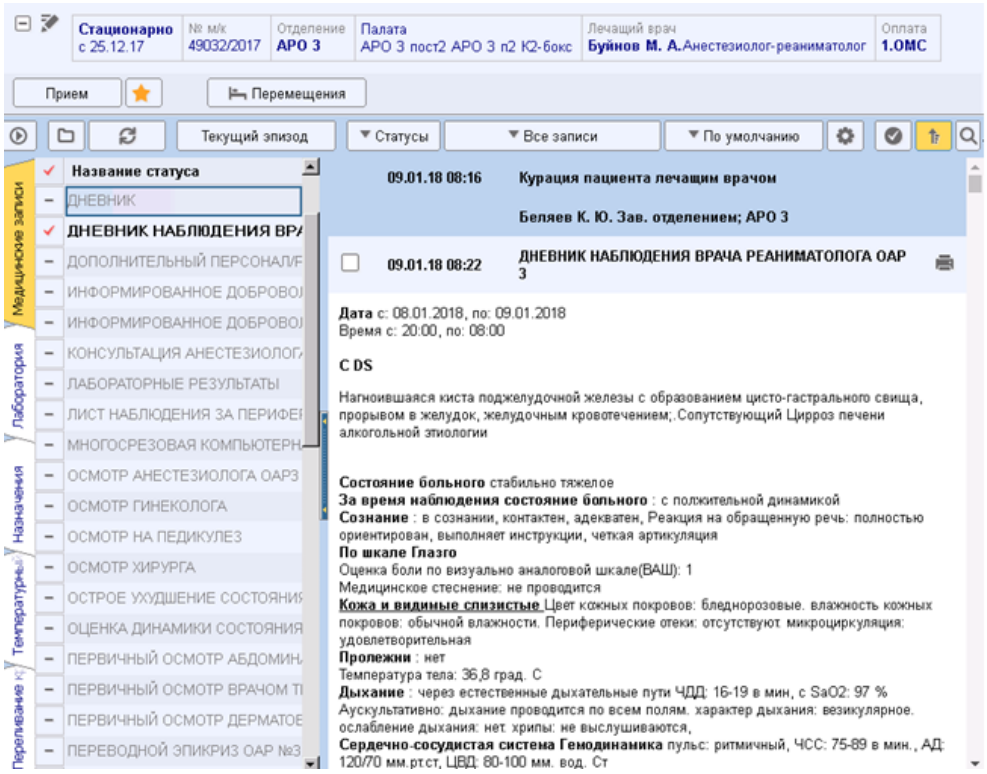

Fig. 2. The diary resuscitator

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INTERDEPARTMENTAL INTERACTION OPTIMIZATION OF THE MUNICIPAL LEVEL IN ACCORDANCE WITH THE CONCEPT OF SMART CITY

***Keywords**: Smart City, Smart technologies, software complex, informatization, optimization.*

INTRODUCTION

This paper analyzes the current state of informatization in local *self-governing authorities* and justifies the mechanisms of applying Smart technologies for effective solving administrative and management problems (evidence from implementation of the system of integrated automation of local *self-governing authorities* "MSG-SMART"). Timeliness of the topic is related to the need of business-process improvement of interdepartmental interaction of state and municipal government authorities, including in the conditions of the regulation of processes within the framework of the Smart City concept.

The growth of interest on a Smart City idea has significantly increased through the last few years and continues to spin up.

Smart City is a model of city development, which assumes the active use of modern technologies in city planning and in the development of various spheres of urban life.

The development of society in the modern world is characterized by global informatization of all spheres of life, which confirms the need for the use of information technologies in the field of state and municipal government [1].

Therefore Smart City should be characterized by highly efficient economy and management, high quality of life, mobility, careful attitude to the environment and active participation of the people in urban life [2].

Krasnoyarsk is a modern business, cultural and historical center of Siberia, a city with a developing innovative economy, high standard of quality of scientific and educational infrastructure, urban environment and social standard of living.

One of the priority areas of social and economic development is improving the quality of life in the city, including through the formation of an effective system of city management on the basis of a unified municipal geographic information system (UMGIS) [3]. This is possible by informatization the activities of local governments, improving the quality of municipal management and services.

According to the Ministry of Digital Development, Communications and Mass Media of the Russian Federation, at the end of 2018 the number of municipal services provided electronically is expected to grow by 15 % (70 % of the total number of services), and the share of electronic document circulation in the interdepartmental workflow of the city administration will be 90 % [4].

Software complex "Municipal self-government-SMART" – a system of integrated automation of local government body or the effective solution of administrative and management tasks [3].

Deployment of software complex "Municipal self-government-SMART" on the regional level will make it possible to create a unified information system of municipalities in the whole region, containing information on the population, land, property and personal subsidiary plots, providing all the municipalities of the region with a single information and methodological space.

The unified centralized database of the software complex "Municipal self-government-SMART" with applied Internet Technologies allow to carry out information exchange between the federal executive bodies (Federal Tax Service, Federal Service for State Registration, Cadastre and Cartography, Pension Fund of the Russian Federation, etc.), regional executive authorities, federal and regional GIS, integrate with the Interdepartmental electronic interaction system (Regional Interdepartmental electronic interaction system), unified and regional portals of state and municipal services of Public Services Portal of the Russian Federation (central and local government services) [4].

Issues to solve:

- construction of a unified information system of municipal entities containing information on the population, land, property, personal subsidiary plots of all settlements in the region (municipal District);
- organization of purposeful work on increasing the taxable base and attracting additional revenues to local budgets;
- assessment of the effectiveness of local government;
- rendering of state (municipal) services at the request of citizens, including in electronic form (issue of regulated certificates and extracts on the basis of records of household books);
- interdepartmental electronic interaction of local authorities with the Federal Executive Authorities, Regional Executive Authorities, state informational system, IEIS [5].

Advantages:

- scalability and scale of territorial coverage;
- reliability and fault tolerance;
- low requirements for signal links with flexible and user-friendly interface;
- increased level of data security;
- centralized administration and maintenance (reduction of requirements for the qualification of employees in the field of information technology in the local self-government bodies);
- cost reduce of the implementation and further maintenance and support.

According to the Agency of Informatization and Communication of the Krasnoyarsk Territory, one of the priority activities of the Krasnoyarsk Regional Information and Communication Agency is the formation of an e-government infrastructure [6].

RESULTS

Processes were ranked for optimization on the basis of subjective evaluation and are shown in Table.

Table

Ranking processes based on subjective assessment

The importance of the process/process state	High efficiency	Average efficiency	Low efficiency
A very important process	Provision of state and municipal services in electronic form	Technical support of the IT infrastructure of the municipality	
An important process	Informational System Development	Management of city video surveillance system	Video materials transferring to the Ministry of Internal Affairs in the Krasnoyarsk Territory
Secondary process	Documentation and reporting		

This assessment is rather subjective, therefore, to perform a preliminary rapid analysis of the processes of the enterprise, a matrix of indicators was constructed on the basis of qualitative indicators (Fig. 1).

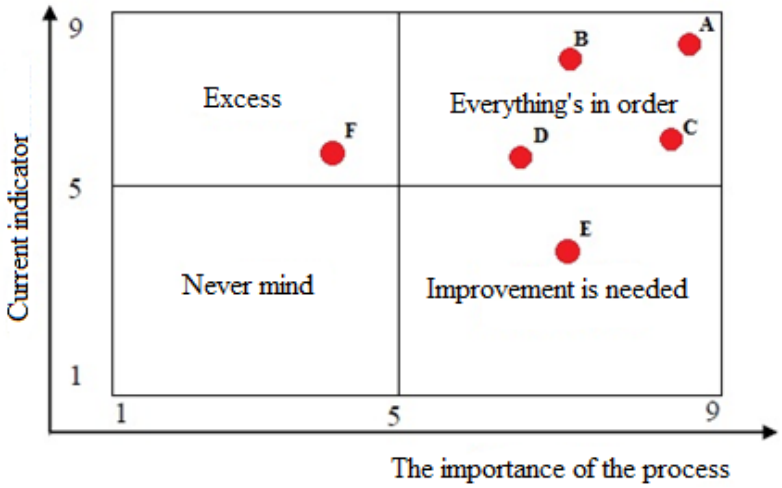

Fig. 1. Indicator Matrix

Point A – Documentation maintenance and reporting;
Point B – Information system development;
Point C – Technical support of the IT infrastructure of the municipality;
Point D – Management of the city video surveillance system;
Point F – Provision of state and municipal services in electronic form;
Point E – Video materials delivery to the Ministry of Internal Affairs (MIA) in the Krasnoyarsk Territory.

The process that falls into the square "Improvement is necessary" is the process of "Transfer of video materials to the MIA for the Krasnoyarsk Territory", therefore this process primarily needs to be optimized.

Identification of problem areas is carried out with the help of an enlarged scheme of the process. The diagram shows the main groups of functions and their performers. The problem areas are indicated and a description of their brief characteristics is given.

Consider Fig. 2, which analyzed the problem areas:

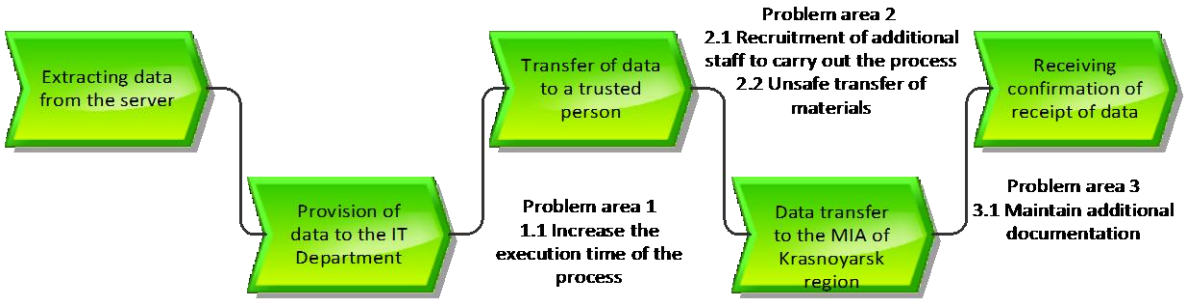

Fig. 2. Problem areas of the process

The first one is connected with the transfer of data to the authorized person. The second is connected with the transfer of data to the MIA for the Krasnoyarsk Territory. And the third is related with a confirmation of the receipt of materials by bodies of the MIA of the the Krasnoyarsk Territory.

Figure 3 presents a model of the process of transferring video materials to the MIA of the Krasnoyarsk Territory as following.

Using build model it is possible to define redundant / missing functions or their duplication. Also we can note a long way of transferring video materials to the MIA of the Krasnoyarsk Territory and involvement in this process of persons which is possible to exclude using a remote automated system.

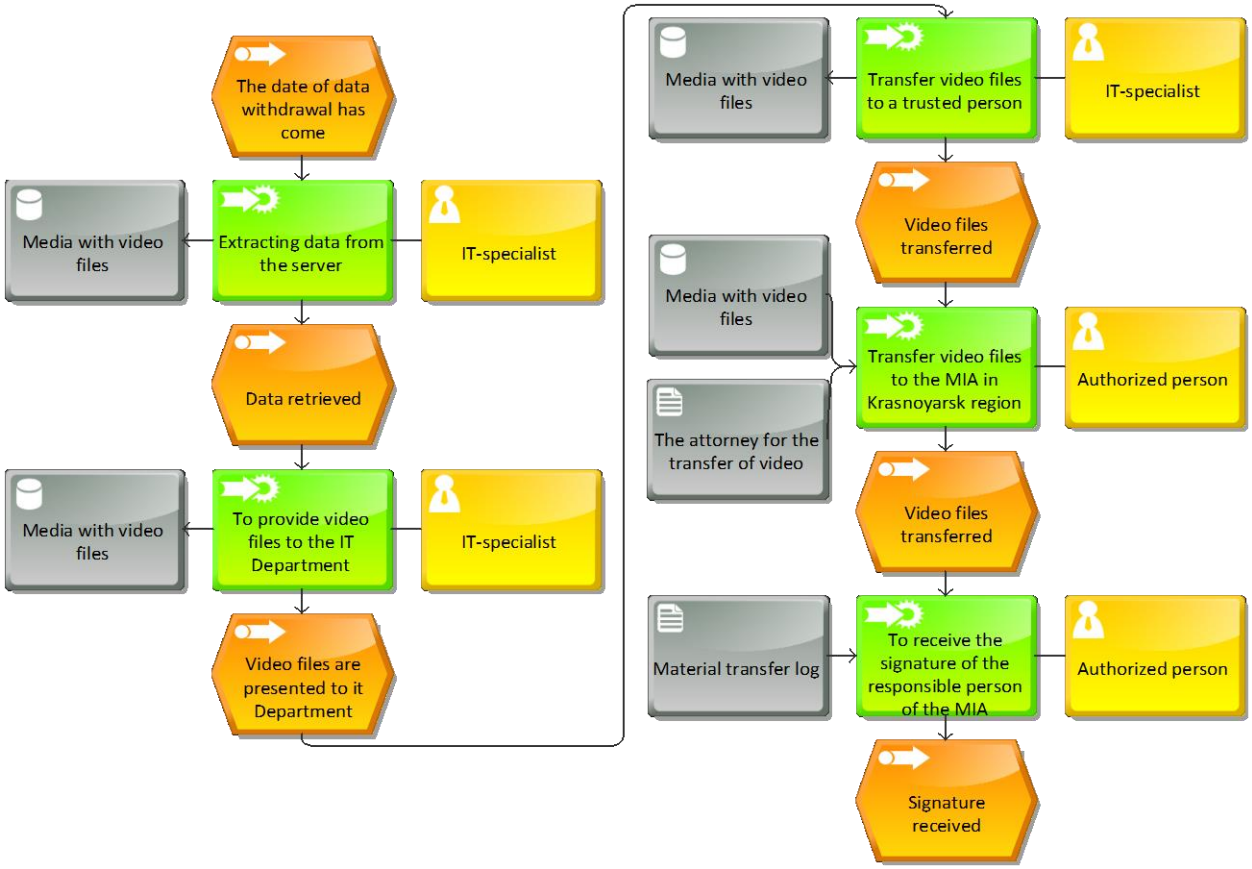

Fig. 3. Model of the transfer process of the video "as is"

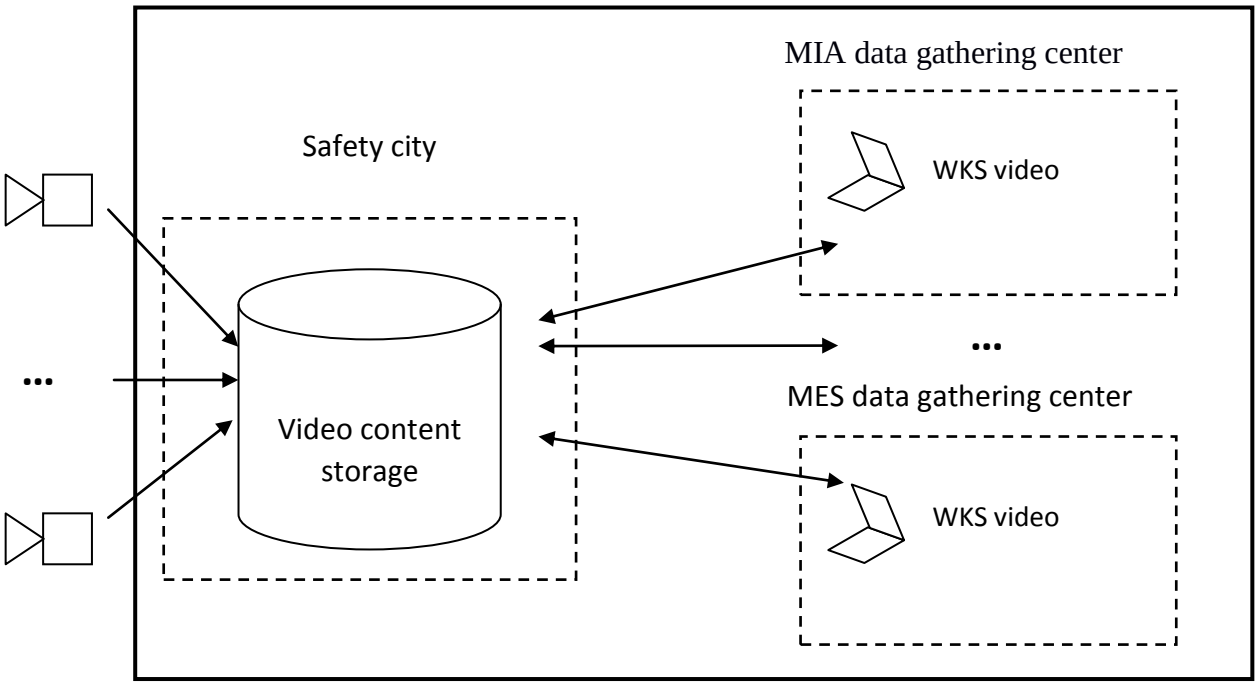

Fig. 4. Scheme of functioning of the "Smart"

The process involves additional documents, such as "Power of Attorney for the transfer of materials" and "Journal of the transfer of materials". Data before going to the MIA of the Krasnoyarsk Territory are passing several instances, which significantly slows down the process itself.

Figure 4 shows the scheme of functioning and interaction automated informational data system "Smart" of the region with MIA informational center.

The main functionality of the automated informational data system "Smart":

1. Electronic data interchange in encrypted form between the Agency of Informatization and Communication of the Krasnoyarsk Territory and the MIA of the Russian Federation for the Krasnoyarsk Territory.

2. Delineation of access to information resources, encryption of information in the database in order to ensure the protection of personal data in accordance with Federal Law of July 27, 2006 № 152-FZ "On Personal Data" [7].

3. Convenient access to video materials through the personal account of an authorized officer of the MIA of the Krasnoyarsk Territory.

4. Maintaining in the Agency of Informatization and Communication of the Krasnoyarsk Territory a common database (DB) for the MIA of the Krasnoyarsk Territory with the update of the data as the changes occur.

In the proposed optimization solution, the data will be transferred from the server to the server, without the help of third-party involvement (courier).

CONCLUSION

The selection of the priority processes of agency for optimization was carried out using the tools "ranking of processes on the basis of subjective assessment" and compilation of a matrix of indicators, as a result of which a process falling under the category "Improvement is necessary" is the process of "Transfer of video materials to the Ministry of Internal Affairs of the Russian Federation for Krasnoyarsk Territory", hence, he first of all needs to be optimized.

As a solution for optimization the process of transferring video materials to the MIA of the Krasnoyarsk Territory, it is proposed to develop the automated informational data system "Smart", by which video materials will be safely transferred from the server to the server, without the help of third-party involvement (courier), thereby shortening the execution time of the process and reducing the cost of resources.

Combination of technology, human resources and interactive management is important in contemporary urban development. Interactive management is the aspect that most likely will ensure holistic sustainability.

It is necessary to invoke regional administrations to promote development. A mere technological advance in itself is therefore insufficient to ensure a city's smartness. Further empirical research of what is actually happening in the real smart city is thus needed.

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NEW TRANSACTIONAL MECHANISMS IN HOUSEHOLDS' PAYMENTS ON THE GOODS MARKETS: FACTORS OF DEVELOPMENT AND REGIONAL DIFFERENCES

The aim of this investigation is to analyze what payment mechanisms are used by households, and how their abilities and preferences in methods of payments are changing. We analyzed as the speed of new payments mechanisms' spread, as the reasons for the use of certain methods of purchase of goods.

Under the forms of payments we understand the set of means and mechanisms of transactions by which purchases are paid. We mean payments in cash, by electronic cards or by money transfers to personal accounts in banks or online.

Thousands of years passed before the gold stood out the world of goods and began to perform the role of a universal equivalent. Centuries passed before the gold settled in the vaults, and the role of the means of circulation began to perform its substitutes: symbolic paper and metal money.

The rate at which new payment instruments appear increases with each new round of progress. For a long time traditional purchases and forms of settlements remained shopping in stores, stalls, from trays, in the markets, with payment in cash.

The new century is so rapidly generating new forms of payments and new areas of exchange, that people do not even manage to master a new form of money, as new ones are emerging. Along with the small shops, stalls and trays, where cash payments were and are still conducted, new types of shops function. There are no sellers in such new shops who can recommend something, and the trade is expanded through Internet. Instantly and by many times increases the degree of buyer awareness on pricing and specifications of purchased goods. With the advent of salary electronic cards, the population began to widely use electronic money to pay for everyday purchases.

The interviewing of almost 100 people in the May of 2018 was held to assess the degree of involvement of Krasnoyarsk population in new payment mechanisms. Empirical survey let to fix the reasons of so deep involvement of the population in new payment mechanisms and the speed of distribution of new forms of payment:

The first reason is availability of terminals for card payments in the shops. Answering the question "What prevents you from completely refusing cash payments?" more than half of the respondents chose: "The lack of terminals from sellers." About 18 % of respondents prefer cash because of "a feeling of greater reliability and better control". And only 6 respondents refuse card payments because of "Absence of the card".

Today even elderly people in Russia mostly have electronic cards, suitable for payments for current purchases. About a quarter of pensioners are currently employed [1], and they have both a pension and a salary card.

The second reason of the wide spread of new payment mechanisms is the process of integration of outlets and the development of trade networks. Payment terminals are inherent feature of network supermarkets. Besides, there are numerous bonus programs in card processing, for example, the premium program from Sberbank named "Thank You".

The more the share of network supermarkets in the total number of outlets is, the greater the proportion of the population using electronic money will be. This explains the regional

differences in the structure of household payment instruments. Of course, one can meet the street trade even in Moscow, and the payment there should be made in cash. But the share of goods purchased "on the street" in the metropolis is much less than in small towns.

The third reason is caused by the intention of the public authorities to improve tax administration, increase the collection of taxes. New forms of payments are being legalized formed to improve the tax collection. Thus, from July 1, 2019 all retail trade and catering services in Russia are obliged to use on-line cash registers, regardless of the form of payment [2].

Thus, the possibility of non-cash card payments is significantly expanded: now both in vegetable pavilions and in stalls people will be able to use electronic money [3].

It should be noted that these institutional changes affect the whole territory of the country and act as a factor that smoothes regional differences.

Increasingly popular is the trade through on-line stores: only 2 people from about 100 respondents did not apply to their services. It should be noted that this method of shopping demonstrates significant regional differences. If the average resident of Moscow and adjacent cities carries out purchases through Internet shops 2-3 times a week, then in Krasnoyarsk only 2-3 times a year. Also, if for Krasnoyarsk durable goods and air tickets are the typical shopping through the Internet, then in Moscow also items of current consumption are included in online shopping. An objective prerequisite for the spread of this method of purchases is, along with the computer literacy of the population, the availability of the Internet in a locality [4]. The speed with which Wi-Fi services are distributed correlates with the speed of the spread of the modern form of transactions.

A new form of payment for purchases is online payment from a mobile phone account, from a bank card, an electronic purse, etc.

The main factor in promoting such payments is the computer literacy of the population. Growing also with acceleration, this factor promotes the possibility of using personal computers, tablets, phones to make fast online payments.

This factor cannot be overestimated: the secondary school, since the late 1980s, has been making an increasingly significant contribution to the training of literate users of computer technology. We observe that every new generation of applicants comes to higher education with the best skills and knowledge in this area, and the share of households, that is able to use new technologies of calculations, has a steady tendency to increase.

Of course, the spread of the described forms of payments is due to the development of their proposals: the emergence of new banking products, such as "mobile bank", various credit cards with a preferential (interest-free) period, bank terminals located within walking distance to the consumer, etc. And while the generation of pensioners masters ATMs and mobile payments applications, new generations of graduates of schools and universities are starting to develop crypto currency. The digital currency in Russia has not become a legal instrument of payment yet, but we are on the threshold of a new phenomenon in the field of exchange processes. The locomotive of its advancement is the global development of the digital economy.

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TAXATION PROBLEMS IN DIGITAL ECONOMY

Nowadays extremely important not only to solve the problem of stability and effective functioning of digital economy, which relates to its rapid development, but also the problem of the taxation in the created conditions.

This conundrum is raised at the international level (for example, from recent events) by conferences G20 at the level of Ministers of digital economy in 2017 in Düsseldorf, later, on August 27, at a meeting of Ministers of the countries of the G20 responsible for digital technologies in Salta or at the International forum "Russian Week of the International Taxation" in September of this year. Indicators of growth of level of a GDP's share falling on digital economy in the G20 countries can act as confirmation of the importance of this sphere.

Table

Growth of a share of digital economy
in GDP of the countries of the G20 from 2010 to 2016, %*

Country	2010	2016
Great Britain	8,3	12,4
South Korea	7,3	8,0
China	5,5	6,9
India	4,1	5,6
Japan	4,7	5,6
USA	4,7	5,4
Mexico	2,5	4,2
Germany	3,0	4,0
Saudi Arabia	2,2	3,8
Australia	3,4	3,7
Canada	3,0	3,6
Italy	2,1	3,5
France	2,9	3,4
Argentina	2,0	3,3
Russia	1,9	2,8
Republic of South Africa	1,9	2,5
Brazil	2,2	2,4
Turkey	1,6	2,3
Indonesia	1,3	1,5

*The source is http://ar2016.rostec.ru/digital-g20/.

Certainly, it has promoted development of the legislative base of economic and tax systems, however compliance of the ideas and degree of their implementation is not ideal. If the government strengthen the control and the regulation of a situation by means of the publication of the effective and "working" enough laws, then tax base erosion and profit shifting will be problematic for subjects of the economy.

In Russia, the issue of the taxation in the conditions of digital economy began to be discussed most actively at the end of 2016, after the appeal of the President of Russia to Federal Assembly with the annual Message in which the attention was focused on the importance of transition to

new level by means of digitalization of economy and also a digitalization of the processes connected with economic system [1]. The same direction is traced also in the Message from 3 January 2018, however, accents are placed differently, in our opinion, they are less indistinct. Such idea as transformation of taxation payment process by entrepreneur and representatives of a business environment in the simple transactions which are automatized has drawn all the attention [2].

Despite prospects of this approach to the taxation and contribution of clarification of tax and economic systems, nevertheless there are some difficulties.

The important factor interfering usage of all the potential of digital economy in a key of the set subject is uneven development of tax system and system of digital economy. Comparing both systems, it should be noted that there were not enough measures for overcoming barriers. As an example, many types of business on the Internet can not still be taxed because from the point of view of the law the matters are not regulated. Although in November 2017 the project of the plan of measures of the Digital Economy program for reforming of standard and legal regulation [3] which supposed to be implemented during the period from 2018 to 2020 has been published.

It is also supposed that such problems as an obstacle of legal restrictions to the most effective functioning in the conditions of digitalization of economy and introduction of the separate legal institutes directed to the solution of formation of digital economy priorities will be solved. What is more, according to the plan of measures the permanent mechanism of management of changes and competences in regulation of digital economy will be created.

Already here we can observe a contradiction between reality and the legislative regulation (which is contained in documents, in many respects it does not find a place in life) that is confirmed by chronology of transformations and changes. From the moment of the first mentions of digital economy there have passed about two decades, and from the moment of one of the most serious discussions in Russia two years, but only on 20February 2018 in the Russian newspaper has been told that for the current year the State Duma should adopt more than 50 laws on different questions of digital economy.

Elimination of the problems correlating with execution of the action plan of OECD for counteraction to shifting of taxable base can guarantee the fair and effective taxation in the digital market and the united game field for all organizations.

The realization of all 15 consolidated actions of the BEPS plan allows to avoid the situations of the double taxation arising because of differentiation of the tax laws in different countries; promotes the solution of problems of the taxation of multinational corporations; regulates questions of pricing, crystallization of systems and usage of privileges [4].

How to provide stability and efficiency of digital economy? There are two main directions of a solution: development of long-term and stage-by-stage strategy or application of the short-term measures guaranteeing safety of straight lines and indirect taxes.

According to opinion of Association of Banks of Italy [5], long-term strategy would allow to carry out the full and developed analysis both problems, and opportunities arising in the conditions of digitalization of economy. Processes of reforming of system are gradual at such approach. However, it should not be forgotten, that the implementation of such approach is suitable not for all states, for example, being under political pressure it is very difficult to build models for a long-term perspective, measures of short-term character can become the most effective.

Thus, taking into consideration the current political situation of Russia when it is possible to speak about inconstancy of negative trends which can easily calm down, disappear and come back again, we can draw a conclusion that it certainly serves as a barrier to an in-depth and full-fledged study of a question of long-term measures application in the sphere of the taxation in the conditions of digital economy. Moreover, many actions happen in direct interrelation with the multinational companies which are also dependent on policy of the states under whose jurisdiction they are. Though attempts of development and application of long-term measures

from the Russian government are available (above-mentioned measures), it is impossible to tell that they have considerably affected a real situation.

As for a banking system of the state, influence of changes of economic space on it also takes place, affecting a role of banks. For example, if nevertheless Russia manages to automate process of tax payments to the level of elementary transaction, then it could not be done without participation of banks, speaking objectively. Today (with arrival of digital economy) e-banking takes an essential place among the provided services. Probably to automatize the taxation, there will be a need to use the Internet platform as a certain basis, expanding at the same time an online banking activity range. So, changes in the sphere of the taxation directly lead to changes of a banking system, becoming the intermediary of international and interstate transactions, the bank will promote clarifying process and will make it simple.

What about the foreign experience, then it is possible to notice, on the example of Estonia that cooperation with banks takes place for a long time. Banks participate as the third party, providing additional guarantees for the consumer; procedures are simplified, by means of partial automatization of processes of taxes payment on the one hand and customer service on the other [6].

Asia on the example of China where weakening of restriction for foreign investments in addition to flexible foreign currency has promoted that more and more companies work at the international level in a digital format of economy that in turn causes a number of problems connected with taxes (a large number of tax consultants, questions concerning consequences of deduction of income tax, transfer pricing and another) [7]. Mechanisms which assume settlement of the matters in the long-term period, the governmental body, responsible for settlement of tax policy are created in China.

Within the territory of different countries different laws work, getting under this or that jurisdiction natural and legal entities can have privileges, and can have also a tax burden. However, it should not be the cause for speculation due to payment or non-payment of taxes that it is in fact very difficult to trace. Therefore, to offer a universal way of the problems' solution is represented impossible, each state must proceed from the realities, and international organizations must consider these realities most effectively.

It should be noted that without study of the budgetary and tax law sustainable development of Russia and regions, in particular, accumulation of tax potential is impossible [8].

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EVOLUTION OF ELECTRONIC FREIGHT IN RUSSIA

The usage of online services for business activities is becoming a growing trend in today's economy. The foregoing could also be applied to e-freight systems – as the forms of vitrual interaction between the customer (shipper) and the provider (carrier) of the transports operation.

Virtual travel marketplaces have begun to emerge in Russia more than 10 years ago. Established in the mid-2000s "AutoTransInfo", "Avtodispetcher", "Della", etc., be now, gained serious experience. Their services are used by tens of thousands of companies in Russia and surrounding countries.

In Table we gave the indicators of the most prominent virtual transportation services according to Russian Federation's most popular Internet search engines: Yandex and Google. Among all of the "First generation" virtual transport services sites, the highest credit is awarded to "AutoTransInfo".

And it is not the matter of the fact that a huge number of its pages are indexed by both Yandex and Google. This site also has a very solid themed citation index (TCI) in Yandex (2200) and remains to be one of the Runet leaders in terms of the Google system. It stands on 614th place among all sites among Russian space in the indicator of credit by this global search engine (see. Alexa Country column). Finally, this is the leader in site attendance among all the transportation online services. In comparison, Yandex itself as of March 2017 has TCI of 100,000 and the rating of Alexa Country is 4.

Table

Ranking of Online transportation services in Russia in the search engines as of March 2017 [1]

Title, URL	Year of Domain Registration	Themed citation index of Yandex (TCI)	Pages indexed by Google	Pages indexed by Yandex	Alexa Country (Russia)	Attendance per 1 day
Avtodispetcher, avtodispetcher.ru	2004	850	450 000	10 651 208	1 368	3 495
Della, della.ru	2004	60	462 000	713 197	44 543	449
AutoTransInfo, ati.su	2005	2 200	676 000	1 153 954	614	5 560
Vezyot vsem, vezetvsem.ru	2010	220	594 000	189 390	8 733	1 029

In second place by the importance among the services cargo transportation we can see "AutoTransInfo" site. Also, the influence of the third member of one of the oldest services in this market segment – Della.ru – is declining. Despite a large number of registered in the Yandex and Google pages index, it has a relatively low TCI and attendance.

The creation of these resources in the mid-2000s was a logical step. During this period, almost all major sectors of the national economy the specialized electronic trading platform B2B were established, designed for searching the business partners and transactions fulfillment.

"Transportation companies engaged in international and domestic cargo transportation, – according to [2] – actively create their own websites, offering their services in the search engines and display ads on electronic boards. Nevertheless, when transport companies try to findi the customers they visit not thecorporate sites, but a united virtual transportation portal. In the vastness of such Internet exchanges a lot of competing companies, shippers (forwarders, logistics,

transport, freight dispatchers) and their clients are united. This arrangement allows carriers to work on the basis of honesty and openness, and their clients can choose the most suitable partner for each other".

The further development of IT-technologies, the experience gain allowed to move to a new level of online transportation services. Online services have become an important element of the B2C segment of the freight market. One of the trends of nowadays is the introduction of new facilities in the taxi service. Through the introduction of online technology in the order management process the opportunities were created for dispatching function of assignment to the computers, which started defining the location of the customer and directing the nearest taxi to him and immediately calculating the price of the order. In 2011, Yandeks.Taxi service was founded. Around the same time, the same opportunities and the necessary software were offered by the other players in this market. Finally, in 2016 the software products, became the online aggregators of the magor taxi services appeared on the market. These include mobile application "Taximeta" – a project that combines all the applications for searching and ordering a taxi: Uber, Gett, Yandeks.Taxi etc. When it is loaded into the mobile phone there is no need in downloading other services [3].

Because along with passenger taxis, these services also supervised the cargo taxi, then these services began to penetrate into the cargo transportation market. One of the market start-ups was an online service "Vezyot vsem" established in 2011 in Rostov-on-Don, and quickly moved to a leading position not only in Russian, but also an international level.

"The idea of the resource is simple – says one of the founders of the service, Ivan Plastun [4] – For example, a person conceived to move from one city to another and it has a lot of boxes with goods. He places the request on the website "Vezyot vsem" with the description of the goods, indicating the route, the date, the need for loader services, may also apply photo of bales and boxes. The request comes to a registered carriers operating on that route. Less than one day a client is offered at least 5-7 quotations. Starting an auction, the customer and the carriers are discussing all the details, and then the customer chooses the most attractive offer according to the price and conditions".

Scientific analysis of this resource was fulfilled not so long ago [5]. Therefore we can add only a few details. As of March 5, 2017, 579 028 carriers and 193 503 shippers have used this service. The main advantages of the service include: reasonable prices, formed on an auction basis, convenience and reliability. For carriers, this service is a very serious source of new orders. Therefore, carriers, working with "Vezyot vsem", as stated on this resource, never raise their prices and do not change the conditions after the transaction confirmed [6].

According to the owners of the site, the average savings for shippers in transportation contracting with it is 34.5 %, with the average number of replies on the order – 7. This positive effect for the shipper, is believed to be achieved largely due to the fact that the carriers carrying out a trip "in reverse" direction are forced to cut prices drastically in order not to return empty to the original point of sending. The fee of the system depends on the size of the order, and is about 10 % in average. The freight forwarders are paying in advance to the system after the generation of transportation contract conditions by the system.

There is no doubt that the online service has become one of the first in its market segment and become a role model. Perhaps, we can recognize that the portal dostavkin.com founded in 2015 is based on the same model of transport organization, though in this case the commission, which, depending on the cost of transportation is from 2 to 14 %, is paid by the carrier. However, at least 10 similar services are now available in Russia. It is expected that the market in the nearest future will offer the summarizing aggregators of online cargo transportation services, such as those that already exist on the taxi market.

To sum up, in mid-2000s in Russia the first major virtual travel marketplaces were established. Their feature is that they have been serving the B2B market segment. In the early 2010s, a new trend is amplified – to emerge to and develop the high-tech online B2C services for

the cargo transportation market. However, the services such as “Vezyot vsem”, working with individuals, carried out the orders for the large companies. Since many business processes of these services are standardized and automated, their cost is relatively low. This can not but lead to a further intensification of competition in the cargo transportation market and improvement of their level.

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CLOUD SERVICE FOR STUDENT ENGAGEMENT AUTOMATIC RECOGNITION FROM FACIAL EXPRESSIONS

Abstacts. *Digital revolution can significantly improve the quality of education. There have been already discussions for a long time about the advantages, disadvantages and opportunities for transforming traditional classroom activities. Modern students use smartphones and tablets “from birth”, and for most academic subject areas students can often obtain more complete, accurate and up-to-date information from the Internet than from lectures. Is it interesting for students to learn? Are they in time with the professor? Is the presentation clear? How deep are students engaged in learning in the classroom? These issues come to the forefront in the era of digital education. However, it was almost unrealistic to control the level of student engagement until recently: for example, only in the Moscow campuses of the Financial University the classes are held daily from 8.30 to 22.00 in more than 500 classrooms.*

Existing information systems for student engagement automatic recognition are focused on analyzing individual engagement of students and schoolchildren. We propose a system that constantly analyzes the flow of data from video cameras installed in classrooms, uses machine learning models to identify students’ faces, recognizes their emotions and determines the level of engagement, and then aggregates engagement data on student groups, faculties, courses, etc. on interactive dashboards.

The training dataset of 2,000 face images was used for machine learning model identification with boosted decision trees algorithm (ADABoost). The quality metrics (Accuracy, Precision, Recall, AUC) on a test dataset of 500 students’ faces showed the results all above 0,81.

The system is developed as an elastically scalable cloud service that automatically collects video streams from cameras installed in classrooms and forms the resulting metrics of the students’ and groups’ engagement in the Microsoft Azure cloud.

INTRODUCTION

Modern students use various computational devices “from birth”, and on the Internet for most of theoretical and practical academic disciplines students can often get more complete, more accurate and more relevant information than from the classes. At the same time, information on the Internet is often delivered more effectively and eye-catching than in the classrooms. Is it interesting for students to learn? Are students in time with the professor or the pace of presentation is too fast or too slow? Is the presentation clear? How much are students engaged in learning in classroom? These issues come to the forefront in the era of digital education. However, it was almost impossible to control the level of student engagement until recently: for example, only in the Moscow campuses of the Financial University the classes are held daily from 8.30 to 22.00 in more than 500 classrooms.

Methods for measurement and analysis of student engagement in learning have been actively developed since the 1980s, primarily with the aim to find a possibility to decrease the number of expelling students. Surveys conducted at various universities and schools showed, that from 25 to 60 % of students are constantly bored in the classroom and distracted from learning (see, for example [1; 2]).

Management of students’ engagement level is relevant nowadays for the traditional classroom teaching, for MOOCs, for educational games, for simulators, for intelligent teaching systems, etc. [3–6].

The most common methods for student engagement measurement include self-assessment by students themselves; external monitoring using control charts and subsequent rating; automatic

measurement using technical means [7]. For example, the most often used method in Russian studies is self-assessment (see, for example, [8]).

Information systems for automatic measurement of student engagement have been used for a long time. A significant part of them is based on analysis of tests execution speed and accuracy [9; 10]. For example, random answers to easy questions or very short lead times could indicate weak engagement.

Another class of popular techniques for automatic measurement of engagement level is based on data processing from various electro- and neurophysiological sensors [11; 12]. These methods could not be implemented at a large-scale, for example, at the level of a whole university, because it is impossible to provide special sensors to every student at the university.

The third class of techniques for automatic recognition of engagement, which includes the system described in this paper, is based on the use of computer vision [13–18]. Such techniques allow researchers to assess a student's engagement by analyzing the position and inclination of the head, the view direction, pose, different gestures, and so on. The major advantage of such systems is that the engagement level is measured unobtrusively, without diverting students' attention to the engagement measurement process itself.

This paper describes the experience of a cloud service development and implementation for monitoring student engagement in the classroom based on intelligent analysis of video streams from cameras placed in the classrooms, and subsequent aggregation of average engagement for groups, courses, areas of training, education, faculty on interactive dashboards. In this case, the *supposed engagement* is measured, that is the level of student engagement assessed by external experts.

Based on images of students in the classrooms, the system uses machine learning principles to determine whether or not this student is engaged. Initially, a large number of photos of students' faces made by video cameras in classrooms are presented to experts who divide the photos into two classes (engaged and not engaged). Then the classification model is trained on this dataset, labelled by experts, and after training the classification model is used to predict the level of student engagement in the pictures, which neither experts nor the classification model had previously seen.

The engagement recognition service is deployed in the *Microsoft Azure* cloud. The user identification is based on the *Microsoft Azure Active Directory* directory services synchronized with the on-premise university directory services. The identification of students is based on pictures from the campus access control database, and the identification of classes and professors is based on information from the on-premise classes schedule database. Currently, the system is being piloted in two buildings of the Financial University, with about 60 video cameras in the classrooms connected to it.

In all known systems engagement is measured based on video streams from cameras placed on individual computers. These systems are capable to measure level of engagement of individual students in computer labs or in distance learning systems (including MOOCs). Unlike that we propose a system automatically measures the engagement level not only for individual students but also for academic groups, faculties, years, and for the whole university.

CLOUD SOLUTION ARCHITECTURE

The architecture of the cloud solution is illustrated by Fig. 1. We use video cameras placed under the ceiling of classrooms as the Internet of Things devices connected to the *Microsoft Azure IoT Hub*. Before being sent to *IoT Hub*, video streams are preprocessed locally: individual frames are captured at a specified periodicity.

Data on the classes schedule are taken in reference to the classrooms in which the video cameras are placed from the on-premise classes schedule database. These data for each class include classroom ID, start and end time, set of academic groups' IDs (there usually is one academic group at a seminar or lab, and more then one academic group at a lecture), academic subject area ID, and the professor's ID.

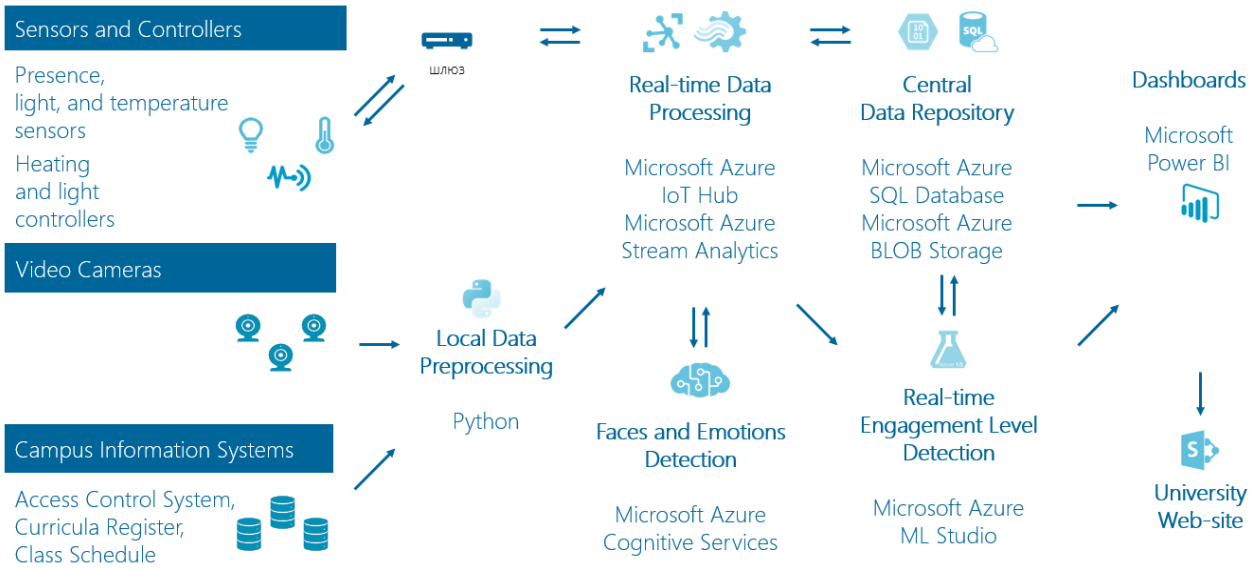

Fig. 1. Engagement Monitoring Service Architecture

When the *IoT Hub* receives an image containing a snapshot of students, it sends it to the *Microsoft Azure Cognitive Services* to recognize students' faces and emotions (the students' pictures in the *Microsoft Azure Cognitive Services* are synchronized with the campus access control database). For each face in the picture the *Microsoft Azure Cognitive Services* return recognized age, gender, student ID (from the campus information system), head pose, facial landmarks, indicators of lipstick, glasses, mustache, sideburns, beard, recognized emotions, occlusion, etc.

For each face, all the features received from the emotion recognition services, as well as snapshot timestamp, type of the class (lecture, seminar, computer lab, etc.), academic subject area ID and professor's ID are stored in the *Microsoft Azure SQL Database* while images are stored in the *Microsoft Azure BLOB Storage*. When a new entry appears in the faces and emotions recognition results table, this entry is automatically submitted to the *Microsoft Azure Machine Learning Studio* web service based on the previously trained classification model. This web service returns the scored probability for classifying the student as engaged, and this probability is stored in the faces and emotions recognition results table.

We use the *Microsoft Azure Stream Analytics* service for real time event processing and *Microsoft Power BI* for dashboards publication.

IMAGE LABELLING

We developed a special application for images labelling. This application is published in the *Microsoft Azure* cloud and allows experts to mark each face as engaged or not (Fig. 2).

We asked professors to assess the images of their students. Each professor receives a task to assess engagement level for a certain number of recognized faces. Most of the faces are automatically selected from the images obtained from the cameras during classes taught by this professor (the proportion of such persons is a configurable parameter; we recommend setting its value at the level of 90–95 %), and the rest of the faces are taken from the classes of other professors. This is necessary to ensure the adequacy of assessment. Experts have also the opportunity not to evaluate the engagement for individual picture in cases when the student's engagement evaluation is impossible or unnecessary.

MACHINE LEARNING MODEL

We tried logistic regression, boosted decision trees and random forest models as the predictors of engagement class. The best classification results are obtained using the *ADABoost*

Two-Class Boosted Decision Tree model. For this model the following quality metrics were obtained: *Accuracy* = 84.8 %, *Precision* = 82.5 %, *Recall* = 81.5 %, *F1 Score* = 82.0 %, *AUC* = 91.2 %. These results indicate the legitimacy of using the model to predict engagement level.

Among the factors that have the greatest positive impact on the engagement level, the following features are distinguished (in order of decreasing importance): head pose; recognized age; level of sadness; level of surprise; and some facial landmarks.

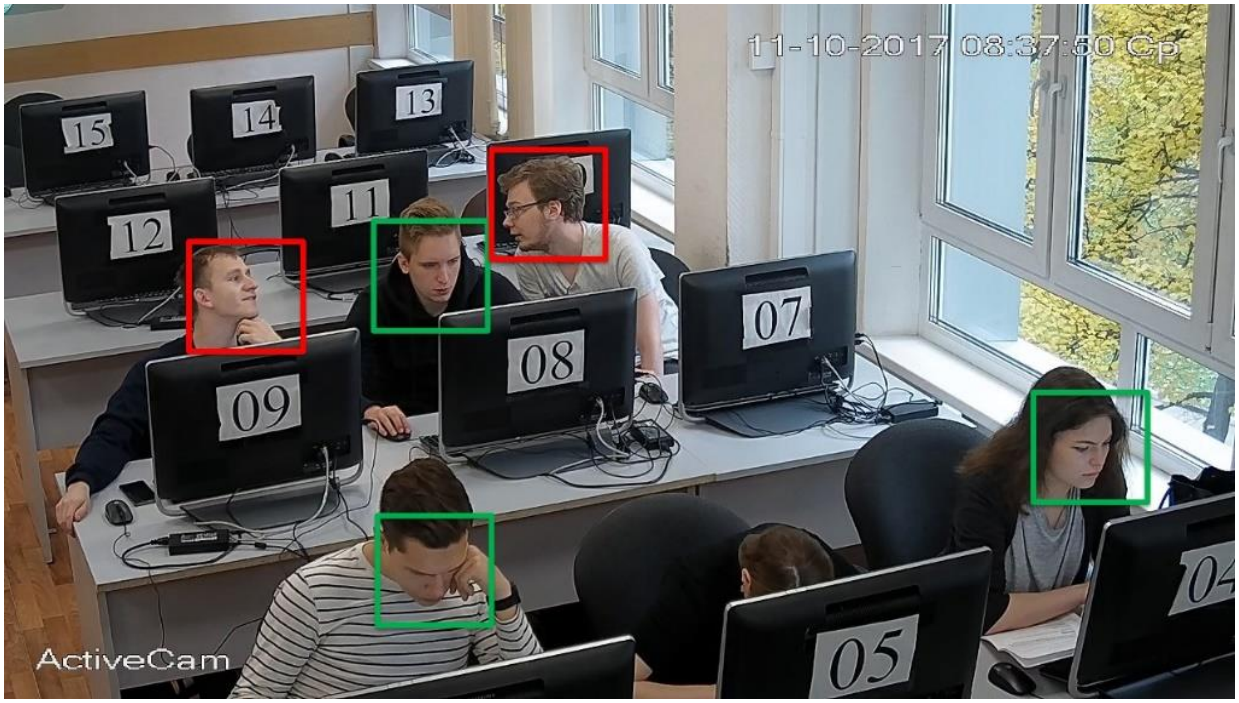

Fig. 2. Engagement Labelling

DASHBOARDS

The dashboard is placed on a single web page. In the top menu the user chooses the reporting period: semester summary, monthly or daily summary, or individual classes summary. At any level of the hierarchy the information about engagement is displayed by the universal display unit in the form of a discrete color scale for the selected period. Initially, the dashboard displays the upper levels available for the particular user (university, faculty, major, or academic subject area). In the detail mode of the month, the level tree is made in the form of a classic explorer; in front of each level (faculty, major, level of education, year, academic group, student, professor), the information on average engagement for the selected level is displayed by different colors. A fragment of the dashboard is illustrated by Fig. 3.

RESULTS AND DISCUSSION

Most of the tools traditionally used to measure the level of student engagement are too complex to measure the dynamics of the engagement of all the students in the university on an ongoing basis.

The student engagement monitoring service is intended for use by the university administration to obtain an operational feedback on the dynamics of the average engagement of student groups during the semester, to compare the dynamics of changes in the engagement between faculties, years, groups, etc., and to support the decisions on appropriate corrective actions.

A distinctive feature of the proposed system is that it is built in the form of a cloud service that can be used to monitor the engagement of arbitrarily large groups of students, elastically scaling when the number of students changes. Such a service can be used at the same time by several university or even across the entire education system.

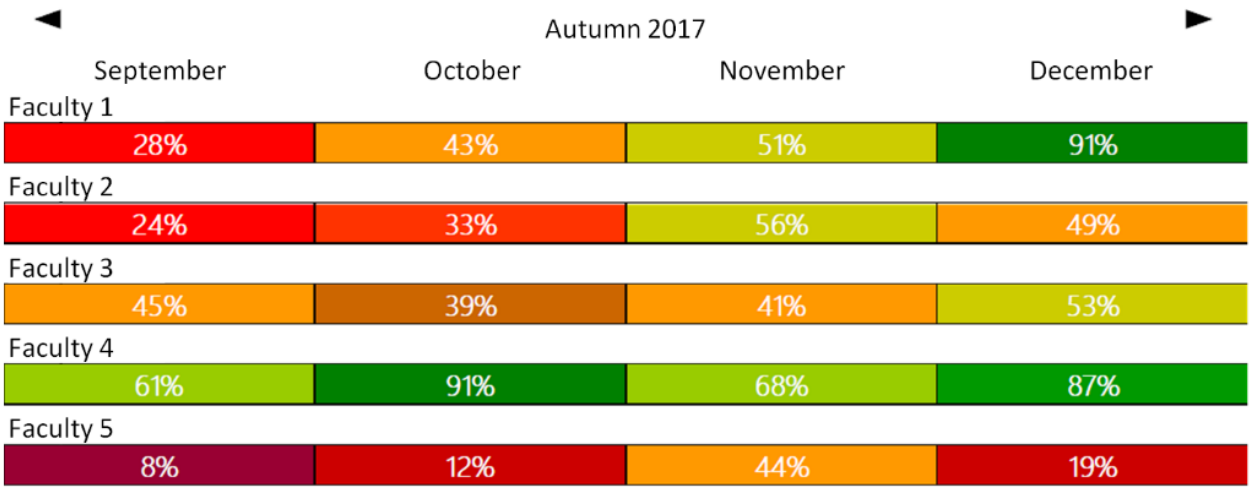

Fig. 3. Engagement Monitoring Dashboard

The results of the pilot use of the service demonstrate a sufficient degree of engagement prediction adequacy.

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WHAT IS 3D TECHNOLOGY?

What is 3D technology? 3D is an abbreviation for three-dimensional.In simple words, 3D technology stands for three-dimensional technology that offers a wide array of possibilities in near future in almost every walk of life. Specifically speaking, it includes: 3D software industry, 3D hardware industry, digital entertainment industry, manufacturing industry, construction industry, virtual reality, geographical information GIS, 3D internet and so on.The use of 3D technology in TVs, laptops and other products is growing.

The application of 3D printing technology in the medical field lies mainly in medical diagnosis and surgical planning. It can manufacture medical products, prototype devices, biological models, anatomical models, implants for implantable human bodies or scaffolds for biological tissues. It can effectively improve the diagnosis and operation level, shorten the time, and save costs.

Fig. 1. The history of 3D technology

The long history of 3D technology can be drawn the way back to the start of photography. A new invention by David Brewster in 1844, Stereoscope could take 3D photographic images. At the Great Exhibition in 1851, a picture of Queen Victoria taken by Louis Jules Duboscq, using the improved technology became very well known throughout the world. Soon, the craze for steroscopic cameras caught on and these were quite commonly used by World War II.

In the 1960s, in the history of 3D technology, a new technology known as Space-Vision 3D was released. This new technology removed the need to use two cameras to display 3D movies. The first movie to use this technology was “The Bubble” and the 3D experience still lured in huge audiences.

In 1970, Stereovision, a new 3D technology was developed, which used a special anamorphic lens that would widen the picture using a series of Polaroid filters. The first movie to be released in Stereovision was “The Stewardesses”. By 1980, many more movies in 3D technology were released, like, Friday the 13th Part III, and Jaws 3-D.

In the 2000s, many big studio movies were released in 3D, using the latest HD video cameras. Some of them are “Spy Kids 3D: Game Over”, “Aliens of the Deep”, and “The Adventures of Sharkboy Lavagirl”,”The Polar Express”. In 2010, there has been a big push towards 3D television. There are channels already displaying educational shows, animated shows, sporting events, documentaries and musical performances all in 3D.

Fig. 2. Application of 3D Technology in Medical treatment

The application of 3D printing technology in the medical field lies mainly in medical diagnosis and surgical planning. It can manufacture medical products, prototype devices, biological models, anatomical models, implants for implantable human bodies or scaffolds for biological tissues. It can effectively improve the diagnosis and operation level, shorten the time, and save costs.

Now, there is a way, it is the most modern – 3D printing of organs. They are people working in new laboratories. Meaning: Does not require non-organic skeleton (the cell itself is completely HOLD), does not need someone else's body. The patient gave them a small portion of adipose tissue and obtained the necessary structural elements from it by continuous cell therapy. It creates a three-dimensional model of the body and converts it into a CAD file. So this is because we can print our cells. In a 3D printer where it needs to “underscore” the point of view, it's a specific type of cell in three-dimensional space.

The obvious complexity of this method is as follows:

Get organ model. We need to take a plan somewhere.

Get the cell itself. Obviously, we need materials to print our organs.

The printer is assembled so that the cells can be printed (many problems with organ structure formation).

Hypoxia during organ creation. (hypoxia)

Implement the body’s nutrition and mature until ready.

Therefore, a 3D printer is only part of the manufacturing organ: it needs to provide drawings and materials, and then the organ model produced by the cell is still growing.

THE USE OF 3D TECHNOLOGY IN COMPUTERS

Today, people want to experience 3D not only in games but also in such activities as Web, corporate presentations and learning.

The advancements in technology are slowly driving the PC hardware capabilities up and prices down. Therefore the use of 3D technology in computers will definitely be on the rise and more accessible to consumers. Further research is still going on methods and algorithms. Many of the essential algorithms are encoded in hardware or are available through graphics APIs.

Meanwhile, to encourage the 3D technology in computers, improvements in motherboard- have enabled the competent internal transfer of massive 3D datasets and large bitmap graphics. There is better software for creating 3D textures and animation that have definitely made 3D technology more desirable.

Fig. 3. Summary

3D technology will have good prospects for development. Moreover, 3D technology is used in more and more areas, and has brought great changes to our lives.3D technology will be more applied to our daily lives, because this is the trend of the times.

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APPLICATION OF E-COMMERCE TECHNOLOGY IN IMPROVING THE RECYCLING CHANNEL OF RENEWABLE MATERIALS AND PERFECTING ITS RECYCLING SYSTEM

BACKGROUND

On December 25, 2017, China promulgated the regulations on the implementation of the Environmental Protection tax Law of the People's Republic of China, which came into effect on January 1, 2018. In June, 1996, the German government issued the "Act on the treatment of packaging waste", which forced the enterprises to take the responsibility of recycling the disposable packaging. Clearly identify packaging materials and recyclable labels on product packaging. Streets and lanes classify trash bins to make us the most common, with labels such as recyclable, non-recyclable, explosives and so on. When shopping in the supermarket, shopping bags also began to charge It's over [1].

Advances in Internet technology provide a technical basis for artificial intelligence. How to achieve the classification and disposal of garbage one-stop. In the age of network, we must look for the answer to the network [2].

MODEL AND INDUSTRIAL STRUCTURE OF RECYCLING RENEWABLE MATERIALS

First, the rural recycling of individual households is based on household units. Second, the rural waste recovery self-employed household waste storage is their own dwelling land. Third, the rural waste recycling self-employed purchase of short-term direct flow to reuse processing enterprises. Fourth, the city is taking a new model, waste recycling contract system, cleaning and recycling integration. Recycling of recycled materials is in the weak link of the industrial chain, and there are more non-military, informal forces, that is, some of them have not been put on record in the Commerce and Industry Bureau, do not have business licenses, and often take the form of monopolies. The common people are commonly known as "land scabs", the price can not reach the price of the regular army.

DEFICIENCIES IN EXISTING CLASSIFIED BINS

There are several main problems in the system of classified recovery and comprehensive utilization of garbage in China as follows:

(1) inadequate equipment for refuse separation and delivery.

(2) the garbage separation and transportation system has not been established.

(3) there is no associated waste sorting and recovery device before landfill or incineration.

(4) the industrialization system of comprehensive utilization of garbage resources has not been established [3].

(5) the numerous "deaf ears" sort of garbage bins have resulted in unnecessary expenditure and huge waste of government finance.

CURRENT SITUATION OF RESEARCH IN THIS FIELD IN VARIOUS COUNTRIES OF THE WORLD

(1) China-waste recycling and networking perfect encounter, many recycling enterprises with the help of the Internet, the introduction of all kinds of recycling websites and intelligent

recycling machines. Beijing Ying Chuang Recycling Resources Recycling Co., Ltd. is the "Internet recycling" model leader. Yingchuang focuses on the research and development of beverage bottle recycling machine, clothing recycling machine, mobile phone recycling machine, bottle and can integrated machine and many other intelligent recycling machines [4].

(2) UK-singing trash can, British dustbin will be loaded with electronic chips [5].

The chip on the trash can sense the weight of the garbage. When the garbage truck comes to the door of each household to collect garbage, it can pick up the weight of the rubbish from the chip of the bin, while the government collects the garbage fee according to the unrecyclable weight of the rubbish discarded by each household.

(1) Germany's mineral water bottle exchange machine, plastic bottles and cans recovery deposit system residents buy less than 1.5L of water, drinks, the price of the bottle automatically levy 0.25 euros deposit, after returning the bottle can get back the deposit.

SWOT ANALYSIS OF CURRENT RESEARCH RESULTS

Strength. The traditional waste collection channels are gradually integrated into the modern technology means and some artificial intelligence, the Internet technology becomes the technical support to improve the recycling channels of renewable resources, and the electronic commerce technology is gradually applied to the field of environmental protection. Internet-based online trading is also applied to the recycling system of renewable resources, which improves the market order in this field.

Weak. Recycling storage system is still relatively backward, advanced compression equipment should be applied to the recycling machine. The storage time of recycling material in the collector is too long, which affects the recovery efficiency. The distance from the collector to the recycling plant, fixed delivery personnel can not deliver in a short period of time, or delivery costs. E-commerce technology has not been fully applied to improve the circulation speed of recycled materials, and the network information service platform is also an important means to accelerate the recycling logistics flow.

Opportunity. More and more people pay attention to environmental protection, and the government has issued relevant policies to support the development of the industry. E-commerce technology is widely used in other fields and provides a cooperative platform for e-commerce in environmental protection field.

Threat. The current technology of garbage recognition and classification still needs to be further improved, and the classification of garbage is too rough, which hinders the quality and efficiency of garbage collection. There is still a long way to go for the universal promotion of intelligent recyclers. The compressed storage technology of recycled materials needs to be further improved to achieve zero pollution, low energy consumption, simple and easy to operate. The application scope of e-commerce technology in the field of environmental protection still needs to be further broadened.

PROPOSAL

Establish a complete recovery chain and improve the recovery system

As the terminal of recycling, the Internet should connect the nodes in the recycling chain through the online information center. The nodes in this chain include social citizens, trash producers, factories, large-scale recyclers, scattered trash recycling vendors, recycling plants, commodity manufacturers, etc. Each node is a community of related interests, and the improvement of environmental protection must take into account the interests of each node in the chain.

(2) Taking "Environmental Credit" as the Evaluation Standard for individuals to carry out Social activities

The dustbin does not talk, it does not have ears, it does not know who is putting so many "luxuries" in its belly every day, we have to increase the conversation between people and

machines, and set up an environmental account for every citizen. Each trash can follow our garbage drop record at any time as the basis of environmental credit assessment, "environmental credit" will also provide a guarantee for the social activities of users [6].

(3) Strengthening cooperation with other ecommerce platforms

Renewable resource recovery platforms can work with travel websites, online shopping sites, online ticket buying sites, mobile communication sites, online payment platforms, social networking software and other online platforms to increase interaction with them.

CONCLUSION

In recent years, with the help of Internet platforms, carrying Internet express trains, e-commerce technology has made the recycling industry of renewable resources develop rapidly, not only increasing man-machine dialogue. It has also advanced the development of the B2B model in the industry, where Internet platforms have enhanced dialogue among recyclers, between citizens and recyclers, and in the field of environmental protection and in other areas. At the same time, the Internet platform also provides data for the government's environmental monitoring. However, the application of electronic commerce technology in improving the recycling channels of renewable resources still has more room to play, and deep excavation. The application of the Internet in the field of environmental protection is the direction we should continue to strive for. In the recycling system of renewable resources, we should adhere to the "dual integration" strategy to achieve full recovery.

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LOW-CARBON CITY TRANSPORT SYSTEM

PROBLEM

Existing technologies of low-carbon urban transport have shortcomings that reduce its consumer value [1]:

- Bicycles have low power-to-weight ratio and high level of traumatism in collisions.
- Rail electric transport takes up a lot of expensive ground, aboveground or underground space with fixed traffic.
- Electric land vehicles have a high cost, a long battery charge time and in addition increase the load on busy urban roads.
- Electric flying vehicles have a small supplyof energy, which is quickly consumed. They do not have the ability to autonomously move over long distances and create a high risk of injury for close encirclement.

TECHNOLOGY

Employees of the Siberian Federal University (Krasnoyarsk) have developed a low-carbon transport system, in which these shortcomings have largely been overcome. It includes:

1. AeroMobileis a hybridflyingcar of ultralightcategory [2], whose appearance is shown in the Fig. 1. The design features of this airmobile are a rigid wing-parachute, filled with lighter-than-air gas, semi-rigid suspension and paramotors with variable thrust vector. For ground-based vehicles, wheels or skids can be used as chassis. Floats are used for surface basing. This design provides the following operational modes and motion characteristics:

- Vertical takeoff / landing on a hard surface or on water in helicopter mode;
- horizontal flight and maneuvering in airplane mode;
- parachuting and planning in paragliding mode;
- movement on the surface of water in the mode of the aircrew;
- payload up to 300 kg;
- flight range at one gas station up to 500 km;
- cruising speed of horizontal flight up to 80 km / h;
- vertical take-off speed more than 5 m / s;
- speed of parachuting is not more than 1 m / s;
- survivability and controllability after collision with an obstacle.

2. A network of base stations equipped with mooring devices forsafe take-off / landing, devices for parking and / or storage of airmobiles.

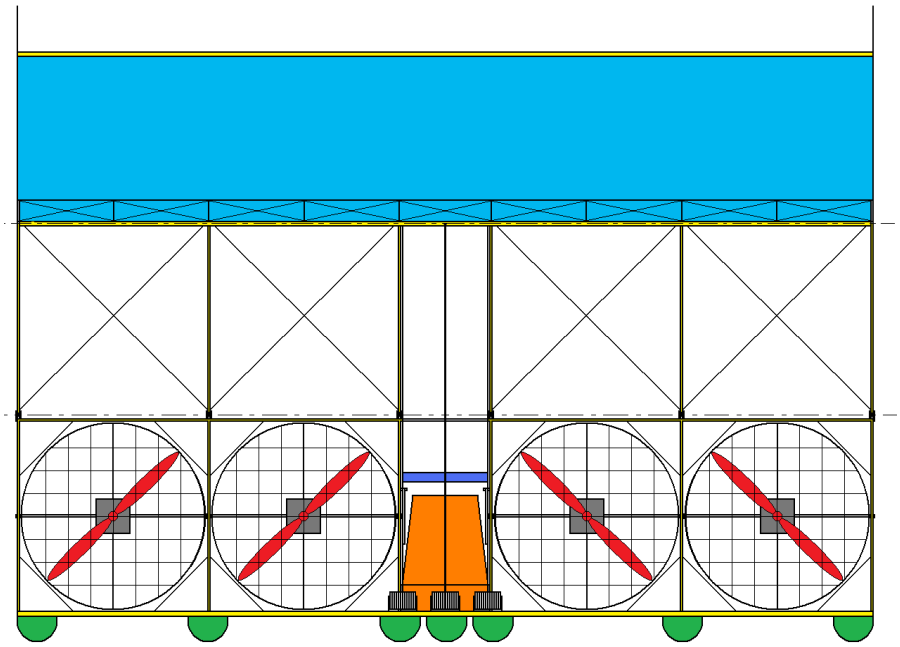
Transportation of passengers and goods has two modes of operation:

- autonomous, when the pilot carries out the control on board the airmobile;
- centralized, when control is carried out remotely, from the traffic control center.

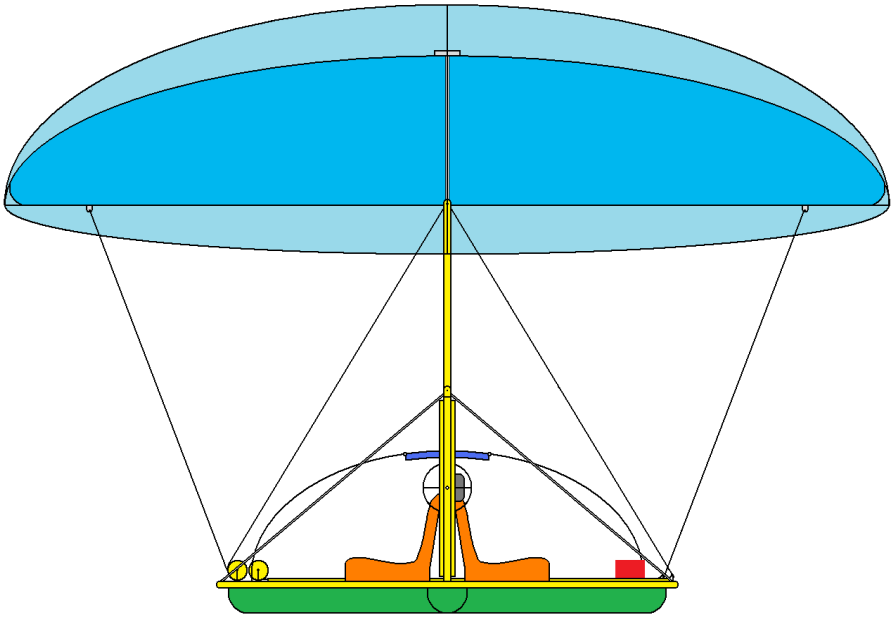
Autonomous control can be:

- manual, which is carried out by the pilot with high professional and physical training;
- semi-automatic, with the help of a directional control systemon board an airmobile. It does not require high training of the pilot.
- automatic, which is carried out on-board autopilot – robot.
- Centralized control of the movement of air cars includes:

- management of autonomous traffic with the help of space-based pointers and limiters and recommendations of the navigation system;
- direct remote control of robotic aeromobiles and collective stations from a single control center;
- analysis and elimination of the consequences of transport accidents involving air cars, which are carried out by the air traffic safety service of the control center.



Front view



Profile view

Fig. 1

The base stations are located:

1. On free plots of land or water area. The organization of such stations is carried out according to the rules and regulations established for the organization of ground helipads. Movement of goods and passengers outside the airmobile is carried out on traditional horizontal routes on the earth's surface.

2. On the roofs of buildings and structures. The organization of such stations is carried out according to the rules and regulations established for the organization of helipads on the roofs of buildings and structures. Movement of goods and passengers outside the airmobile is carried out on horizontal routes on the roofs of buildings and structures and vertical routes on elevators and stairs. So Santa Claus delivers gifts to children. The traffic pattern is shown in Fig. 2.

3. On the walls of buildings and structures. For the organization of such stations, it is necessary to install berthing facilities on the walls and to free the passage to the elevators and stairs. Movement of goods and passengers outside the airmobile in this case is carried out on horizontal routes in the aisles and corridors of buildings and structures, and vertical routes on elevators and stairs.

The reduction in the volume of used carbon fuels and associated emissions is achieved due to the operation of the engines only during take-off and climb. Most of the flight, descent and landing are carried out on the shortest route, with idle engines in the guided planning mode. Also, fuel economy is achieved through the use of ascending flows for climbing and tailwinds for displacement. An additional reduction in emissions will occur when replacing internal combustion engines with electric motors.

The main technological risks for an airmobile are the headwind in flight and air turbulence in the take-off / landing zone.

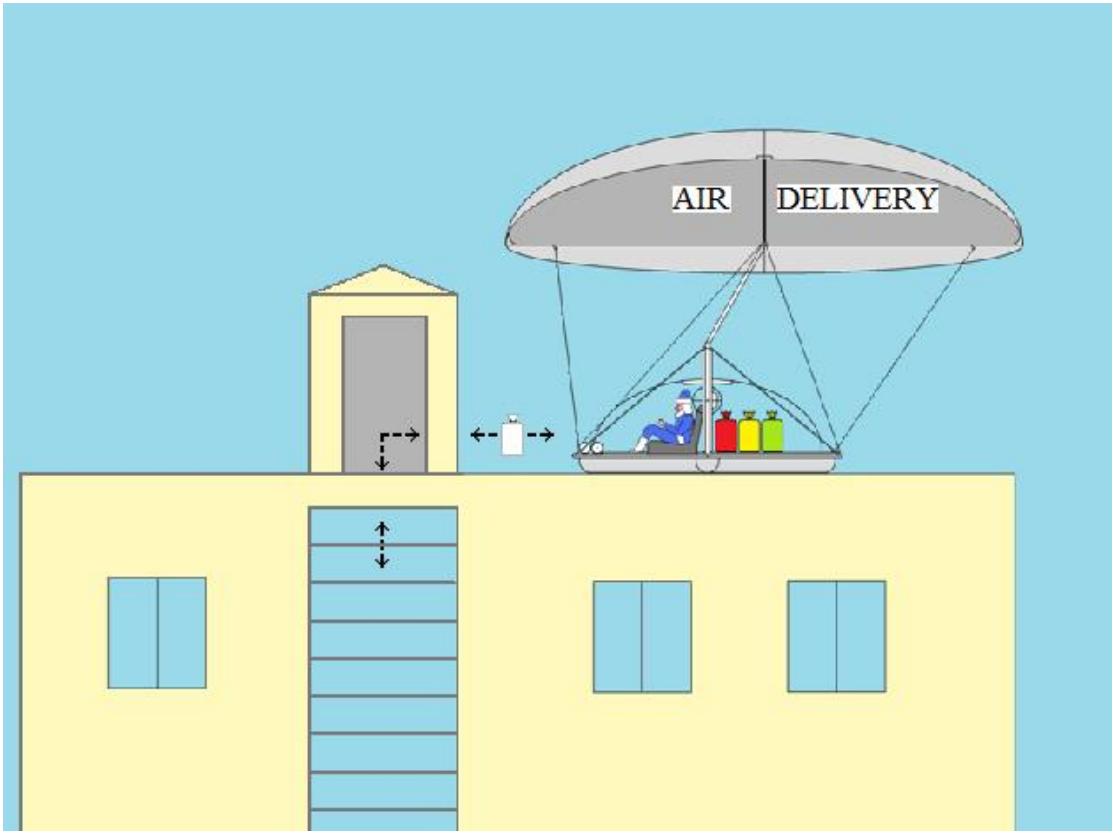


Fig. 2

ECONOMY

Capital costs for the creation of a transport system depend on the structure and configuration and are approximately equal:

- $ 15,000 – $ 25,000 for one airmobile;
- $ 2000 – $ 3000 for one private station;
- $ 20,000 – $ 30,000 for one collective station;
- $ 200,000 – $ 300,000 for one remote control center for airmobiles and collective airmobile stations in cities with a population of up to 100,000 people.

The operating costs depend on climatic and atmospheric conditions, the composition of the fleet of airmobiles and the layout of stations. For a specific urban agglomeration, it is possible to estimate this by statistical indicators of the actual functioning of the transport system. The main items of current costs are:

- expenses for fuel and consumables;
- costs for routine maintenance and service;
- expenses for training and retraining of pilots of airmobiles and remote control operators for robotic airmobiles and stations.

For the transport system in a city with a population of up to 100,000 people, the operating costs are 3–5 % of the capital costs.

An important aspect of the functioning of the system is the legal and regulatory support for the processes ofits creation and operation. In most cities and agglomerations, it is absent and the legal field is free from prohibitions and regulations. But in some cities there is a complete ban on flights over the city territory.

CONCLUSIONS

The proposed low-carbon urban transport system is characterized by:

- the greatest safety for users and environment in comparison with existing types and systems of civil air transport;
- low level of use of hydrocarbon fuel and environmental pollution;
- Higheroperational characteristics and consumer valuein comparison with existing types and systems of urban low-carbon transport;
- Low cost of creation and ownership.

The main consumers of the transport services of the system are urban residents, economicentities that conduct economic activities in the city and municipal authorities.

The main risks for the creation and operation of the system are its assimilation with the existing urban environment and the regulatory framework governing air traffic over the urban agglomeration.

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SESSION 3

MODELING ASSESSMENT OF RESOURCE AND SCIENTIFIC-TECHNICAL POTENTIAL FOR INTERREGIONAL AND INTERNATIONAL INTEGRATION

UDC 005.5

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THE APPROACH TO MANAGING ORGANIZATIONAL MATURITY LEVEL BASED ON THE BUSINESS PROCESS MANAGEMENT SYSTEM

The article describes the implementation of the organizational maturity assessment system for achieving sustainable organizational success with BPMS ELMA business process management system.

Any organization in its development process passes certain stages that are characterized by different strategic approaches, technologies, the level of managerial culture, the competence of personnel and other qualitative and quantitative characteristics. There are certain approaches that allow to assess each level of the company's development. An example is the model describing the stages of development of the organization, which are called "models of maturity levels".

A universal model for assessing maturity is Capability Maturity Model Integrated (hereinafter CMMI). CMMI describes a scale of five maturity levels based on how consistent the company or organization is in following the general recurring processes in carrying out its work. Figure 1 shows the maturity levels of the CMMI model. The lower level of the scale describes companies without recurring processes, where most of the work is chaotic and confused. The upper level describes companies that use specific and recurring processes, collect metrics to continually improve their processes, and on a regular basis look for creative methods that work better.

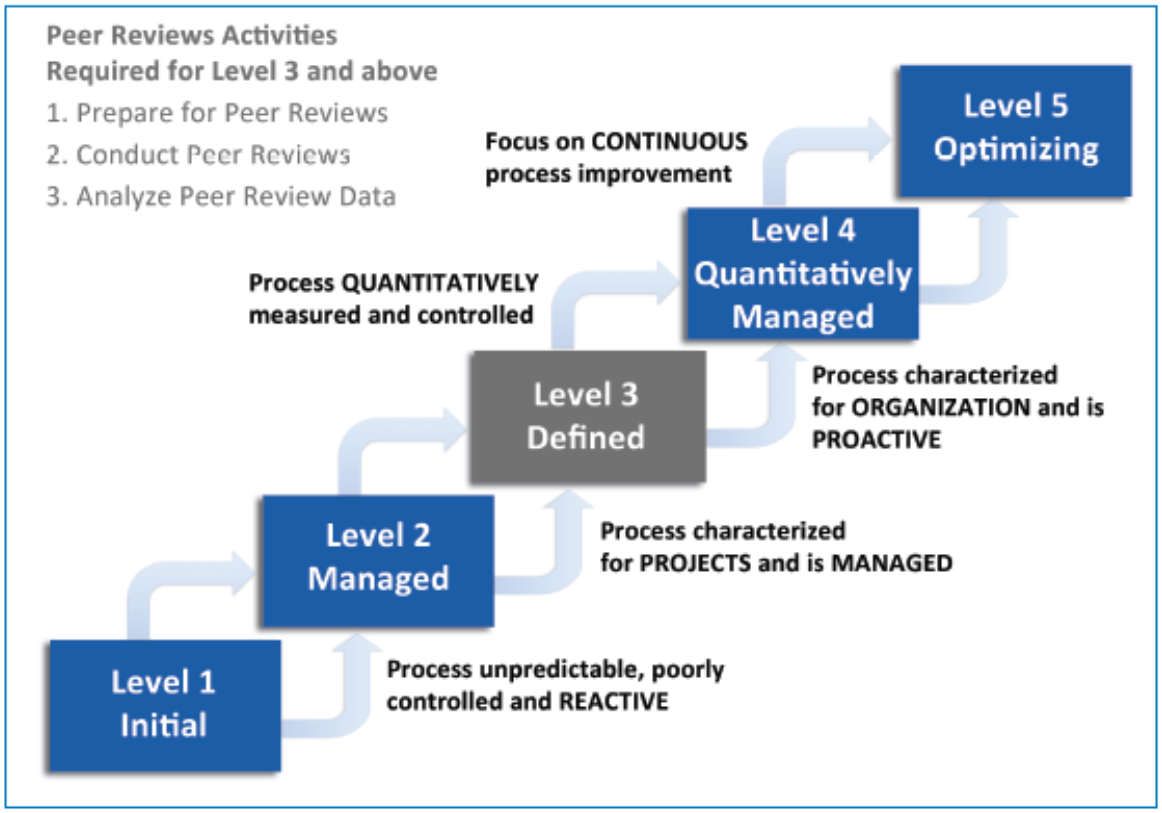

Fig. 1. CMMI Staged Maturity Model

The International Organization for Standardization (ISO) applies CMMI to create international standards. Within the framework of this article, we will refer to ISO 9004-2010 “Management for the achievement of sustainable organization success” standard.

According to ISO 9004-2010, the sustainable success of an organization is achieved through its ability to meet the needs and expectations of its consumers and other stakeholders on a long-term basis and in a balanced manner. Sustained success can be achieved through effective management of the organization, by understanding the organization's environment of its existence, through training and proper application of improvements and (or) innovations. This standard offers a methodology for self-assessment of maturity levels based on a survey, based on which we can conclude that the level of maturity of the organization [1; 2].

This questionnaire is required to be implemented in the ELMA business process management system, for passing the test by the employees of the enterprise. To solve this problem, a free version of ELMA Community Edition [3] was used. Let us briefly consider what this system is. The ELMA business process management system allows you to build interaction between employees and monitor their activities in order to improve the quality of the entire company. The system is divided into two parts. The first is the ELMA Designer, in which business processes are designed, and the second is a web application in which business processes created in the designer are run.

First you need to create organizational structure of the organization. Without the organizational structure, it is impossible to start the process, since the performer must always be assigned to the process. After creating the organizational structure, we turn to building a graphic model of the business process. Before building a process model, it is necessary to allocate a zone of responsibility within which a business process will be launched. The area of responsibility determines which of the participants in the process at this stage is the executor. ELMA distinguishes four types of areas of responsibility: static, dynamic, dynamic (scenario), business role.

To enable each respondent to independently launch the testing process, a dynamic zone of responsibility was chosen. For this purpose, in the settings of the zone of responsibility, there was created only one user – the initiator. The graphical model of the business process is shown in Fig. 2.

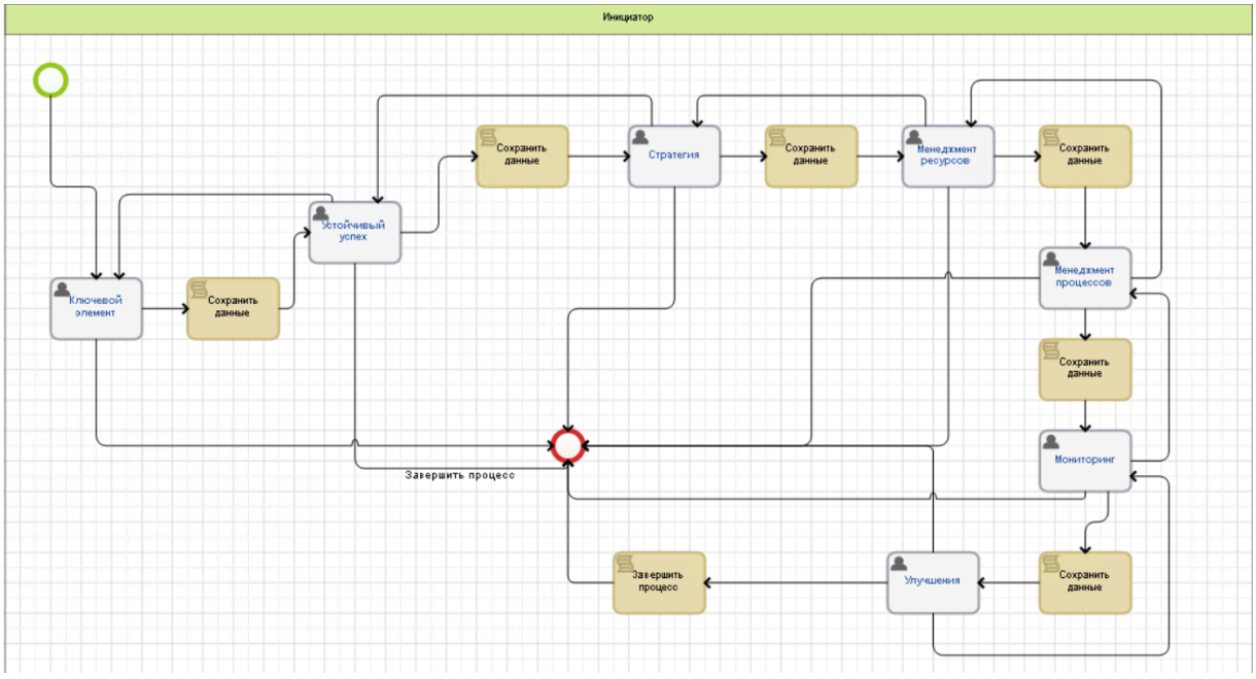

Fig. 2. Business process “Interview with the company’s employees”

The business process includes one start event and one final event. Also, a script is added to the graphical model, which preserves the results of the survey. All blocks are interconnected by arrows of transitions. The next step is to create context variables in which each question from the test is one variable. The form for setting the context variable is shown in Fig. 3.

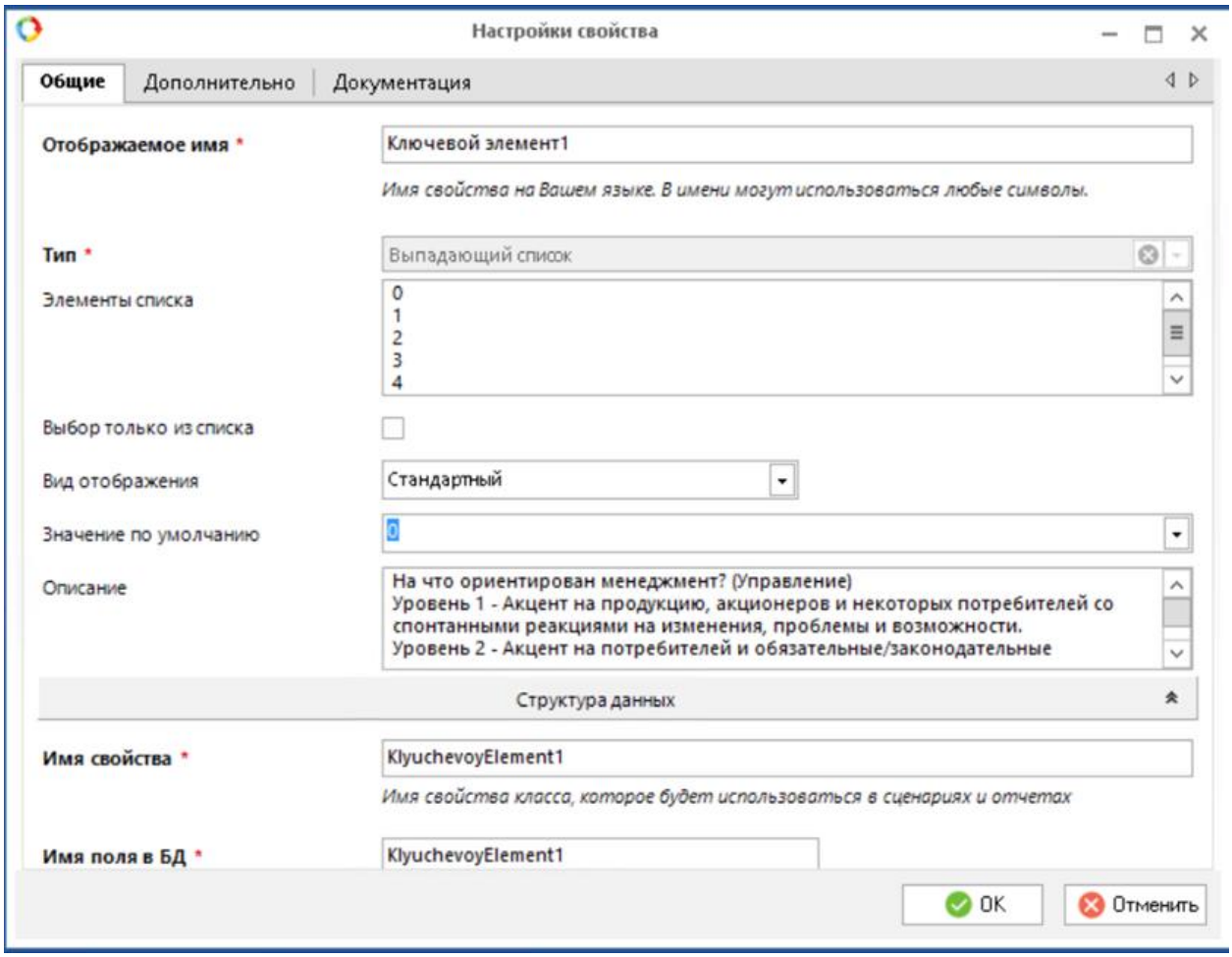

Fig. 3. Form of creating of a context variable

A context variable must have a unique name, because the system automatically generates a similar class property name for the script and the name of the field in the database. After you create all the context variables, you configure the forms for them and the transitions between the forms. Figure 4 shows a fragment of the running business process “Employee Interviewing”.

The logic of execution is that the user needs to start the testing process and select one response for each context variable. All fields are required, so the user can return to the previous form and change the selected values. After answering all questions, the user completes the process.

Currently, the solution described in the report is operated in the company “Krasnoyarsk Machine Components” [4].

Thus, the decision on automatic collection of organizational maturity estimates described in the report allows us to use the results obtained in the assessment of the organizational maturity of industrial enterprises and their business processes in order to effectively manage the activities of the organization.

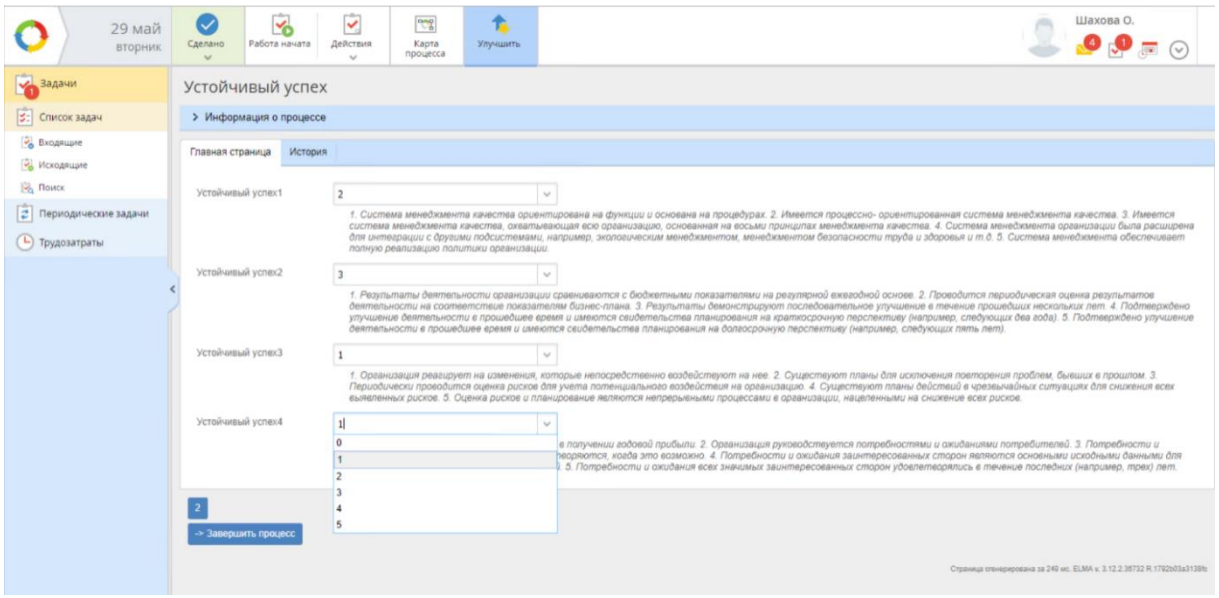

Fig. 4. Fragment of the process “Interview with employees of the enterprise”

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UDC 658.5:005.85(47+57):330.322.12(510)

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CHINESE PRIVATE EQUITY FUNDS ON THE RUSSIAN MARKET FOR CORPORATE CONTROL: MOTIVES AND INDUSTRY PREFERENCES[1]

Completion of the recession, stabilization of oil prices and adaptation of the Russian economy to the sanctions regime strengthen the interests of Chinese investors to the Russian assets of non-public companies. In China, against the background of the huge attraction of foreign PEF funds for the period 2002-2017, a powerful segment of its own PEF was formed, ready to search and implement investment projects in Russia. Statistics confirm that China is one of the key players in the global investment market (Tab. 1) and Russia remains in the list of priority directions [1].

Table 1

The amount of attracted funds and private equity funds
in the BRICS countries in the years 2002-2017, million $ [1]

Country	2002	2008	2011	2012	2013	2014	2015	2016	Q3 2017
Brazil	270	3 363	6 484	2 080	639	3 924	792	151	144
India	142	6 114	2 669	2 545	1 017	1 649	4 142	3 199	2 092
China	105	14 185	21 358	11 173	11 377	12 450	11 955	19 717	7 292
Russia	**100**	591	262	575	601	317	–	–	–
South Africa		219	39	837	3	80	–	312	–

At the beginning of the XXI century, Russia and China held approximately the same positions in terms of the amount of funds raised by the PEF, but by 2017, PE investments focused on China were 100 times more capital than those working with Russia. Chinese private equity funds (PEF) consider the situation to be attractive, as there is a very low threshold for entering the capital of Russian non-public companies.

Geo-economic strategies of China, the search for strategies for further growth based on the growth of domestic consumption form and adjust the configuration of the institutional space for foreign expansion of Chinese investment (Tab. 2).

Table 2

Chronology of the revitalization of the Chinese equity funds in the Russian economy

Metric institutional framework for the expansion of Chinese investment	Priorities and sectoral preferences of Chinese investment
2009–2018. program of interregional cooperation of the Far East and Eastern Siberia and North-East China. Creation Of the Agency of the Far East for attracting investments and supporting exports, opening a foreign representative office in China, the possibility of obtaining advice from potential Chinese investors directly in Harbin, Shanghai and Beijing.	Chinese priorities – oil and gas industry, agricultural cooperation, high technologies in housing construction, etc. In the Amur region – the construction of a refinery with a share of 90 % of the private capital of the Chinese company “Manling, since”; in Primorsky Krai, the consortium of private entities “Tanuan” of Jilin province in the development of science and technology in agriculture and animal husbandry; in the Khabarovsk region the launch of the project pulp and paper mill – the investor is a subsidiary of the China Paper Corporation ($1.5 billion). In Kamchatka, RE are ready to invest more than 4 billion rubles in the port industrial park.

[1] The work was financially supported by the Russian Foundation for Basic Research (project №. 17-02-00016-Department of Humanities).

2013. The emergence of the concept and project of the New Old silk road (NSSP) as a Eurasian land bridge for a large-scale transformation of the entire trade and economic model of Eurasia.	The priority for China is the land corridor to Europe: infrastructure and logistics projects. The boundaries, costs and results of possible projects are outlined. The project implied specific terms of its implementation, certain goals, as well as significant amounts of funding. Thus, only the management of the development Bank of China (DBK) promised to allocate up to $1 trillion of soft loans for "silk" projects until 2020.
2014. Establishment of the Asian infrastructure investment Bank (AIIB) – international investment Bank and Asian development Bank (ADB).	China is the main shareholder and Manager of loans for infrastructure projects.
2015. The Emergence of the Chinese initiative "One Belt and One Road".	Unlike the project, the initiative is more amorphous: it does not oblige the initiator to meet specific goals and deadlines. "Belt and Road" unites the land economic belt and the sea route. The initiative involves the use of related loans in the partner countries and the weakening of the situation with overproduction and excess steel, cement and building materials in the Chinese industry.
2015. Launch to support the silk road investment Fund (FSR) initiative. It invests funds on a return basis.	Four priorities for investments for the Fund: infrastructure, energy, industrial cooperation and financial cooperation. All investments in infrastructure projects in countries along the New silk road and the Maritime silk road should help to buy valuable raw materials and infrastructure assets and sell Chinese products. Through FSR China has invested in "Yamal LNG" and "SIBUR". In addition to these two transactions, the FSR has signed many memorandums of cooperation with various funds and financial institutions (including Russian RDIF and VEB).
2015. Agreement on the interface of the Eurasian economic Union (EAEU) and the silk road economic belt (SREB).	The concept of China on the establishment of a network of transport corridors of the EEU and the silk road economic belt. Options for constructive cooperation: ▪ in the field of transport communications and logistics; ▪ joint food security projects; ▪ establishment of cross-border economic cooperation zones; ▪ creation of favorable conditions for the growth of small and medium-sized enterprises, the development of industrial cooperation and the deepening of regional production ties.

Source: [Compiled by the authors].

At present time, the institutional configuration of Chinese PEF on the Russian market has its own characteristics.

1. Due to serious risks, Chinese projects and PEF are focused primarily on cooperation with state institutions: RDIF and Vnesheconombank (VEB). The sector of infrastructure projects (projects for the construction of roads, ports, energy projects) on the basis of private-public partnership with solid state support traditionally attracts strategic investors from the Chinese National Republic (CNR).

2. The expansion of the activity of PEF led to the creation of The Russian direct investment Fund (RDIF) and China development Bank joint Fund in yuan for investment in joint projects of up to $ 10 billion. 30 projects in the field of retail, agriculture, food industry, real estate and pharmaceuticals are studied [2].

3. The emergence of the international equity Fund. It was created on the initiative of China to implement the concept of "One Belt and One Road". It unites the projects of the Silk Road Economic Belt and the Sea Silk Road of the XXI century. Among the participants – RDIF, the Industrial Development Fund (IDF), Silk Road International Development Fund, Hong Kong (SPIDF) and the Center for investment, technology and trade [3].

4. PEF of the largest investment groups in China are actively investing in Russian assets in various fields. One of the priorities is the commercial real estate in Moscow. Companies and funds PE from China closed in 2017 a number of large transactions and, thus, proved to be the main and only foreign investors in the commercial real estate market of Moscow since the

beginning of 2017, according to the results of the first half of 2017, the volume of investments of investors from China in commercial real estate in Moscow is estimated at $170 million [4].

Significant investment opportunities for Chinese PEF in Russia are associated with a low level of labor productivity in the economy compared to the developed PE markets and a huge potential for its increase in many industries and areas. Unlike Western PEFs, for which investment in many areas is "frozen" by the imposition of sanctions, Chinese PEFs are not limited in the space of their preferences. Experts estimate the potential volume of investments from the PRC in the industry and commercial real estate of the Russian Federation in a few billion dollars. Also, according to research, 57 % of Chinese companies plan to increase and expand their investment portfolio [4].

New geopolitical conditions, changes in the structure of the global and Russian economies are forcing Chinese private equity funds [5]:

- search for new industry growth points that meet the challenges of the time. Among them: agribusiness, hospitality, logistics, infrastructure projects, etc;
- actively use the opportunities to attract financial resources. The emergence of new international institutional investors – the new development Bank, the Asian infrastructure investment Bank, the BRICS Bank, and China's dominant position in the charters of these organizations allow Chinese investors to gain particularly broad access to the smart capital of these organizations;
- expand the regional focus of its presence in Russia, focusing on the investment attractiveness rating.

Opportunities for expanding the presence of Chinese PEF in the Russian corporate control market are related to the possibility of participation in the privatization of a number of Russian companies, as well as the weakening of internal restrictions for Chinese investors on the acquisition of foreign assets. At the same time, such problematic issues as the lack of specialists in the field of Economics and logistics with knowledge of the Chinese language, although the need for them is extremely high, difficulties in combining the contract law of Russia and China, etc., can be serious limitations.

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SINO-RUSSIAN COOPERATION IN RUNNING SCHOOLS IN THE BACKGROUND OF THE "ONE BELT, ONE ROAD" INITIATIVE

China and Russia are both important countries along the "One Belt, One Road" initiative. There are still some problems in the process of Sino-Russian cooperation in running schools. Therefore, new path of improving the level of Sino-Russian cooperation in running schools should be taken.

***Keywords**: "One Belt, One Road" initiative, Sino-Russian cooperation in running schools.*

CHINA AND RUSSIA HAVE ACHIEVED MULTI-LEVEL COOPERATION THESE YEARS

According to the data collected from the Chinese consular service network and the country guide of Russian investment, China and Russia attach more importance to heavy industry cooperation in import and export, while in terms of investment, cooperation in the second and third industry are more.

In terms of scientific and technological cooperation, China and Russia have signed a series of cooperation agreements. Science and technology cooperation between China and Russia has been gradually extended to the introduction of biological technology and information technology.

SINCE THE "ONE BELT AND ONE ROAD" INITIATIVE WAS PROPOSED, SINO-RUSSIAN EDUCATION COOPERATION HAS BEEN DEVELOPING VIGOROUSLY

In 2018, China has established 17 Confucius institutes in Russia. The number of Chinese students studying in Russia reached 25,000 in 2016 and the number of Russian students studying in China is 18,000, and the number will be 100,000 by 2020 [1]. Meanwhile, Chinese and Russian universities have established 7 university alliances [2]. Through establish university alliances, the resources of each member are integrated into the same platform, which greatly improves the efficiency of exchanges and cooperation.

SINO-RUSSIAN COOPERATION IN RUNNING SCHOOLS HAS SHOWN A POSITIVE TREND OF DEVELOPMENT

(1) Development status and characteristics of Sino-Russian cooperative education project

1. The cooperative education project focuses on the introduction of Russian education resources to China. China has 85 Sino-Russian cooperative education programs in 17 provinces (autonomous regions) by now. At present, there is only one institution of Sino-Russian communication program which is set up by Chinese university with Russia [5].

2. At the level of education, undergraduate programs are the mainstay. As for 2018, China has 85 [3; 4] Sino-russian cooperative programs, which are 2 graduate programs (including one doctoral graduate program) and 83 undergraduate programs.

3. Subject and major Settings are widely distributed. Among the 83 projects with bachelor degree or above, 45 projects are involved in the cooperation of natural science. Projects involved in humanities and social sciences and professional cooperation is 38. The Sino-russian cooperative program's majors covers nine disciplines besides philosophy, military science, agriculture and law.

(ii) Development status of Sino-russian cooperative schools

1. The discipline focuses on natural science. According to the distribution of majors [2], among the 41 majors, there are 27 natural science majors.

2. More cooperation in advantageous subject areas. It can be seen that Sino-russian cooperation in running schools has carried out more cooperation in majors like rail transit, precision instruments, aerospace, machinery manufacturing and art education.

THERE ARE STILL PROBLEMS IN THE PROGRAMS

(1) The quality of cooperative education needs to be improved

According to the information statistics released by the ministry of education's foreign-related supervision information network, in 2017 there are 15 Russian universities in China that have held 3 or more sino-russian cooperation school-running projects with different Chinese universities [4].

In addition, some of the Sino-russian cooperation in running schools project is not to keep the original intention of cooperation in running schools, only borrow the name of Sino-russian cooperation in running schools.

(2) The layout of cooperation in running schools is not yet perfect

According to the data, among the majors opened, computer science and technology, automation, music, accounting and other majors are relatively large. However, the professional layout of Sino-russian cooperation in running schools is still not perfect. For example, the new hot fields of energy, life science and ballet in Sino-russian cooperation are not reflected in the professional setting.

(3) Language barriers still exist in cooperative education

Russian is the bridge of communication between teachers and students, but the language barriers are there: most students begin to learn Russian from universityand they need to be familiar with Russian and specialized courses quickly; but some teachers even only know Russian and know little about the major they teach.

NEW PATHS OF SINO-RUSSIAN COOPERATION SHOULD BE EXPLORED

(1) Introduce high-quality education resources

The ministry of education and local government education departments should strengthen guidance and supervision of Sino-russian cooperation in running schools, put forward Sino-russian cooperation in running schools professional guidance catalogue.

Universities should further strengthen their understanding of the necessity and importance of Sino-russian cooperation in running schools, pay more attention to improving the quality of education and focus on the real integration of high-quality education resources abroad.

(2) Establish Sino-russian education cooperation and exchange demonstration zone

The government should integrate the existing higher education resources of the provinces through policy support and capital input. The government should also build a education cooperation and exchange demonstration center in regions without the advantages of traditional geographical relations. In addition, some universities can also serve as the education cooperation demonstration point.

(3) Guide China carry out overseas schooling

In recent years, the strength of Chinese universities has been gradually enhanced, and the "One Belt, One Road" initiative is urgently needed to be constructed and implemented by inter-disciplinary talents.

Education authorities should increase institutional supply. The government should provide financial support and encourage the development of overseas education through multiple ways.

Colleges and universities should design their own development plans according to the directory of Sino-russian cooperation in running schools. At the same time, colleges and universities should develop courses to introduce China's economy, laws, local customs and practices, history, culture and customs, etc.A group of specialized personnel should be trained and selected to form a quality team for overseas education.

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INFLUENCE OF ADDED VALUE ON THE INTEGRATION POTENTIAL OF TERRITORIES AND FORMATS FOR INTERNATIONAL COOPERATION

In today's economy, the end product hast not only the great importance, but also the activities result of the actors participating in the creation of this product, including through the formation of an integration potential along its entire chain, is of great importance from the point of view of ensuring employment and development. At the heart of integration processes is the potential of relationships and the orientation toward value creation. According to D. Wilson, business relationship creates value, as they increase the competitiveness of the participating parties on the basis of their bilateral interaction [Wilson, 1995].

The value of relationships creation, in terms of resource approach, leads to the creation of unique assets of companies and depends on the level of organizational abilities to manage relative resources. The value itself acts as an indicator efficiency of the companies asset management and the success of efforts to integrate the resources and capabilities of the parties involved [1].

The strategic creation of the value of relationships in the network perspective, in turn, depends on such factors as resource tolerance, complementarity of actions, cooperation degree, resources uniqueness and etc. [Mandjak, Darrien, 2000]. The value of relationships arises in the chain of companies and identifies the need to develop a balanced approach to the formation of a portfolio of relationships based on a system of selection criteria (profitability, mutual benefits, strategic importance).

In this connection, the term "value chains" (VCC) or "global value chain" (GVC) for international systems has become widely used. This is well combined with various forms of interregional and inter-firm interactions within the framework of soft network forms of business integration, among which a separate class of structures is created – the network (chains) of creating value [2].

Value creation chain represents the company as a set of different activities, each of which creates an additional cost of the goods for consumption and is considered in some studies, even in the form of a business model [Klimanov, Tretyak, 2014]. The business model, accordingly, discloses additionally mechanisms for assigning jointly created values and can be used to analyze the organization of interfirm cooperation.

It should be noted that any position in the value creation network benefits participants because it creates opportunities for them to enter the market and access to technologies and management practices. Significant financial flows pass through the network. Value creation networks depending on the degree of centralization in the field of coordination of interaction can have different architectures: hierarchical, quasi-hierarchical, market and depending on the characteristics of the industry and the partner network to acquire a simple linear or concentric pyramidal-hierarchical form [Ojasalo, 2004] Khaba [Sheresheva, 2006; Oleskin, 2013].

This diversity allows you to choose a network architecture that will satisfy all its participants.

One of the central issues in such networks is the issue of management and control, on which depends the product, functional and (or) process structuring.

The nature of the VCC depends also on the types of management they will be market, modular, relative, captive or hierarchical [3].

It should be noted that the VCC is not only an analytical tool, but also an instrument of international economic regulation, changing and transforming into a global value chain (GCS). Effective participation in it depends not only on the ability to import, but also on export opportunities, especially intermediate goods and services, whose share on average is about 70 %.

A whole range of benefits and participation risks in the GVC can be identified [4]. In addition, it is necessary to note the improvement of the quality of education, the infrastructure development, investing in research and development, creating favorable conditions for doing business. Among the risks is a reduction in the national share in the country;s exports, which can be compensated only by increasing efficiency in the remaining sectors, leading to an increase in demand in the market. Ecological, conjectural, economic and social risks may be exacerbated.

The task of opening up new promising markets in the field of investment, industrial cooperation and non-primary exports becomes obvious to regions and macroregions. The signing of the Treaty on the Eurasian Economic Union (2014), as well as the Cooperation Agreement within the framework of the Yenisei Siberia (2018), opens new prospects for expanding business opportunities, implementing joint investment and cooperation projects, coordinated regional policy, coordination at external levels, including number of embeddings in the GVC.

The scale and effectiveness of the participation of Russian business in the GVC today does not correspond to its potential. The data presented by OECR and VTO show that the nature of Russia's participation in the GVC raw material, and the participation index is only 51.8 [5].

This specialization prevents the creation of high added value. In addition, the exported resources already in the form of finished goods are imported into the Russian Federation with a corresponding mark-up. The share of export-oriented companies in creating added value of imports is higher than foreign ones. Three quarters of the Russian consumer demand is covered by local producers, their contribution to the value-added services sector up to 90 % [6].

To promote Russian companies in the GVC and maximize their participation benefits in the global chain, it is necessary to evaluate the features of value-added processes in relation to various types of goods and services in the sectors that are of greatest interest from the point of view of economic growth in the regions and promote interregional and international cooperation.

For the YUS regions, this is mainly agriculture, logistics, transport.

It is of fundamental importance to involve key participants of the GVC in the regional strategic planning. Based on the principles of the OECP for the organization of effective interaction between the private and public sectors, the prospects for the formation of new GVCs with the leadership of Russian companies should be considered. Such a strategy will allow to take into account the tendencies of development of new markets and potential opportunities for taking leading positions on them, as well as the developing geopolitical situation when choosing foreign trade partners.

One of the important aspects of this work is the formation of appropriate databases and the improvement of the methodology of statistical observation. National production and bilateral trade statistics do not fully visualize the value chains, networks and communications in the production process. The lack of information in the construction of value chains leads to the use of a large number of assumptions. And if the movement of goods on the territory of Russia, albeit with conventionalities, is covered by added value, then for its chapels one can rely only on the OECP and VTO estimates. The TiVA database (Section “Trade in global value chains”), used by them, is limited in volumes of relevant information, has insufficient geographic coverage of countries.

In order to improve the methodological approaches and increase the reliability of the evaluation, it is necessary to use existing international approaches in the area of building the supply and demand balance, organizing the system of national accounts, and others. We need our own databases with an emphasis on the strategic importance of the EES regions, the BRICS countries, the UVA, the intensification of the processes of inter-sectoral research and interaction with international organizations.

It should be kept in mind that in the international standard industrial classification (ISIC) three sectors of production are distinguished – primary (raw materials and materials), secondary (manufacturing industry), tertiary – services. In the world export of goods and services, about 40 % falls on industrial products, 16.4 % for raw materials, 44.7 % for services. The national added value in world exports of industrial products is now 76.3 %. The position of the countries in relation to the world average level speaks either of long production chains, or indicates the circulating nature of production.

The global content of the national added value in the export of raw materials is 72.4 %. The internationalization of production activity reduces this share. By the share of services in exports, one can also judge the degree of internationalization of this sphere. The national added value in the export of services is about the same as in the industry.

Thus, the high value of the national added value is characteristic for the export of services by highly developed countries, as well as leading in its individual sectors.

As already noted, basically the issue that is solved in the CSA is the choice of forms of management and control over them. By the nature of its action, the CSD is more regional and concentrated in three centers: North America, Europe and East Asia.

The first two regions are mainly demand centers, the latter is the supply center. Concerning them, and should build the VCC for decision-making. You should also keep in mind their direction “from the top down” or “from the bottom up” (Gereffi, 1999). The first way characterizes the position of companies and the organization of their production process, the second regulates the increase in the role within the VCC. In addition, the process of adding value passes through three stages: pre-production, production and logistics. The first and the third stage bring the greatest revenue, the second – the minimum. In accordance with this, Russian companies should focus on participation in the first and third stage, and in the second should involve potential partners.

To improve the quality of cooperation and determine the position of network participants in the value chains, it is necessary to determine the sequence of their formation, identifying material flows and key processes for the selected type of activity, non-standard activities related to the production of a particular product, to the subsequent grouping of VCC suppliers, manufacturers and expansion channels [7].

As a result, a list of all entities involved in the phased creation of the value of the final product is formed, taking into account their international characteristics, competitive advantages are determined. The identification of a manager in the VCC is decisive, since it establishes the proportions of value added between entities, creates competitive advantages and the productivity of their activities. By performance here is meant the ability of the subject to create value added, which is not redistributed to other participants in the chain.

The process of formation of the VCC is completed with the selection of activities with the highest value added, as well as network participants that have favorable trade, investment, tax policies, a regulated labor market, intellectual property, and other specific elements. Their systematization will allow further to pass to an estimation of quality of the added cost and to a final choice of the preferred variant.

Cooperation with the ATR countries can serve as a basis for the formation of cross-border VCCs in various areas. The transit potential of Russian regions contributes to the modernization and development of transport and logistics infrastructure (seaports, reloading terminals, airports).

Participation in the VCC should be thoroughly elaborated from various sides, all pros and cons are weighed, cluster policy tools are used to reduce risks and guarantee additional forms of support. Implementation in the VCC should be accompanied by a change in the emphasis in the trade and investment policies of the member countries.

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INVESTMENT'S OPPORTUNITIES AND RISKS OF SIBERIAN REGIONS IN ECONOMIC SPACE OF NEW SILK ROAD

The recent problem of Russian regions in the modern conditions still is the encouragement of investments in the capital stock. Despite the fact of activation government investment's policy in the last few years, implemented mechanisms did not bring the effective result yet. Taking into account world economy' external challenges it is the government, which should be an initiator of development and implementation of activation investments operation mechanisms, which consist of market mechanism and government assistance that allow accumulate and divert available resources to strategic importance economic sector.

In the frame of annual presidential address to the federal assembly of Russian Federation on December 2013, the development of Siberia and Russian Far East was outlined as "national priority during the XXI century". According to the Russian Academy of Science estimates during the period till the 2030 year it is needed to invest 570 billion US dollars including government' investments in systemic programs and projects to provide accelerated development of Russian Far East and Siberia. Furthermore, the necessity of key investment's partners' diversification which invest in the economy of Siberian regions was noticed.

European sub-federal units are still the most attractive for foreign capital. However, harsh weather conditions and vast geographical distance make Siberian and Far Eastern regions less foreign investment attractive.

One of the determinative targets for investors is special investments ranking. The Investment attractiveness of regions ranking' made by Rating Agency "Expert RA" is the most popular in Russia. In the last few years, the results of the ranking show a regular decline of Siberian regions positions. A fraction of Siberian regions in Russian investment potential consistently diminishes as the investment potential migrates to West. Regarding the results 2010-2017 years, 3 of 12 Siberian regions are characterized by high and extremely high investment risk (25 %). None of the Siberian regions attained the sub-federal units' group with high investment rating.

Main factors that determine the high level of investment risk of the most Siberian regions are lack of developed infrastructure, high transportation cost due to geographical farness from major consumption centers of output, harsh weather conditions, and hostile terrain, hard environmental situation, high criminogenic level.

A characteristic feature of Siberian regions is a low level of infrastructure development. Since 2005 Siberian regions have not changed the positions in the aspect of the infrastructural component in investment potential. Due to the fact of underlined disproportion in the investment sphere, the Siberian regions have less opportunity in promotion to the higher level of investment attractiveness. In the current conditions, the main aim of Siberian regions is finding the own way out of a current state all without the help of federal government investments or waiting for the start of new strategic infrastructure projects, which are initiated by federal center.

In its turn, the strategy "change to East" started from 2014 in Russian Federation creates the potential opportunity for Siberian and Far East regions to be inlined in the system of fast-growing Asian market's external economic relations with People's Republic of China (PRC) which is the certain leader. The PRC global infrastructural project determines the future development of a huge Asia' common economic area, it was announced in 2013 as "One Belt and One Road". In the frame of the project, there are two transport corridors to be created: "Silk Road Economic

Belt", which is aimed to develop the trade at land domains and "The 21st Century Maritime Silk Road". Whereas the maritime road is going to be built far from Russian borders and traditional attractive zones, the overland route is planned to be realized through the former Soviet republics' territories, the Central Asia countries.

The project gives the unique chance for countries and regions to intensified and modernize economy through the participation in the global united transportation-trade network. However preliminarily the only railway spur is mentioned in the European part of Russian Federation. Whereby, the south of Krasnoyarsk region is the closest part of Russian border to the key station (Urumtsi) of the overland transportation corridor. Consequently, the main component of participatory Russian-Chinese development future program in the field of Silk Road economic belt with the openness to Asian markets should be the Siberian regions including [1].

The global infrastructural project near the border of Siberian regions presents the unique possibility and obliges to realize the attempt for involving the Siberian regions into the global transportation-trade Asian network. The regional significance policy paper should be the motive to start the process of Siberian region involving to the system of economic and infrastructural networks of New Silk Road. In its turn, the accumulated systemic problems which are significantly constraining the economic development provide the need to change the baseline of regional investment policy. As can be seen from the above, the Siberian regions' governmental authorities need to overview the regional level' strategic policy papers with the aim of including the specific steps forwarded on developing Asian economies investments' activation and stimulation in the frame of involving the territories in the global infrastructural megaproject "One Belt and One Road".

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NON-FINANCIAL CORPORATIONS (NFC) DEBT IN EMERGING MARKET ECONOMIES (EME): TRENDS, DRIVERS, RISKS AND COUNTERMEASURES

The rapidity of the rise in EME corporate debt to now significant levels has raised concerns about the risk this debt poses for EME countries and the global economy[1]. In addition, the normalization of the monetary policy in G4 indicates that global financial environment is gradually tightening. Such developments could put further pressure on EME corporates, especially those that have issued dollar-denominated debt, and potentially trigger broader financial stress. Therefore, the policymakers of EME should pay attention to this phenomenon and actively seek ways to reduce the leverage of the NFC to prevent the occurrence of debt risks and systemic risks. To achieve this goal, it is requires knowing more about the state of emerging market corporatedebt, the drivers of debt accumulation, and the effects of both on the macroeconomy.

THE CURRENT STATE OF THE DEBT PROBLEM OF NON-FINANCIAL CORPORATE SECTORS IN EMES

There was a rapid credit expansion in emerging-market countries in the aftermath of the Global Financial Crisis (GFC), especially after 2011.In 2013 and 2015, the leverage ratio of non-financial corporate sector in EME exceeded developed countries and the average leverage ratio of 98 percent (weighted by national GDP) on the eve of the Asian financial crisis (AFC) respectively[2].

1. The styled facts of NFC leverage in EME

(1) The facts in different countries

In the aftermath of the GFC, EME were characterized by increases incorporate borrowing.There is, however, substantial heterogeneity across emerging market countries. Consider risky debt might be better capture the EME corporate vulnerabilities, we next use firm-level data (Osiris database) to quantify the amount of debt which is at risk, andprovide a more granular assessment of vulnerabilities across countries.For a given country, wemeasure the share of risky debt as the debt of firms with ICRs less than 2 (Pomerleano, 1998), divided by the totaldebt of firms in our sample.The results showed thatthe share of risky NFC debt inBrazil, Argentina, Chile and India in 2016 is higher than the average of in the crisis countries on the eve of the AFC (48 %). Especially, the proportion of the riskyNFC debt in Argentina and Brazil was more than 80 % in 2016.

(2) The facts in different industries

According to the global industry classification standard (GICS), we divided all sample corporates into ten industries (excluding financial industry). We found that the leverage ratio of most industries in post-crisis (2011–2016) is not significantly higher than pre-crisis (2002–2007), even lowerin some industries.But the share of risky NFC debt in most industries, in

[1] Emerging market countries include: Argentina, Brazil, Chile, China, Colombia, Czech, Hungary, India, Indonesia, Israel, South Korea, Malaysia, Mexico, Poland, Russia, Saudi Arabia, Singapore, South Africa, Thailand and Turkey. Reference to: https://www.bis.org/statistics/totcredit/credpriv_doc.pdf

[2] Based on data availability, the crisis countries selected here include: South Korea, Hong Kong, Singapore and Thailand.

addition to theconsumer discretionary, information technology and real estate, has a significant rise in post-crisis. In particular, the share of risky debt in utilities, energy, telecommunication services, industrials, is increased by 50, 37, 25 and 37 % respectively.

2. Changes in the composition of NFC debt in EME

While bank lending is still the largest component of corporate debt in EME, the share of debt financing has also increased rapidly.According to the BIS statistic, outstanding debt issued by non-financial corporate sectors in emerging markets rose from $360bn in 2008 (30 percent of outstanding debt in all sectors) to $1,100bn in 2015 (50 percent of outstanding debt in all sectors).Issuances by non-financial corporations were particularly important in Asiaand Latin America. At the same time, the external debt of non-financial corporates sectors in EME also increased significantly during the same period, from $180.7 billion in 2007 to $529.5billion in 2016, which increase about 193 %. And the Dollar-denominated external debt accounts for about 90 percent of the total external debt of the non-financial corporate sector in EME.The external debt of the non-financial corporate sector in Latin America is significantly higher than that of the other three regions in both scale and growth.

THE CAUSE OF THE DEBT PROBLEM IN THE NON-FINANCIAL CORPORATE SECTOR IN EMERGING MARKET COUNTRIES

1. Domestic factors

Relatively higher GDP growth than developedcountries partly maintains the corporate'sinvestment willingness and opportunities in emerging markets, especially the domestic corporates. However, the declining profitability of the corporates in emerging markets makes it difficult for corporates to meet the capital needs of expanding investment or maintain normal operation through internal financing.The relatively underdeveloped stock markets in emerging markets further limit the scale of equity financing, which makes it easier for corporates to become more dependent on debt financing. In addition, the expansionary monetary and fiscal policies adopted by emerging market countries in post-crisis, as well as the investment- dominant economic growth model, are also one of the reasons for the high leverage of the non-financial corporate sector in emerging markets.

2. Global factors

The implementation of quantitative easing policy in G4 can enable emerging market corporates to debt financing with lower financing costs and more opportunities, which could increase the leverage ratio of NFCs in emerging market countries. First, this could provide a better opportunity for non-financial corporates to have access to the international bond market by reduce the risk premium of EME corporate bonds and entry capital cost.And, in the context of emerging market currencies appreciation and low exchange rate volatility, arbitrage incentive are also increase international bond issuance of non-financial corporates in emerging market countries（Bruno and Shin, 2017. Second, quantitative easing monetary policy in G4 can promote leverage growth of the corporates in EME by relaxing borrowing constraintsthrough severalinterrelated channels. It should also be noted that the impact of G4 monetary policy on emerging market countries will vary with the country characteristics of emerging market countries.

THE DEBT RISK OF NON-FINANCIAL CORPORATE SECTORS IN EMES

1. The impact of high debt ratio of corporates on economic and financial stability

(1) Reducing investment and curbing economic growth.

Excessive corporate leverage will increase corporate default risk and increase corporate financing costs. External financing constraints will have a significant negative impact on corporate investment through financial friction channels (Tan and Zhang, 2018). Gebauer et al. (2017) used European enterprise data research to show that after the global financial crisis, companies with a leverage ratio of 30 % will invest 1.4 % more per year than companies with a

leverage ratio of 60 %, and 2.4 % more than companies with a leverage ratio of 80 %. In terms of the impact on economic growth, it is generally believed that the relationship between the leverage ratio of non-financial corporate sectors and economic growth is "non-linear", the so-called "inverted U-shaped" relationship. When the leverage ratio of a government and a non-financial enterprise sector is at a relatively high level, the negative impact of the continued increase in leverage of the corporate sector on the economy will be more pronounced.

(2) Increasing economic volatility and triggering banking crisis

When the leverage ratio of an enterprise is too high, once an external shock occurs, it is easy to trigger a "debt-deflation" spiral effect, causing economic fluctuations. Declining corporate profitability and asset prices can lead to a significant increase in the likelihood of companies being unable to pay their debts and bankruptcy. A large number of debt defaults and bankruptcies will directly lead to an increase in the non-performing loan ratio of the banking system in emerging market countries, resulting in an increase in systemic risks. In addition, if non-performing loans in emerging markets increase, the willingness of international banks to lend to emerging market banks and businesses will decrease. At the same time, as the US dollar strengthens, it is more difficult to expand hard currency debts. Non-financial companies in emerging markets are beginning to withdraw funds from domestic accounts, which in turn will cause many emerging market banks to encounter foreign exchange financing risks.

(3) Deepening economic recession and delaying economic recovery

Excessive leverage in the corporate sector will limit the government's ability to regulate macroeconomics through monetary and fiscal policies. Due to the immature development of the financial system and the unsmooth transmission of interest rates, the effectiveness of monetary policy in emerging market countries is much lower than that of developed countries. Excessive leverage can limit the ability of the corporate sector to finance debt as interest rates fall or credit supply increases, further weakening the effectiveness of monetary policy in emerging market countries. At the same time, due to the existence of the "crowding out effect", the increase in the debt scale of the government sector will increase the debt financing costs of or squeeze out investment projects in the private sector, which will eventually lead to a reduction in private sector investment. This "crowding out effect" is more pronounced in emerging market countries with insufficient credit supply, immature capital markets and high corporate credit and equity financing conversion costs (Demirci et. al, 2017).

2. Emerging Markets Corporate Fragility

We compared corporate financial fragility indicators of EME in 2017 with the same indicators of five crisis countries on the eve of AFC[1].The reason for choosing the AFC as the benchmark is that theunderlying microeconomic roots attributed to the AFC include corporate debt vulnerabilities.The crisis was accompanied by widespread corporatefailures due to adverse balance sheet effects via currency and maturity mismatches at the firmlevel.

(1) liquidity risk: The proportion of liquid liabilities to total liabilities is used to measure the liquidity risk of corporates. The higher the index, the higher the short-term liquidity risk of corporates.Except for India and China, liquidity risk in other emerging market countries is not higher than the average level of crisis countries in the eve of the Asian financial crisis.

(2) Solvency: Generally, the higher the coverage ratio, the better the ability of the firm to fulfill itsdebt obligations.Based on data availability, we use a modified version of thecoverage ratio that is the ratio of EBITDA to total liabilities.While this ratiowill be biased downward, it provides a useful snapshot of a firm's solvency position.We found that the EME coverage ratios (12.5 %) in 2017 is significant below the average coverage ratio (23 %)of the five crisis countries on the eve of the AFC.

(3) Profitability.The ROA is used to measure the profitability of corporates in EME. The higher the index, the higher the profitability of corporates.The results showed that the ROA of non-financial companies in emerging markets fell from 11 % in 2007 to 5 % in 2017, which is

[1] The crisis countries include: Indonesia, Malaysia, the Philippines, South Korea and Thailand

much lower than the average ROA of the five crisis countries on the eve of AFC. This means that even if the scale of non-financial corporate debt in emerging markets remains unchanged, deterioratingprofitability will make it more difficult for corporate to repay existing debt by gradually eroding their solvency.

(4) Z-score.A modified version of Altman's Z-score(Altman, 2005) is used to be as a composite summary statistic for corporate fragility.The Z-score of non-financial corporates in emerging market countries dropped to 5.46 in 2017, that is, the financial vulnerability of corporates has fallen into the "grey area", with a high probability of bankruptcy.In particular, the Z-score of corporates in Argentina, India and the Philippines has fallen into the "crisis area" in 2017, which is only 3.24, 1.52 and 0.52 respectively.If the Z-score proposed by Altman (2005) can be used as a leading indicator of corporate financial distress, the results indicates that the corporates have relatively high bankruptcy probability and debt risk in most emerging market countries.

POLICY IMPLICATIONS

For the emerging markets, some measures could be taken now toreduce or stabilize the NFC leverage. Firstly, strengthen macro-prudential regulation system, and ensure the stability of the financial system in EME. Secondly, the EME could transfer non-financial corporate leverage into other economy sector, which could relieve the pressure of corporate debt repayment in the short term.Third, developing institutional system and capital market, and establish a better operating environment for corporates as soon as possible. Fourth, implement a reasonable mix of policy tools to reduce negative external shocks.

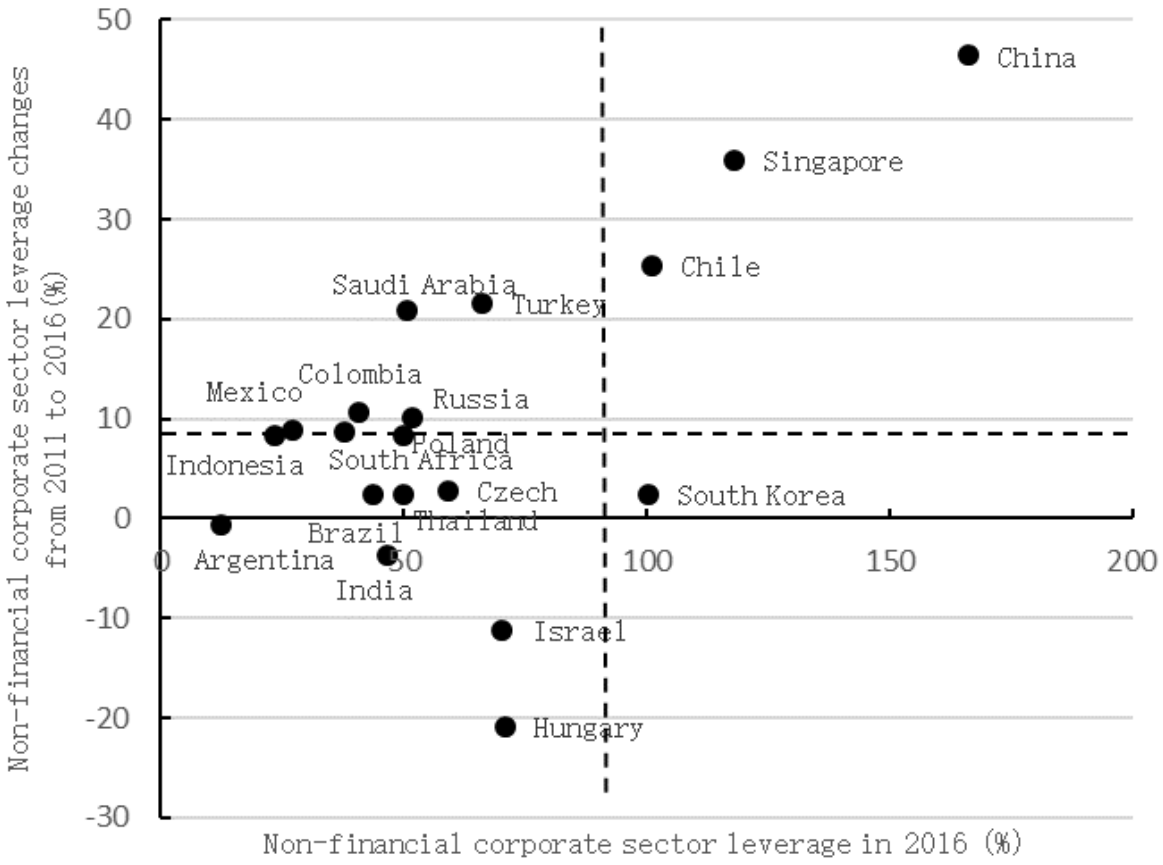

Fig. 1. Leverage of non-financial corporate sectors in emerging market countries
Data source: BIS, the authors calculate

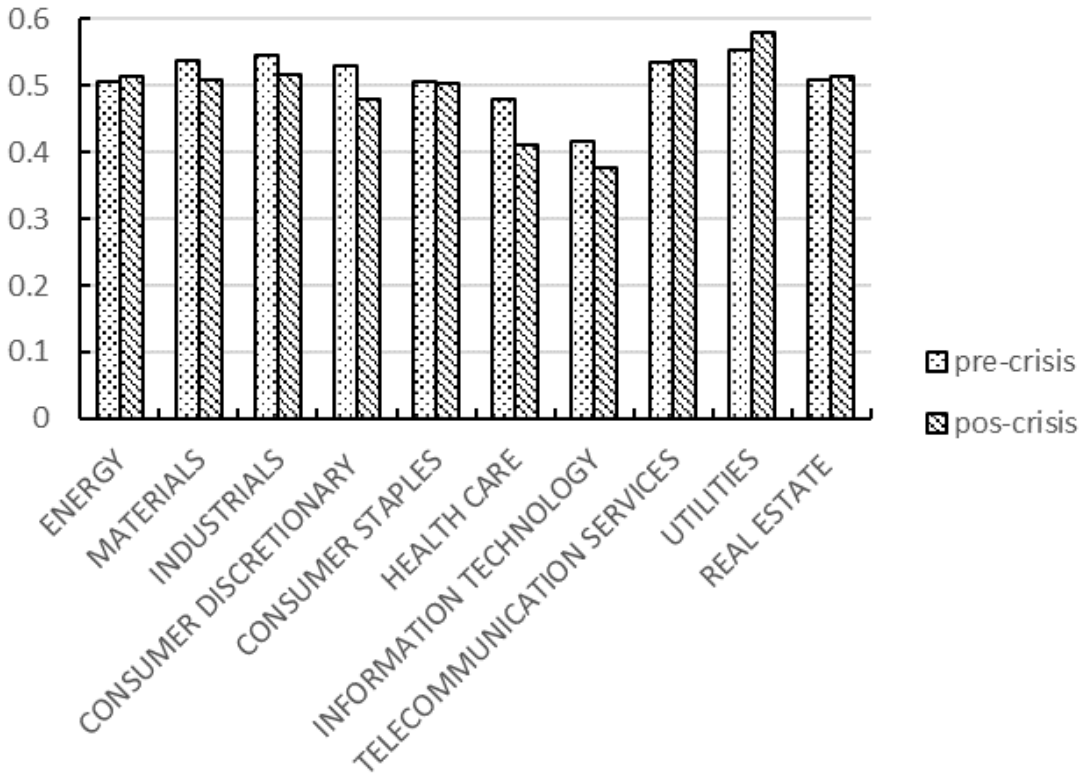

Fig. 2. Leverage of various industries in emerging market countries
Data source: Osiris Database, calculation by authors

Note: pre-crisis refers to 2002–2007; Post-crisis refers to 2011–2016.

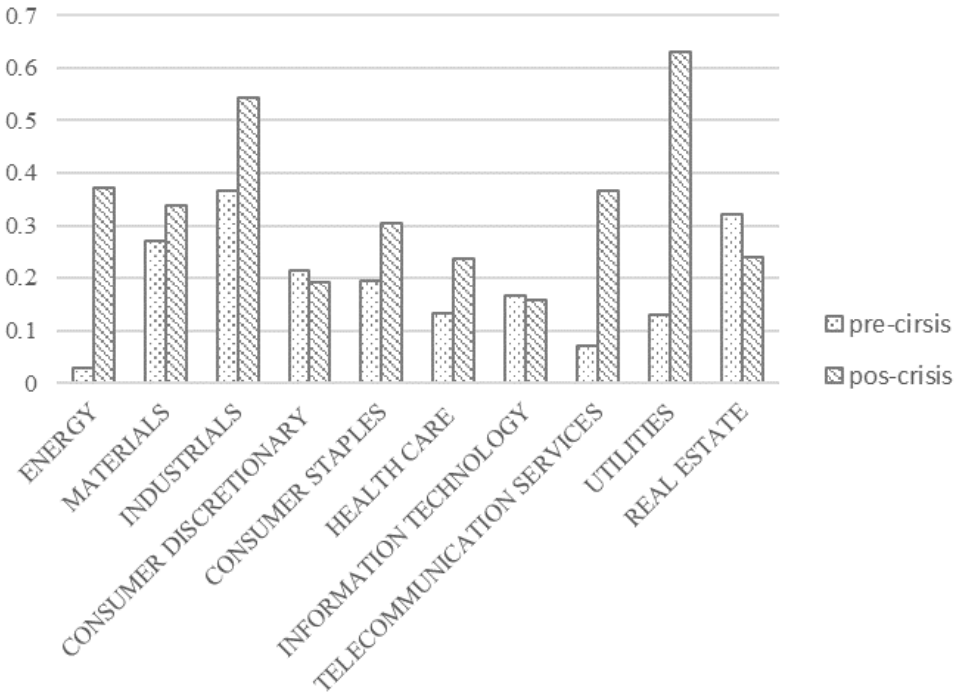

Fig. 3. Risk debt ratio of various industries in emerging market countries
Data source: Osiris Database, calculation by authors

Note: pre-crisis refers to 2002–2007; Post-crisis refers to 2011–2016.

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RESULTS OF JOINT RUSSIAN-CHINESE RESEARCH ON FORECAST OF EARTHQUAKE (2011–2017)

Complex geological and geophysical information of geodynamic monitoring serves as a basis for analysis and assessment of changes in the stress-strain state of the earthquakes preceding strong earthquakes, and for monthly assessment of the degree of seismic hazard in the territories of the North Caucasus, Altai-Sayansky, Baikal and Far Eastern regions of Russia [1].

The present work summarizes the data of a complex of geological and geophysical methods (gas-hydro-geochemical fields, seismology, NPEMFE, radon emission) at geodynamic polygons in Siberia and the Far East in 2007-2017 to assess the change in the geological environment stress-strain state and the forecast of seismic events [2–4].

Currently, seismologists mainly adhere to the model of a seismic focus, based on avalanche-unstable cracking. A dilatant model of the seismic focus is developing abroad. Neither model takes into account the phenomenon of resonance, which manifests itself in all physical bodies (including the seismic focus) when the frequencies of the natural oscillations of the system coincide with the compulsory external force. Geodynamic monitoring in various regions of the Russian Federation (Kamchatka Peninsula, Sakhalin Island, Khabarovsk Krai, Altai-Sayanskaya Seismoactive Area) constantly fixes resonances of gravitational tides in the Earth's crust in various geophysical fields (gas-hydro-geochemical fields, seismology, the natural pulsed electromagnetic field of the Earth – NPEMFE, radon emission).

Prior to our publications [2–4], examples of recording 14-day resonances of gravitational tides in the scientific literature are unknown. Resonances of gravitational tides are a powerful energy source of various geodynamic processes in the body of the Earth, therefore in 80 % of cases strong earthquakes (M≥6.0) on the globe coincide in time with the calculated resonances of gravitational tides. In the preparation of strong earthquakes (from month to day), characteristic changes occur in the structure of the natural pulsed electromagnetic field of the Earth, which are indicators of earthquakes.

The physical nature of the natural pulsed electromagnetic field of the Earth still causes debate. The founders of the NPEMFE method, based on 30 years of experience in applying the method, published a monograph [5], in which the core role in the formation of the NPEMFE is assigned to the vibrations of the Earth's core. However, this does not explain the existence of the diurnal course, whereas gravitational tides and their resonances explain the features of the diurnal variation and the influence of tidal resonance on the structure of the NPEMFE [3].

For forecasting specific earthquakes, it is necessary to use "regional" features of the NPEMFE structure. In particular, a particular seismic focus at the stage of earthquake preparation will inevitably come into resonance with the driving force. And as we have established, in 80 % of cases, the driving force that causes the resonance of the seismic focus is the resonance energy of the gravitational tides. In 20 % of cases, the resonance of seismic sources is apparently provoked by other energy sources (slow deformation waves that are constantly present in the body of the Earth).

Resonance in seismic sources is accompanied not only by the dumping of the elastic energy of seismic waves, but also by the release of electromagnetic energy, the release of heat, gases, etc. The structure of the natural pulsed electromagnetic field of the Earth correlates steadily with the resonances of gravitational tides, which are triggers of strong earthquakes, respectively, NPEMFE data contains information on seismic sources and the energy processes occurring in them.

Thus, the created monitoring system for dangerous endogenous geological processes is intended for operational control over the change in the stress-strain state of rocks in seismically active zones for the purpose of forecasting strong earthquakes and is an integral part of the state monitoring of the state of subsurface resources. At the same time, monitoring of dangerous endogenous geological processes is included in the federal system of seismic observations and earthquake prediction (FSSO).

Within the framework of this system, variations in the tectonically stressed state of rocks, dynamics of development of processes, properties of rocks are studied; the influence of processes on the environment on the complex of hydrogeological, seismological and deformation indicators. The main objective of this system is to provide a higher level of safety for the population, territories, facilities and reduce damage from the effects of earthquakes and their consequences by creating more effective earthquake prediction systems and integrated targeted mapping of the seismic hazard of the territories at the regional and local levels.

Geodynamic monitoring by a complex of geological and geophysical methods (gas-hydro-geochemical fields, seismology, NPEMFE, radon emission) provides not only an assessment of the change in the geological environment the stress-strain state, but also a medium-term (1-3 months) and short-term (1-10 day) forecast of strong earthquakes with $M \geq 5.0$. The achieved accuracy of the forecasts is in magnitude – $\Delta M \pm 0{,}5$ and in time – $\Delta t \pm$ 1-15 days, as well as in the location of the epicenter – ΔS of the order of 100 km. The low accuracy of determining the location of the epicenters of seismic events is associated with the fundamental impossibility of predicting from the data of seismic catalogs of conjugate magnitudes: magnitudes and positions of the epicenter.

In our opinion, despite the controversial nature of a number of conclusions, this generalization can be used to develop normative and methodological recommendations for the integration of geological and geophysical methods on geodynamic landfills in order to control the stress-strain state of the geological environment and the forecast of strong earthquakes.

Over the past 10 years of cooperation with experts from China, a significant experimental material of geological and geophysical methods used at geodynamic testing grounds has been accumulated. Chinese specialists (Chinese Geological University, Wuhan) created geoelectric equipment DD-108 with a high level of protection against electromagnetic interference and due to this increased the sensitivity of the electrical channel when registering the resistance of rocks.

By means of cooperation with Chinese specialists, at the present time the possibilities of increasing the reliability of the registration of the electrical component of the NPEMFE are being investigated. At the same time in Russia, China and India will be installed 3 stations of the type MGR-01 for the registration of the NPEMFE, Chinese stations DD-108 and Indian recorders.

Joint monitoring of geoelectric and electromagnetic processes in the Earth's crust on a large base (the distance Krasnoyarsk-Wuhan is about 4000 km, Krasnoyarsk-Delhi about 4000 km, Delhi-Wuhan is about 3000 km) will reveal indicators of preparation of strong earthquakes in Central Asia.

The registration of resonances of seismic sources will increase the reliability of the forecast of strong earthquakes from 0.5 to 0.75 and reduce the risks of adverse consequences of earthquakes (deaths, destruction of infrastructure) by 25-30 %. This is the goal of research.

The following results were obtained during the research.

1. The structure and parameters of the instrumental, algorithmic methodological and information support of the Geophysical Field Geomonitoring System are proposed and

substantiated. They allow researchers to solve the problems of geodynamic hazard assessment reliably and in advance in the framework of the polygon studies of the Altai-Sayan seismically active area saturated with especially responsible technogenic objects.

2. Algorithms for isolating and analyzing precursors-structures in seismic monitoring data, monitoring the NPEMFE and radon concentration in groundwater are developed on the basis of adapted algorithmic and software for estimating the parameters of the process of preparing a strong earthquake for a selected focal area. Methods for the analysis of geodynamic monitoring spatial data to improve the reliability of seismic activity estimates for an urbanized area have been developed.

3. Based on the analysis of data from experimental studies and calculations, it is shown that it is necessary to take into account external geophysical factors when performing predictive estimates of the parameters of the expected strong earthquakes. A computational technology for estimating the influence of external geodynamic factors, taking into account the barycenter concept, is developed.

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CLIMATE CHANGE IMPACT ON FORESTRY AND AGRICULTURE: A SYSTEMATIC REVIEW[1]

According to Intergovernmental Panel on Climate Change, the second half of XX century was the warmest in the last millennia and the global surface temperature rose by 0,74 °C from the beginning of the last century. Recent multi-model analysis of IPCC predicts 5°C temperature increase by the end of the XXI century [1].

United Nations Climate Change Conference (COP 21) held in Paris in 2015 proclaimed the global agreement to decrease greenhouse gases emissions by all parties and limiting temperature increase to 2°C or less. 174 countries agreed to reduce emissions of greenhouse gases by 2030 and stop them by 2050. These measures are expected to involve parties in the solution of global warming problem and to accelerate the shift to renewable energy economy. Speaking at the conference, Russian President Vladimir Putin, particularly, made a commitment to achieve a 25–30 % cut of CO_2 emissions by 2030 compared to 1990 [2].

There is an extensive literature devoted to diverse economic effects of global warming. For instance, as the result of the changes in temperature and precipitation conditions, epidemic outbreaks and diseases among people are able to alter economically active population – labor force and GDP level [3]. Climatic changes influence fishery, levels of water and energy consumption, agricultural sector through crop yields and forest economy through volumes of harvested wood and so forth. Moreover, climate-induced extreme events cause significant damage to coastal zones that calls for high financial costs [4].

Dell et al. investigated the impact of climatic variables on economic activity of countries and concluded that rising temperatures slow down economic growth and implicate industrial and agricultural output diminution in low-income southern regions [5]. In addition, this would enhance per capita consumption and costs of living, partially, due to energy demand growth for cooling [6]. In turn, in temperate and high-latitude countries warming climate will shorten heating season and diminish costs for heating services [7]. Hence, climate change contributes to expanding the gap between low-latitude developing countries that are likely to suffer substantial losses and high-latitude developed ones which would gain from warming [8].

Climate change consequences affect social welfare and the environment which serves both habitat and resource base supplying people with vital goods and services, e.g. forest resources. Forest plays an important role as a provider of some essential environmental services in human society. It serves as carbon sink, absorbing CO_2 during photosynthetic process, creates tourist and recreational opportunities and supplies such non-timber products as mushrooms, berries, medicinal plants and so on [9]. But the ability of forests to sustain these services is changing due to the climate change. Nowadays lots of scientists in various fields of knowledge pay attention to the recent climate change and its consequences, namely, the impact of climate change on forests and forestry. Climate change along with its components such as air temperatures, water regime, precipitation, etc. have multilateral effect on forestry. For instance, it is expected that temperature, moisture and carbon concentration increase under thinning activities will boost productivity of stem wood on average by 22–26 % resulting in 12–13 % enhancement of timber yields in boreal forests of Finland [10].

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Gradual rise in temperature and greenhouse gases prolongs growing season of trees enabling development of global timber markets in terms of wood harvests and wood supply. By the way, annual global demand dynamics for industrial wood and biofuel is supposed to be positive as well. According to some estimates, progress in processing techniques will enable to lower prices for biofuel making it more competitive relative to unsustainable fossil fuel. As a result, demand for biofuel is expected to have upward trend over the next 50 years [11; 12].

Nevertheless, climate change is not limited by positive impacts and there is a set of factors leading to deforestation and forest degradation. For instance, devastating storms and shortening of soil frost duration cause windthrow. Meanwhile, prominent temperature rise coupled with low moisture entail droughts making trees (primarily dark coniferous) more susceptible to various insect and disease outbreaks [13]. Boreal forests of North America are mostly damaged by spruce budworm and jack pine budworm [14] and boreal and temperate forests of Siberia and Far East are primarily disturbed by Siberian silkworm [15]. Moreover, drought represents a high-risk of wildfires accompanied by significant emissions of carbon dioxide into the atmosphere, so that forest function as a carbon depositor won't be realized properly [16].

The ability to carry out logging activities depends on such characteristic as technical accessibility of forests. The most part of Siberian boreal forests is situated in the area of bog wet ground, so forest soils are characterized by high moisture there. Hence, wood harvesting activities are carried out in Siberia during winter period with a stable snow cover because wet forests soils prevent logging machinery from moving towards felling sites in frost-free season. Thus, the main reason for the limited accessibility of forests in Russia is the presence of wet forest soils that makes inexpedient and even impossible building of all-season forest roads and using the machinery in frost-free season. Since wood harvesting is available only in winters, then low-cost temporary winter roads are usually built to felling sites. Taking into account current development of forest roads in Russia, it is logically supposed that accessibility of forests in Russia will get worse due to the decreasing duration of the frosty season caused by the rising mean annual air temperature. Eventually, this may result in reducing the volumes of winter final felling. Goltsev and Lopatin in their research aimed at calculation of duration of winter-felling season as well, but Tikhvin District of the Leningrad Oblast of Russia was selected as a study area. The authors didn't consider non-working days in their analysis and carried out data smoothing using simple moving average method and derived downward trend that afterwards was extrapolated to 2099. Their findings showed that the rising temperature would entail shortening of winter-felling season duration by 3-4 days per decade [17].

In fact, there are a number of factors affecting forest industry directly. For example, logging and felling trees are prevented by frequent extreme events so working on forest sites becomes unsafe [18]. Moreover, stepwise air temperature rise may drive permafrost thawing processes and strengthen flood events in springs together with trunks losses that, in fact, will adversely affect the wood-processing industry [19].

Another remarkable impact on forests is a shift of the most vulnerable tree species towards more suitable conditions as an adaptive response to climate change. For instance, there was a prominent westward and northward shift of trees in the eastern United States over the past 30 years that occurred due to changes in moisture regimes of ecosystems caused by the resent climate change [20]. It is considered, that in Central Siberia increase in air temperature will propel shift of the most vulnerable to drought tree species towards tundra with milder climate. At the same time coniferous in the south are expected to be replaced by expanding steppes, resulting in 8-10 % diminution of the total area of light and dark-coniferous by 2080 [21]. As a result, logging activities is thought to shift mainly northward following the trajectory of forest migration [11].

The forest industry effect is partly similar to agricultural sector impact of global warming which is usually different and depends on the farmland location. There is some based on applying the Ricardian model studies exploring the sensitivity of farming to the climate change in specific

locations of the world. For instance, European farms are more vulnerable to the climate then American ones and gain from climate change. Besides, territorial heterogeneity leads to the southern part of the European agriculture suffers losses from rising temperature [22]. Examination of agriculture in West Africa, carried out by Wood and Mendelsohn, shows negative impact of high temperature and precipitation level during hot and rainy season, but positive effect of net revenue increase is observed during cooler and dry season [23]. Application of irrigation system is likely to reduce receptivity of net revenue from high temperature and possible drought in the future, therefore it can serve as preferable option for adaptation to the climate change [24], though Calzadilla et al. consider improvements in agricultural productivity through investments in agricultural research and development seem to be more effective adaptation strategy for South Africa [25]. It is expected, that Asian farmlands contributing nearly two thirds of the global agricultural output will not benefit from climate change and lose 13 % of their income in the 1.5 °C scenario or even 28 % of net revenue in the 3 °C warming scenario. However, the presence of carbon fertilization effect may entail 3 % benefit in the 1.5 °C scenario and 3 °C temperature increase would cause 12 % of damage [26]. In turn, per capita rural income is sorely sensitive to climate change because it is basically formed by net revenue in agriculture, so countries situated in south latitudes and with poor climatic conditions can face rural poverty increase [27].

Despite increase in crop yields due to rare cold waves and prolonged vegetation period in the north part of China for the last 50 years, drop in wheat, rice and corn production is forecasted by 2050. Additional risk for agriculture in the territory is a high evaporation index that limits supplying crops with water. The losses from Insect outbreaks, floods and hail in southern China are likely to exceed model-based estimates [28]. In the north-eastern India where nearly 70 % of workforce is occupied in the agriculture that provides for about 35 % of national GDP observed impacts in forms of frequent floods and persistent droughts, hail and landslides cause severe damage to cultivated lands. Soil erosion and soil fertility losses exacerbate abovementioned risks. One more challenge for agricultural sector in the region of India is pathogens and insect outbreaks. For the most of the workers who make their living from farming pointed changes will worsen the problems of unemployment and poverty [29]. On the contrary, the Russian agriculture is experienced productivity growth in grain production to date, since the last 30 years were favorable for agricultural activities. For the Russian agriculture further climate change may lead to either high crop productivity or output decline owning to droughts and pest attacks [30].

Climate change is a complicated process and still poorly studied. In fact, consequences of climate change for forestry and agriculture are manifold and varied across countries. The given systematic review represents explanation of social and economic effects of the recent climate change and stresses its consequences for agriculture and forestry that are the most vulnerable to climate change. Changes in climatic conditions are accompanied by both positive and negative impacts. On the one hand, rise in mean annual temperature and increased carbon concentration in the atmosphere spur forest productivity and crop yields. On the other hand, climate change entails severe droughts that are a major cause of wildfires and insects and diseases outbreaks. Increased frequency of extreme events, cold and heat waves pose additional hazards to agriculture and forestry. For low-latitude developing economies, which rely on agricultural production, climate change will be detrimental, worsening poverty and hunger. This means that development of adaptation mechanisms to climate change nowadays is of priority importance for forestry and agricultural sectors of economy in both high and low-latitude countries. In other words, further global temperature increase will widen the gap between poor and rich economies, if no proper adaptive measures are undertaken in advance.

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FUNDAMENTALS FOR DEVELOPMENT OF ASSESSMENT PROCEDURES FOR INTRODUCTION OF SMART TECHNOLOGIES IN AGRO-INDUSTRY

The article considers digital technologies ensuring competitiveness and development of agro-industry. The authors found the positive effect of the intensive method of agricultural development, based on the introduction of smart technologies. Examples of successful cooperation of regional agro-companies for products promotion on new markets are given. The authors came to a conclusion that cooperation allows reducing costs of smart technologies introduction in livestock and crop farming production cycles. The analysis is focused on studying barriers for smart technologies implementation in agro-industry and fundamentals for the development of due assessment procedures for introduction of smart technologies in agricultural companies.

Keywords*: Agricultural Economic Zones of "SMART AGRO" type, symbiosis of innovation production, systems of management, life and labor arrangement.*

Modern agro-industrial complex (AIC) is a system of economic sectors including agricultural industry itself and industrial fields dealing with manufacturing products for AIC, transportation, storage, processing of agricultural products and delivery to a customer. The developed agro business determines the structure of Gross Domestic Product (GDP), Gross Regional Product (GRP), economic potential of the country and regions, the level of food security and social and economic guidelines. The Russian Federation plays a significant role on the international agricultural market. The country is strong in production of wheat – we grow 8 % of the world crop and last year we were ranked the first in the world's wheat export [1]. The pork production is also successful- last year Russia has entered the list of TOP-5 world produces. Self-sufficiency in poultry meat has now reached almost 100 %, in beef 65–70 % [2].

Possessing the potential in lands development, Russia increases crops productivity, demonstrating the highest growth rate starting from the year 2000: the yield has increased by almost 60 percent. At the same time, Russia lags far behind the leading economies in a number of indicators: the crops productivity fares worse than the crops productivity of the United States and Germany by 3-4 times, the cost of agricultural products per employee is 22 times lower than in the USA.

These results were obtained mainly by extensive methods. Russia ranks third in the size of agricultural lands. However, she fares worse than the crops productivity not only of Germany and the United States, but also China and India, which compete on the promising markets of emerging economy countries. Emerging markets (Near and Middle East, South and South-Eastern Asia, Central Africa, and countries of Eurasian Economic Union) where the consumer`s purchasing power grows faster than the opportunities for the development of national agro business, should become priority markets. The boundaries for transition to an intensive development are the lack of platforms focused on the introduction of innovations and smart technologies, shortage of qualified experts and low participation of scientific and educational organizations. There are practically non-existent productions for deep processing of agricultural products. The key role in modernization of agriculture is held by smart technologies and Internet of Things. Smart technologies incorporate facilities, farming equipment, technologies with big

data processing within the agricultural production cycle and beyond, providing logistics, storage, delivery to an end-user and utilization.

Table

GDP and the number of employees in agricultural business

Country	Gross value of agricultural products, (in billion dollars)	The share of agricultural products in the country`s GDP, %	Gross value of agricultural products per employee, (in thousand dollars)	The number of employed in agro business *(forestry and fishery)*		The number of employed (million people)
				% of the total employed number	Thousand people	
USA	197	1,1	180	0,7	1 010	157
Germany	20	0,6	28	1,6	720	45
Russia	**61**	**4,6**	**8**	**9,4**	**7198**	**77**
China	977	8,9	3	33,6	337344	1 004
India	355	17,0	1	49,0	245 882	502

Steady decline of crop yield and agricultural productivity due to expiration of the long-term effects of the "green revolution" of 1960 – 1980ies, requires the widespread introduction of new technological solutions (biotechnologies, precision agriculture, robotic application, compositional fertilizers, integrated bio defense, resource-efficient local agriculture, etc.). During the second half of the XXth century, the "green revolution" (switching to high yielders and chemurgy) has resulted in tripling of crops productivity. However, over the last years modernization paces of global agriculture have slowed down. In this context strengthening the role of fundamental and applied science, without which no further increase in productivity is possible, becomes of key importance [4].

For AIC of Krasnoyarsk Krai the global technological challenge causes risks of negative effects from technological inferiority and poor logistics of agricultural industry. Due to that, the development of a list of modern and promising smart technologies applicable for Krasnoyarsk Krai, stimulating technologies of precision and robotic agriculture, development of spin-offs and start-ups in scientific institutions and universities are required. IT market of agricultural industry currently amounts to about 360 billion rubles. By 2026 it should grow at least fivefold, including through the support of agro start-ups.

Among the objectives of digital transformation of agriculture are: growth of contribution to economy in 2024 up to 8,9 trillion rubles and increase of export revenue by 2025 up to 45 billion dollars; creating, dispatching and aggregation of data flows for designing end-to-end chains from manufacturing agricultural products to their consumption with deep integration into related sectors of the digital economy as a tool to increase labor productivity in agriculture and maximize the profits of agro enterprises. Improving the efficiency of agricultural production, reducing production cost, formation of new knowledge-intensive productions, hiring employees having new professions, rising incomes in rural areas and increasing export of agricultural products- are the goals of smart technologies in agricultural industry. Russia possesses a significant reserve of increasing effectiveness of agricultural production (in 3-5 times) and a potential of increasing industry turnover via introduction of digital processes and technologies in livestock and crops farming, increasing workforce productivity and the full use of capabilities of modern digital platforms to ensure management at the macro and local levels of production [5].

Introduction of smart technologies in agro business allows monitoring the full cycle of livestock and crop farming by smart devices, which transmit and process the parameters of the object and its environment (equipment and sensors that measure the parameters of the soil, plants, microclimate, animal characteristics, etc.), and also the external and internal communication

channels. For example, the most promising application of smart technologies today are systems of precise fertilization, irrigation and spraying, precise planting, and the use of small remote-pilot vehicles. In a long-term perspective the role of cognitive technologies in agriculture will increase: automation of AIC logistics management, robotic application in production, designing interface of interaction of the operator and robotic systems. Modern economy management is non-competitive without using digital technologies.

Introduction of technologies involves the following types of work corresponding to smart agro levels:

1) Data collection (ground and mounted sensors and detectors):

- Monitoring equipment operations: place and time of work, fuel consumption ;
- Collecting environmental data : temperature, humidity level, soil content, insects activity, etc.;
- Collecting data for crop forecasting and detection of diseases (aerial photography with pilotless aerial vehicles (UAV)

2) Platform for sharing and storing data (web service, DBMS and mobile applications):

- Sensors and detectors info;
- Satellite images, UAV images;
- Historical data on yields (including the effects of chemicals, etc.);
- Electronic document flow (standard forms).

3) Controlling subsystems that perform (semi-) automatic input control in case a due command is received by peripheral components of the system, such as: irrigation sensors, radio-controlled tractors and seeders, UAVs which spray chemicals or carry out aerial photography to assess the level of vegetation, temperature and humidity regulators in greenhouses, etc.

4) Analytical decision support systems:

- Yields forecasting etc.;
- Automatic selection and classification of agriculture products, delivery;
- Forecasting financial performance of an enterprise including for the purposes of insurance companies and banks

5) Market place (agricultural products).

The following fields and leading companies are the instruments of added value – methods and technologies of smart agro in Krasnoyarsk Krai:

Delivery management including logistics market promotion of new products, quality assurance:

- Logistics (optimization of lot size, centralized purchase of fertilizers, etc. controlled storage etc.)
- Market promotion of new products (RCI Biotech services, finding due financial instruments, staff training etc.);
- Quality assurance (tools for on-line diagnostics, supporting crop seeds, accounting systems)

Such technologies are being introduced by such companies as *"Agrovizor" LLC* – Electronic trading and purchasing platform for the agro industrial complex and *JSC "Dary Malinovki"* – the development of the logistics center for agricultural products in Krasnoyarsk Krai; "Invest Engineering" LLC – ozone treatment as a tool for reducing losses while storing agricultural products; *dairy and beef factories* – automation and robotic application in agriculture. NIR analyzers and creation of a system for monitoring the composition of feed staff in farms.

- Smart farm:
- Monitoring of production means (systems for diagnostics of the state of plants and animals, accounting systems, etc.);
- Technologies for adaptive feeding of animals considering their individual characteristics and monitoring the real-time body state to ensure an effective management of nutrient bioconversion;

- Collection of large amounts of data on the state of agricultural plants and animals in real time, based on sensor networks and fast low-energy transmission;
- Deep processing (introduction of domestic technologies, deep processing of wheat);
- Labor efficiency and safety (remote control, automation of operations, expert systems).

For example, the leading positions in development of processing technologies in Krasnoyarsk Krai are taken by scientific teams FSBEI of Higher Education "KrasGAU" – Technologies for deep processing of cereal grains for obtaining products of high nutritional value.

- Precision Agriculture :
- Forecasting production volumes (forecasting yields based on historical data, remote sensing data of Earth, weather conditions, etc.);
- Technology of accurate irrigation and plants watering , considering the real level of humidity and its compliance with the requirements, allowing selection of irrigation mode to minimize water consumption
- Technology of high-pressure irrigation systems; drip and underground irrigation;
- Technology of locally differentiated fertilization and plant protection with the real time automatic adjustment of parameters

For example, precision agriculture in Krasnoyarsk Krai is being developed and implemented in cooperation with Universities: FSAU HE "SibFU", FSBSI Federal Research Center Krasnoyarsk Scientific Center of Siberian Branch of Russian Academy of Science, FSBE of HE SIBSU by such companies as "Ar Di Sains" LLC – analysis of data in the agro-industrial complex, the possibilities of yield increasing; space agro monitoring: the possibility of using methods of the Earth remote sensing to assess the status and the use of agricultural lands.

Business-models, dominating in agro industrial companies impede the introduction of smart technologies and their effects are as follows:

1. The existing market mechanisms for land-use are imperfect

2. There is the lack of large holding companies, enterprises integrating to AIC and related industries (engineering, fertilizer and agrochemicals, biotechnology, genetics and seed production, ICT services for precision agriculture, flexible high-tech facilities, and integrated logistics infrastructure).

3. There are no systems for integrated monitoring of origin, quality and biological safety of agricultural raw materials and products throughout the whole delivery chain, including the subsidiary farms.

In our opinion, one of the most effective tools to ensure the introduction of smart technologies in the production cycle of crop or livestock farming can be a cooperation of agro industrial productions and companies which introduce or aimed at introducing smart-technologies and technologies of Internet of Things. Cooperation provided introduction of smart-technologies for companies and AIC will ensure a competitiveness, the possibility of entering new markets and product differentiation. Companies and countries, which are able to suggest the unified standards and decisions integrating the best existing practices in the field of digital agro technologies and solve selection problem and associated risks, will become leaders in agro digitalization.

According to the research results of Accenture, one of the leading consulting companies in innovations, the possible solution of global agro industry digitalization lies in the field of designing integrated cloud services. An accelerated implementation of the unified national cloud service for the Russian AIC and its pilot testing on Smart Agro sites is an effective way to use the organizational advantages of the Russian model of agricultural development

Such institutional solutions already exist in Krasnoyarsk Krai and they are connected with clustering small producers around large enterprises. Such small produces are incorporated in production processes of a big a partner on a mutually beneficial basis (for example, in recycling of wastes and by- products). Examples of such successful cooperation in the format of holding companies and associations in Krasnoyarsk Krai can be demonstrated by Agroyarsk, Dary Malinovki, Sayanmoloko, Selo Rodnoye, Enisey Standard and the others.

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BASES AND CONDITIONS OF FOREIGN SPECIALISTS TRAINING IN DIGITAL ECONOMICS AT PACIFIC NATIONAL UNIVERSITY

The urgent character and the necessity of training specialists, including foreign ones, in the field of digital economics do not require any special substantiation and proves, the issues of digital economics development are in the agenda of the President and the government of the Russian Federation. [1; 3]. Transformation and development of economic systems and primarily national economies of any countries are determined by general trends of globalization and formation of a new economy. Digital economics is an integral part of the new economy and is often considered as a form of the new economy manifestation. [2, p. 177].

To understand basic methodological grounds for forming the system of specialists training in digital economics it is necessary to present brief information on the common factors for the development of the new economy and its basic form – digital economics. According to the analysis of specialized literature the contemporary researchers note over ten distinctive features, common factors and rules of digital economics functioning and therefore running business in these terms. These common factors and rules give grounds for modernization of the educational system in two aspects: in technological and social-economic. Nearly all definitions of digital economics have digital technologies and social-economic manifestations in modern society. Let us consider the basic common features of the development of digital economics as a form of the new economy's evolution.

1. The principle of "disappearance" of the material component and its substitution by the "non-material" one: human capital assets, ideas, knowledge, artificial intelligence, software, etc.

2. The principle of space "compression" and decrease of a distance importance in digital economics globalization. It is the most significant principle of modern economy. The digital economics globality unites manufacturers, consumers and business rivals regardless of their geographical location.

3. The principle of time "compression" means the acceleration of all economic relations, changes and managerial decision-making. In terms of quick links in social production time becomes both a great advantage and responsibility.

4. The principle of "smart" organization and management is no less important in digital economics. The human capital, people, knowledge, ideas and artificial intelligence are the main value of the digital economics.

5. The principle of "network" growth and development in terms of the digital economics is connected with special "viral" character of communications due to electronic network.

6. The principle of value of technological platforms (including digital forms) and standards is determined by quick distribution of successful individual decisions, which later become a basis of a large scale production that provides the capture of a greater part of the market.

7. The principle of the "efficiency" of work with information directs the participants (subjects) of the digital economics to the arrangement of large amount of information. All participants need the information "filtration" to single out the most important and useful information in every particular case.

8. The principle of market "virtuality" makes the physical appearance and presence at the market unnecessary. The comparison of prices and competitive advantages of goods can be made without visiting shopping centers. Special programs can search goods with optimal price-quality ratio. The physical barriers in competition disappear.

9. The principle of changes in cost structure of the digital economics is very significant. The informational component in good's value becomes larger and the material one becomes smaller. The operation and consumption of advanced technology products is cheaper per useful effect unit for a consumer and gives greater satisfaction and admiration.

10. The principle of "impulse" motivation means that the choice and purchase of a product due to Internet are often made impulsively as a single and immediate process.

11. The principle of digital economics "internationalization" can be interpreted on the one hand as a manifestation of international labor differentiation, and on the other hand as development (globalization) of the world economic relations. Due to digital technologies the globalization of economy will remove the barriers and restrictions on products manufacturing and consumption. The international standardization and human capital migration also stimulate the internationalization of the digital economics.

Pacific National University (PNU) has all conditions for high quality training of students, it actively develops international cooperation. PNU has developed and implements the Internationalization Program of the university up to 2020. In 2017 national rating of universities PNU has the 50th position in the "internationalization" parameter. At present the university has 173 agreements with foreign universities, mostly from Asia-Pacific countries: the People's Republic of China, the Republic of Korea, and Japan.

In 2016/2017 academic year 874 international students from 21 countries studied at PNU, among them 771 students studied the degree programs, 103 students – the additional educational programs. The percentage of international students in total number of PNU students was 8.73 %.

PNU is a member of the following international university associations and organizations: the Association of Sino-Russian Technical Universities from 2011, the Association of Universities of Russian Far East and Siberia and Northeastern Regions of China from 2012, the University of Shanghai Cooperation Organization from 2012, the Association of Asian Universities from 2013, The Association of Russian-Chinese Economic Universities from 2013, Russian-Kyrgyz Consortium of Technical Universities from 2013, Eurasian Association of Universities from 2009, the Association of Russian-Japanese Universities from 2016.

The university regularly realizes large international projects, such as the International Forum of University Rectors of Russian Far East and Siberia and Northeastern Regions of China, the International Student Forum of Russian and Chinese Universities "The Youth of Russia and China: a Vector to the Future", the International Russian-Chinese Volunteer Camp "The Flowers of Memory", Russian-Chinese Business Incubator, the International Forum in Architecture, Design and City-Planning "New Ideas of the New Century", Far Eastern Student Sport Festival "New Generation", summer schools to study the Russian language and culture.

At present PNU implements joint educational programs (double diploma and single diploma) with universities from China and France, as well as academic exchange programs with universities from the Republic of Korea, China, and Japan.

Thus, it should be noted that the basic component in training specialists in digital economics has to rely on two groups of competences: technical and socio-economic. The first group of competences supposes substantial training in technological set of disciplines, the second – in economic-managerial and social competences. We think the training of highly qualified specialists in this sphere requires the application of engineering-economic approach to education, the construction of specialist's degree program basing on the balance of digital technological competences and digital economics competences as a whole.

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INDUSTRIAL AND INVESTMENT POTENTIAL OF PRIMORSKY KRAI IN TERMS OF APEC COUNTRIES INTEGRATION

Economic activity in Primorsky Krai, as in the whole Far East, has always been national issue, and therefore there is certain mechanisms aimed to support that territory: tariff regulation, public investment, management of migration inflows.

The basic sector of the entire Primorsky Krai could be the integrated development of logistic service. At the same time, it should be paid attention to lack of competitiveness on macro-regional scale, such as poor performance of local ports, the technological complexity of the Trans-Siberian railway, which is considered as the most important way to connect the West with the East, the underdeveloped system of automobile roads, and low level of logistics infrastructure's development.

To obtain integral, systematic description of the development of the Primorsky Krai, we will first analyze the gross regional product (see Fig. 1).

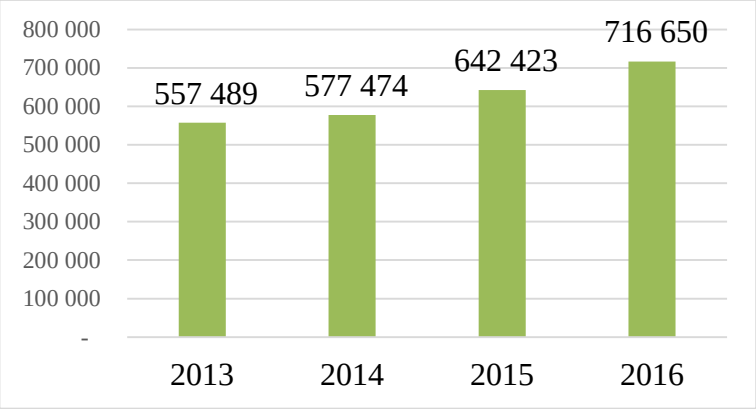

Fig. 1. The gross regional product of Primorsky Krai in mln. RUB over 201322016.
Source: [Official website of the State Statistics of the Primorsky Krai]

Figure 1 demonstrates that the gross regional product of Primorsky Krai in the analyzed period has increased very insignificantly over the years. For four years, the overall increase in the indicator was only 22.21 %.

At the same time, the structure of the regional product remained unchanged for many years. It is presented in Fig. 2, which shows the figures that characterize the volume of activity in the territory for 2017 in certain business activities.

Analysis of the digital data in Fig. 2 allows us to conclude that activities related to logistics are about 25 % of the GRP structure in Primorsky Krai. This is the result of geographically advantageous location of the region. Furthermore, traditionally wholesale and retail trade plays important role in the regional economy, this sector accounts for 19 % of the regional GRP. The manufacturing sector occupies a relatively small share equal to 11 % of GRP.

The results of many fundamental studies indicate that economic renewal and continuous growth are directly dependent on the size and structure of investments, the speed and quality of it's implementation. There are no obvious trends characterizing the investment component of the

regional economy in Primorsky Krai. On the one hand, we can say that various measures are being taken by the government to support investors, on the other hand, there is no sustainable increase in investment. To confirm it, let us consider the volume of investment in fixed assets in the region over the past four years, shown in Fig. 3.

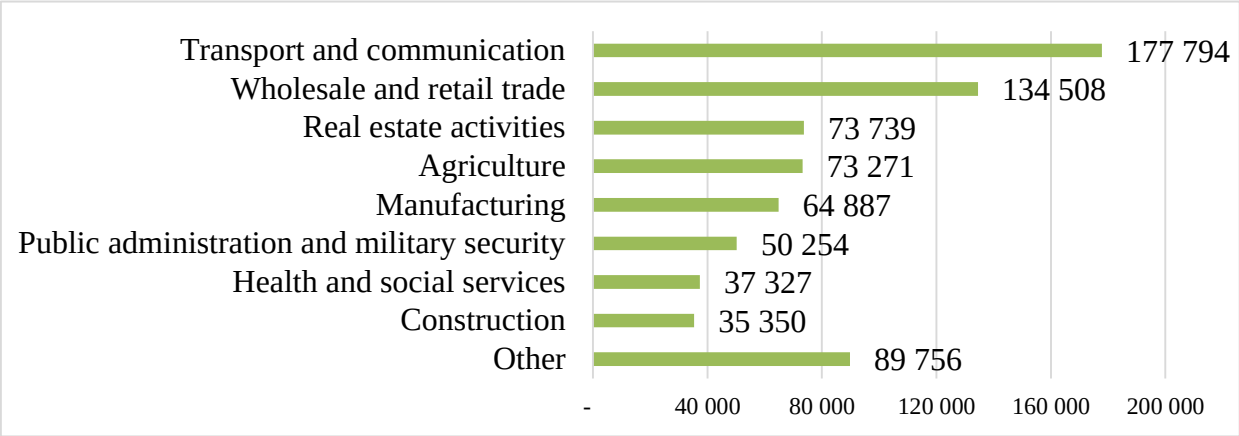

Fig. 2. Gross regional product of Primorsky Krai for 2017 by types of business activity in bln. RUB
Source: [Official website of the State Statistics of the Primorsky Krai]

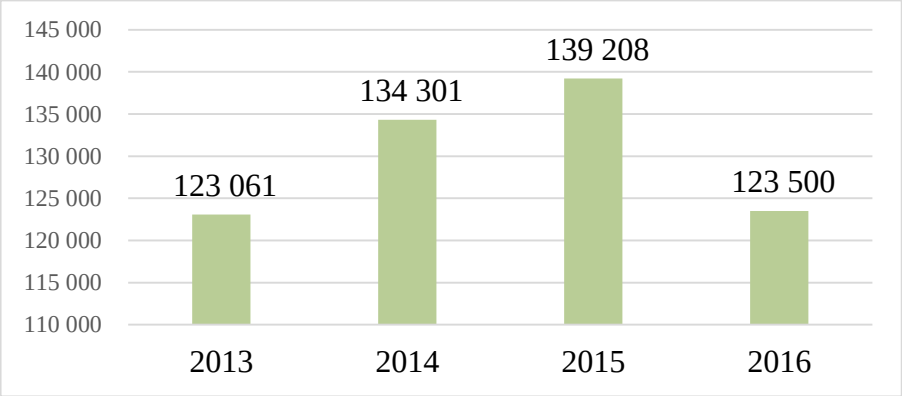

Fig. 3. Dynamics of investment in fixed assets of Primorsky Krai for 2013-2016.
Source: [Official website of the State Statistics of the Primorsky Krai]

The graph in Fig. 3 reflects a dual trend in the investment activity of Primorsky Krai. We see a noticeable increase of investment in fixed assets in the period 2013-2015. In numerical terms, the growth was 11.6%. However, in 2016, compared to 2015, there was a sharp decline in investment volumes by 1.3 times. Investments in 2016 almost equaled the figures for 2013. A significant reduction in investment in 2016 can be explained quite understandable reasons associated with the crisis in the Russian economy. However, few important factors should also be considered. For example: competitiveness of products offered by the enterprises of the region; utilization rate of production capacities and fixed assets; rationality in the use of available resources by enterprises; efficiency and quality of investment projects, which are implemented by enterprises.

Let's consider the investment potential of Primorsky Krai from the point of view of foreign investments in the economy of the region. To understand the interest of foreign investors in the development of the region, we will analyze the dynamics and structure of incoming investments, shown in Table.

Table

Structure of foreign investment in Primorsky Krai by types of investments for 2013–2016

Type of investment	2013		2014		2015		2016	
	USD	%	USD	%	USD	%	USD	%
Direct investments	1,105	65	1,424	75	1,421	75	1,420	76
Other investments (including trade credits)	608	35	478	25	478	25	457	24
Total	1,713	100	1,901	100	1,899	100	1,877	100

Source: [Official website of the State Statistics of the Primorsky Krai]

The figures in Table show a depressing trend of stagnation in the dynamics of the indicator of aggregate volumes of foreign investments in the period from 2013 to 2016, inclusive. For four years, the analyzed indicator increased by only 10.6 %.

At the same time, we should also note here that an analysis of the structure of foreign investments allows us to identify the positive fact that direct investments predominate in the total volume of these investments, which include loans issued by foreign co-owners of local companies.

Analysis of the structure of investment by type of activity points to manufacturing industries have the inconsiderable leading positions on attracting foreign investments in 2016. Other sectors of the region attracted foreign money at times less. For example, the gap from financial activity, which occupies the 2nd position in investment attractiveness, is an impressive magnitude equal to 2.8 times. A high share of the inflow of foreign capital into processing industries can be explained by the fact that this type of activity is the most long-range in the conditions of the development of the regional economy. To date, the largest number of investment projects are being implemented in the industry, which attract foreign investors.

In conclusion, we can say that a favorable investment climate in Primorsky Krai is at the stage of formation. In our opinion, government should play the most important role in this process, creating favorable conditions for doing business. Favorable geographical location creates, undoubtedly, additional advantages for long-term economic development. However, the geography of Primorsky Krai today has a negative impact on its investment potential, characterized by the lack of the necessary basic infrastructure, a weak development of the transport sector.

In the future, Primorsky Krai can become one of the most attractive regions of the Far East for investors from the Asia-Pacific region, given its proximity to the Japanese, Korean and Chinese markets, the availability of iron roads and ice-free ports, the development of shipbuilding and aircraft manufacturing, and other industries.

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ECONOMIC BELT OF THE SILK WAY: PROSPECTS FOR THE FAR EAST OF RUSSIA

In the Strategy for Economic Security of the Russian Federation until 2030, for the first time, it is said about the sovereignty of the Russian economy as a strategic goal. Among the main threats to the Russian economy (from the use of the economic pressure of developed countries to the exhaustion of the raw-material model of the economy), special attention is paid to *"the uneven spatial development of the Russian Federation, the intensification of the differentiation of regions and municipalities in terms of the level and pace of socio-economic development"* [1].

The trend of the world economy in recent decades has been the movement of industry to coastal areas and a large port infrastructure. The direction of development of the Chinese economy over the past 20 years confirms this global trend: China's business activity and industry have moved from the northern and northeastern provinces of the country to the southern provinces along the west coast.

In 2014, the Russian Federation declared the Far Eastern region "a territory of advanced social and economic development" (TOSER) and offers an expansion of cooperation to attract business and investment from China. In 2014, the Russian Federation declared the Far Eastern region "a territory of advanced social and economic development" (TOSER) and offers an expansion of cooperation to attract business and investment from China [2].

The main commodity groups of China's exports to Russia are machinery and equipment, chemical products, which accounted for 45 % of the total. The main commodity groups of Russia's exports to China are mineral fuel, oil, oil products, timber, non-ferrous metals, so the share of natural resources accounts for more than 80 % of the total volume of Russian exports to China. During the period 2014-2016, exports of the Far East to China declined by a value of 29.1 %, while the physical weight of transported products decreased by 2.7 %; similar indicators for imports were 50.7 and 57.8 %, respectively. Based on this statistics, it is clear that for the Chinese side the only sector of the Russian economy that is of interest is the extraction of natural resources.

The volume of accumulated investment between the Russian Federation and the People's Republic of China and their growth rates are quite low: on the Russian side they are $ 0.946 billion, from the Chinese side – $ 8.9 billion. The structure of Chinese direct investment repeats import priorities and is concentrated mainly in resource-extracting industries. Accordingly, the nature of Chinese investment does not allow us to speak of the great interest of Chinese companies in the projects of re-industrialization within the framework of the Eurasian Economic Union.

Chinese capital is ready to participate, first of all, in the development of the natural and resource base of Siberia and the Far East. In this perspective, there is a large negotiating field in Russian-Chinese relations on lending to the construction of the Russian transport infrastructure along the meridional directions for the accession of Russian deposits to the routes of the Economic belt of the Silk Road [3].

Geographically located in Central Eurasia, the Economic belt of the Silk Road is fully consistent with the political and economic changes taking place in the modern world in general and the Russian economy in particular.

Despite the fact that the main transport corridors of the project "Economic belt of the Silk Road" do not affect the Russian Far East, the description of the initiative noted the need to improve transport communications of the provinces of Heilongjiang, Jilin, Liaoning (Northeast of

China) and the border territories of Russia. Increasing the openness of China's regions is an important part of a large-scale national project and implies the development of international cooperation at the regional level.

For Russia, the importance of regional cooperation with China in the territorial framework of the Far East is determined, among other things, by the risk of a decrease in the competitiveness of the western sections of the Trans-Siberian Railway, generated by the active development of alternative routes from China to Europe bypassing the territory of Russia. The transport complex of the Far East can be considered as part of the national fragment of the implementation of the project "Economic belt of the Silk Road", which is, in fact, the land component of China's "One Belt, One Road" initiative. At the same time, we are not talking about the main direction of this project, but only about its local level, at which cooperation between the border provinces of China and the subjects of the Far Eastern Federal District can develop [4].

In the Far East part of the transport complex in cooperation with China, including in the framework of the project "Economic zone of silk road" can be implemented through:

- the development of existing International transport corridors Primorye-1 and Primorye-2;
- organization of new routes using the newly created elements of infrastructure (bridge crossings on the territory of the Amur region and Jewish Autonomous District);
- the use of new forms of cooperation (free port, the Priority Development areas).

Representatives of the Russian side expect to increase Chinese investment, particularly in transport infrastructure corridors Primorye-1 and Primorye-2, placing in the far East of Chinese enterprises in such industries as metallurgy, light industry, communications, petrochemicals, shipbuilding and so on. Chinese investors point to "unfavorable business climate and lack of legal safeguards" doing business in Russia. With the aim of reducing the risks of investments they are interested in renting lands and agricultural development, energy and mining. Despite the unprecedented preferences for business, adopted in the Far East in recent years, investment from Chinese businessmen is very carefully and in relatively modest amounts. A similar line of behavior on the part of China can be traced to a certain extent with regard to participation in transport projects of the Far East. Noting the importance of the Primorsky-1 and Primorye-2 transport corridors in operation, official documents of the Chinese side suggest that, within the framework of the considered middle line "Belt of economic support for the old industrial base of the Northeast", Jilin Province should use a far from new strategy of access to the sea through the lease of the seaport. At the same time, both the North Korean seaport of Rajin and the Russian Seaport in "Troitsa" Bay can be used [5; 6]. For China, the Economic belt of the Silk Road is a new platform for participation in global governance. The task of building the "Economic belt of the new Silk Road" is to create markets and transport routes from China to Europe for the export of Chinese goods. Russia is also concerned about the possible influx of cheap Chinese goods into the Eurasian region, Russian goods may be pushed out of the post-Soviet space; secondly, the integration of transport projects in China and Eurasia can compete with the Trans-Siberian railway of Russia and the Baikal-Amur Mainline; investments are mainly directed to the extraction of energy resources in Eurasia, fourthly, the presence of illegal exports of Chinese labor in the process of foreign economic cooperation can bring to a demographic explosion in the region, and fifthly, cooperation projects undertaken by China in the Eurasian region can lead to environmental problems in Eurasia.

China supports the development of the Russian Far East, is involved in the implementation of the strategy of Russia's re-industrialization, and can also strengthen bilateral cooperation in the strategic aspects of major projects, with emphasis on deepening cooperation in the fields of energy, high technology, joint military strategic planning and cooperation on the missile defense system [7].

The greatest attraction of the "Economic belt of the new Silk Road" is its innovative model of cooperation, as well as concepts and principles, namely that all countries, regardless of their size, are equal and have the right to an independent domestic and foreign policy [8].

The economic belt of the Silk Road as a whole opens up vast new opportunities for Russia. True, only if Russia is reasonable, on favorable terms, will take part in this project, which is based on

China's serious growing economic opportunities. On the other hand, China clearly understands that without cooperation with Russia, without its participation, the Chinese project of the Silk Road will be inadequate. In accordance with the current Chinese version of the Silk Road, Russia is not only a transit country, but also a key partner of the Eurasian corridor in its northern part [9].

In this regard, an important issue is understanding the prospects for Russia in the context of the implementation of the project of the Economic belt of the Silk Road. Russia is rich in energy resources, and China is a leader in investment and industrial production. The role and importance of Russia in the implementation of this project is determined by its ability to supply raw materials and fuel for the growing Chinese economy; partnership in the development of the innovative economy and infrastructure of the Silk Road; political interaction and partnership in ensuring military and political security in the region; as well as the potential for humanitarian development and the commonality of historical destinies and civilizational aspirations. As a result of Russia's partnership, it is expected to change its economic and geopolitical orientation towards the East, develop less developed areas of the eastern regions of Russia and give a new impetus to the Russian economy [10; 11].

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MODELS OF THE VALUE ADDED FORMATION ON THE BASIS OF DEEP RESOURCES AND RAW MATERIALS PROCESSING IN THE POTENTIAL REGION WITH THE PARTICIPATION OF INTERNATIONAL PARTNERS

***Keywords**: added value, models of formation, formation efficiency, economic rent, economic added value.*

The authors substantiate the necessity of searching for tools that provide long-term competitive advantages and effective functioning of enterprises and their partner networks in conditions of a changing external environment. As a tool, the modern concept of value-added chain is proposed, which allows researchers to explore aspects of inter-partner relationships, to identify the potential for competitiveness, to determine the possibilities for achieving a balance of interests of all stakeholders (territory, business, population) and develop appropriate recommendations [3].

Insufficient theoretical and methodological thoroughness of the processes of designing value chains, evaluating their effectiveness, taking into account the specifics and specifics of the development of industries and the economy of the region as a whole, determine the urgency and need for more in-depth study of them. The creation of cluster structures as one of the types of network partnerships is supported where, through the use of key competencies of each other, processes of innovative development and production modernization are activated, access to new markets is facilitated, attractiveness for investors, including foreign ones, is ensured all participants.

The approach proposed by R. Kaplinsky and G. Jerreffi, known as a tool for the analysis of industries and markets, examining the problems of interfirm cooperation, determines the opportunities and threats along the entire value chain, contributes to the development of more effective sectoral and territorial mechanisms for their support [1,2].

The aim of the work is to develop a methodology for assessing the effectiveness of partners' interaction in cluster structures on the basis of analysis of chains of creation of added value and formation of economic rent. In this context, attention is drawn to the structure of the value chain along the technological cycle stages with the definition of the controlling link-producer or buyer [4]. From the location in the chain of value added depends on the possibility of extracting economic rent and its distribution among all partners in the cluster. The more stringent management tools are used in the chain, the higher the scale of the redistribution of value added. It is proved that by managing the structure of added value, it is possible to organize improvements in the interests of not only the manager, but also all partners.

Resource and raw materials potential of the region makes it necessary to evaluate the various options of the value chain, which are considered by the example of non-ferrous metallurgy (aluminum production) and the AIC [6].

Their choice is justified by the versatility of the markets – if the output of non-ferrous metals is oriented to the demand of business and the state, the products of the agro-industrial complex, to a large extent, on the final demand of the non-ferrous metallurgy industry, include chains controlled by the producers of raw materials, APE enterprises are managed by the buyers through

trade networks. Despite this, they have one common advantage related to the availability of raw materials and natural resources and the need to modernize the final links of value chains. First of all, this is stimulating R & D, strengthening and expanding processing of products under their own brands.

Approbation of methodology on the example of the given branches allowed to determine the total added value of each of them in the fraction provided by the cluster. Through the notion of "economic added value" proposed for municipal territories, the possibility of reaching the gross value added value of the region (GVA) is considered, which ensures efficiency monitoring throughout the chain and its distribution by partners and stakeholders [4].

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THE RISK ANALYSIS AND MANAGEMENT OF OVERSEAS INVESTMENTS OF CHINESE ENTERPRISES UNDER "ONE BELT, ONE ROAD" INITIATIVE

Under The Belt and Road Initiative, Chinese foreign economics gets a lot of benefits. However, at the same time, overseas investments of Chinese enterprises also face more prominent external risks, such as political risk, macroeconomic risk, industry risk, exchange rate risk, interest rate risk, human resource risk, financial risk and safety risk. In addition, most of these overseas investments have the characteristics of large scale, long time, slow effect, complex environment, which increases the internal risks caused by improper solutions of the enterprise and defects of the management system. Only by constructing an effective risk management mechanism, promoting external and internal risk management in parallel, it can promote the sustainable overseas investments. In this paper, the external and internal risks of overseas investments of Chinese Enterprises are analyzed, and the management measures of risk response and governance are put forward at different levels.

***Keywords**: risk analysis, risk management, overseas investment, chinese enterprise, the belt and road initiative.*

INTRODUCTION

Considering the political factors of national strategy, the strategic concept of The Belt and Road greatly expands regional cooperation in the economic aspect between China and countries along the line. Although this strategy has brought great opportunities for the development of Chinese enterprises, it also faces many challenges at the same time.

When Chinese enterprises invest overseas, the environment of overseas market is more complex. There are many uncertain factors and diversified risks. Any kind of risk will bring huge economic losses and a series of unfavorable reactions to investment activities. Therefore, it is necessary to make a scientific analysis of risks and then take scientific management measures.

RISK ANALYSIS OF OVERSEAS INVESTMENTS OF CHINESE ENTERPRISES

EXTERNAL RISKS

(1) Political risk

Political risks, including the change of regime in the host country, the unstable political situation and the sudden adjustment of policies and regulations, lead to changes in the management environment of investment enterprises. It can bring irreparable economic losses to investment enterprises and even lead to bankruptcy or stop operation. Because of its suddenness and unpredictability, it is hard to predict and cannot be prevented for overseas investments. In serious circumstances, it will greatly affect the safety of personnel and property. Government corruption, terrorism, ethnic conflicts, religious armed conflicts, border disputes and external forces interference may lead to political risks.

(2) Macroeconomic risk

Macroeconomic risk mainly refers to the risk caused by the macroeconomic instability of the invested country (region), which makes it difficult for overseas investment enterprises to achieve their goals of investment and economic benefits. On the one hand, economic instability or slower growth in the invested country and its region will lead to downward economic development and

industrial restructuring. It results in the decrease of demand for products or services of investment enterprises in local downstream industries, which affects the profits of investment projects. On the other hand, the slowdown or stagnation of the economic development will directly cause the reduction of the government revenue and weaken the ability of the government guarantee.

(3) Industry risk

Industry risk mainly refers to the risk caused by the adjustment of the industry policy, the change of the market operating environment, the sudden change in the supply and demand of the upstream and downstream industry and the sharp change in the price. The above changes will lead to significant fluctuations in the overall market demand and economic benefits of the industry, which will bring uncertainty to the return on overseas investment projects.

(4) Exchange rate risk

The capital contribution of overseas investment projects is usually paid by the currency of the country where the project is located.

If the local standard currency of the invested country continues to devalue, the change of exchange rate will directly lead to a decline in the purchasing power of the investment enterprise, which will increase the capital investment of the enterprise and cause a decline in the rate of return on investment. When the foreign currency bonds or loans are used for financing, if the foreign currency continue to revalue, the actual repayment cost of enterprises will increase correspondingly.

(5) Interest rate risk

Before the closure of financing, the rising interest rate of deposit and loan in the invested countries is often accompanied by the tightening local credit policies. It means that local banks will raise the threshold of loan and increase the cost of loan, which increases the difficulty of financing for overseas businesses. In addition, if the floating rate is used, the rising interest rate of loan will obviously increase interest charges of investment enterprises, which will increase the cost of financing correspondingly. If the fixed rate is used, after the closure of financing, the fall of interest rate will increase the financing cost, which will affect the profitability of the project.

(6) Human resource risk (Labor risk)

Labor laws and regulations in the invested countries often provide detailed rules for labor employment procedures, employment ratio of local employees, minimum salary level and responsibilities of employer. If there is a lack of understanding on the relevant local laws and regulations, it may violate the relevant regulations and be subjected to legal sanctions and economic penalties, which will damage the economic interests of the enterprise and have a serious impact on its reputation.

(7) Financial risk

From external conditions, the instability of the political situation in the invested country, the adjustment of loan and tax policy, the adjustment of industrial policy, and the fluctuation of exchange rate and interest rate, may cause the extra tax burden, the high cost of financing or the delay of approval. From internal conditions, it puts forward higher requirements for the financing capacity and financing structure design of overseas businesses, which are important factors affecting financing risk. The financing capacity of overseas projects depends on the amount of financing channels, the profitability of the project and the ability to resist risk, the degree of popularity to the investment business in the invested country, and so on. The financing structure includes the ratio of own capital to external loan and the structure of long-term loan and short-term debt.

(8) Safety risk

Countries along the line of the Belt and Road include East Asia, West Asia, South Asia, Central Asia, CIS, central and Eastern Europe and other countries. In some of these countries, there are poor public security environment, high risk of terrorism and more serious ethnic conflict. The gap between the local poor and the rich is large and the social contradictions are prominent. Theft, robbery, and other cases often occur.

INTERNAL RISKS

(1) Risk on improper decision-making in enterprises

Because of insufficient cognition of environment, the investment efficiency of enterprises is reduced and the risk of overseas investment is increased. Overseas investment must have a reasonable opportunity. If the enterprise does not make reasonable evaluation on the project target, the market environment and its own ability before the implementation of overseas investment, it will undoubtedly increase the risk of business operation and financial profit.

(2) Risk on defects of enterprise management system

Some overseas investment enterprises do not have sound corporate governance mechanism, risk control mechanism and strategy execution mechanism. Therefore, in the process of making decisions on transnational operations, it is easy to cause unscientific aspects, such as project selection, partner selection, business strategy formulation and implementation. As a result, the investment efficiency has been greatly reduced and assets have been eroded to a higher degree, which has increased the risk of investment.

STRATEGIC ANALYSIS OF RISK RESPONSE ON OVERSEAS INVESTMENTS OF CHINESE ENTERPRISES

Countermeasures on external risks

(1) Overseas investments of Chinese enterprises should give priority to countries that is politically stable and friendly to China. For strategic consideration, if an enterprise needs to be operated in a country with unstable political situation, it can avoid and prevent political risks by signing investment protection agreements, buying Chinese export credit insurance, obtaining sovereign guarantee of host country and other measures.

(2) Overseas investments of Chinese enterprises give priority to countries with good overall economic operation and relatively perfect industrial foundation. If an enterprise needs to carry out business activities in countries or regions with underdeveloped market economy, it can cooperate with other Chinese enterprises or local enterprises with strong background and powerful strength in host country. Relying on their advanced experience in investment and operation in the region, they can effectively avoid economic risks and share possible risks.

(3) In order to better deal with the industry risks, companies with overseas business should obtain and continue to pay attention to the relevant local industry policies and market quotations through a variety of channels. Then they quantify the relevant uncertainties in the project economic evaluation and make the management and marketing strategies that conform to the local market environment. At the same time, in the contracts among the customers, suppliers and the government, identifying the undertaker of risks from changes in related factors of the industry, or avoiding and transferring risks from changes in the industry policy by purchasing bilateral investment insurance, interests of investors are protected as far as possible.

(4) In order to effectively deal with exchange rate risk, enterprises can choose the reasonable payment currency in capital payment, project financing, and contracts signed with supplier and customer, and accurately assess exchange rate trend of the foreign currency used, and try to offset the impact of exchange rate fluctuation through reimbursement.

(5) In order to avoid or prevent interest rate risk, interest rate swaps and other financial derivatives can be used to stabilize interest rate fluctuations.

(6) Chinese enterprises of overseas investment should fully understand the local labor policies, local labor market conditions and local labor salary level. In the process of business negotiation, employment problems, labor visa and remuneration can be included in the discussion. These Chinese enterprises should make full use of local resources and advantages of stakeholders and establish good communication with local government, trade unions, social security management departments, and so on. This can provide guarantee for the stability of labor force and the rationality of labor costs in the construction and operation period.

(7) When the financing scheme is selected, Chinese enterprises of overseas investment can set up professional teams or employ third party laws and financial advisory bodies to sufficiently investigate the requirements of bank supervision, foreign exchange management, financing regulators, financing channels and financing structure demands of invested areas. In addition, in the process of financing negotiations, it is possible to provide guarantee for smooth realization of financing closure by means of profitability description of financial model, overseas insurance or protective provisions in the agreement.

(8) In order to protect property and personal safety of enterprises, overseas investment enterprises must strengthen the safety training of overseas employees and enhance their safety awareness and make strict safety management measures. By establishing emergence plan for safety events, taking regular safety accident exercise, the safety awareness of employees is improved and the emergency management ability to deal with emergencies is enhanced. In areas with poor public security, besides purchasing insurance for employees and hiring legal security companies, enterprises should strengthen the contact with the local police in order to maintain their own security.

Countermeasures on internal risks

(1) Efficient governance mechanism of internal operation risk is an important guarantee for effectively preventing risks of overseas investment. Therefore, in order to prevent risk, it is necessary to strengthen classification and comprehensive training of internal governor and staff, enhance the learning of risk management of overseas investment and improve the ability to recognize and prevent the risk of investment.

(2) To make overseas investment projects of The Belt and Road in an orderly manner, the financial status of enterprise investment projects is strictly supervised, which ensure that financial risks are controllable and financial operation is good. In addition, enterprises should rely on the public service platform, strengthen the construction of their own information system, track the internal financial operation in real time, and reduce the internal risk of overseas investment from the source.

(3) After the establishment of overseas enterprises, it is necessary to continuously optimize the corporate governance structure, strengthen the construction of internal control system, and do well in human resources management. In fact, overseas investment enterprises need comprehensive talents, who have certain strategic thinking and are familiar with enterprises management.

SUMMARY

Under The Belt and Road Initiative, Chinese enterprises go abroad to seek greater development space, which has become the new normality of enterprise development. In the process of overseas investment, risk factors also increase. Only by managing and controlling investment risk, it can ensure the success of overseas investment and promote the realization of economic benefits on enterprises and countries.

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ANALYSIS OF CARBON DIOXIDE EMISSION AT THE STAGE OF RESIDENTIAL BUILDINGS MAINTENANCE

The fuel and energy complex is the main source of carbon dioxide emission. According to statistics in Russia, the percentage of energy consumption is about 40 %. The amount of emission from energy production is 44 %, which is almost double that of the industry [1].

The energy crisis and developing environmental problems caused by energy consumption, the rapid depletion of non-renewable natural resources, as well as emission of pollutants, contributed to the creation of the concept of sustainable development in the 1970s [2]. The goal of sustainable development in construction is to prevent environmental damage, to use renewable resources, to minimize energy consumption and waste production, to reduce carbon dioxide emission throughout the building life cycle.

For a comprehensive analysis of the overall environmental load, it is necessary to assess the degree of harmful effects of carbon dioxide emission at all stages of the building life cycle: extraction and production of building materials, construction, operation, reconstruction, demolition or dismantling, followed by processing of construction waste. The estimation of environmental impact on the environment during the entire life cycle of the building also implies the environmental optimization, systematization and a full-fledged energy-efficient improvement.

Environmental efficiency, which exerts further influence on all stages of the building life cycle, is formed at the design stage. At this stage, the main decisions are made about the choice of the building geometry, the type of building materials and the parameters of heat protection.

Due to the versatility of this issue, the emphasis of our studies was made on the study of a separate stage of the buildings life cycle, which has the greatest negative impact on the environment. The estimation of carbon dioxide emission was made at the stage of operation according to the parameter of heat energy consumption for the heating period.

The aim of the work was to study the amount of carbon dioxide emission from fuel combustion spent on heating residential buildings for the heating season in various construction areas.

Calculation of carbon dioxide emission from fuel combustion during the heating period of buildings was carried out according to the methodology [3].

The construction of residential housing and civil facilities has a significant proportion (more than 70 %) of the construction in the Russian Federation, therefore, residential buildings were accepted as research objects [4]. For the calculation, standard projects of 9-storey residential buildings, accepted for construction prior to the entry into force of the law on energy efficiency [5], and 18, 25 and 26-storey residential buildings taken for construction after the entry into force of the law on energy efficiency were adopted.

Objects before the entry into force of the law on energy efficiency are (facilities No. 1 – No. 13) and the objects after the entry into force of the law on energy efficiency are (facilities No. 14 – No. 17). Typical projects of residential buildings in areas with a seismic activity intensity of less than 6 points (No. 1 – No. 7) at a design ambient temperature of -4 to -47 ° C and in areas with a seismic activity of 6 or more points (No. 8 – No. 13). Enclosing constructions of objects №1 – №13 are made of prefabricated reinforced concrete panels, objects №14 – №17 are made of brick walls with hinged ventilated façade were evaluated.

The estimated conditions and energy indicators of the projects are given in Table. For comparative analysis the data on CO_2 emission from residential buildings during the operational phase were determined per 1 m^2.

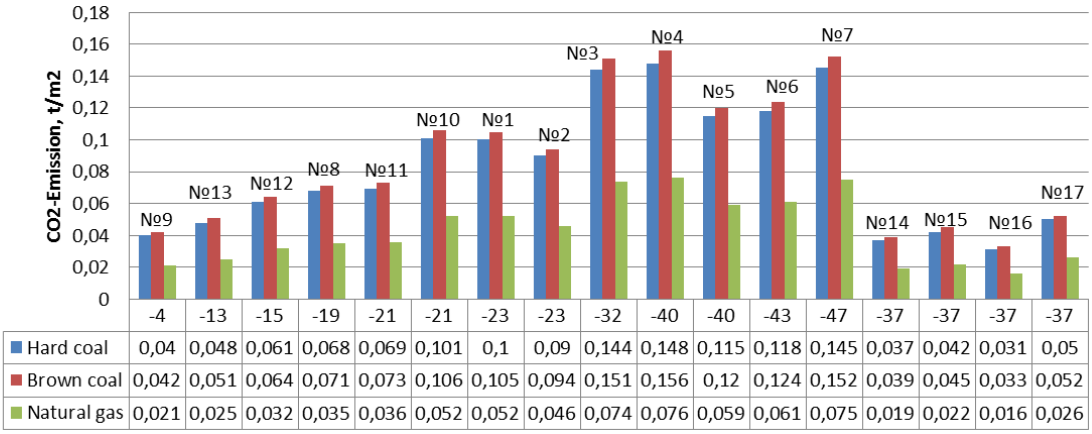
Table

Estimated conditions and energy performance of facilities

Object number	HSDD*, (°C · day)/year	Temperature **, 0C	Thermal energy consumption for heating period, МДж	Heated area, м2	Thermal energy consumption for heating period per 1 m2, МДж/м2	Energy efficiency class
1	2	3	4	5	6	7
№ 1	4172	-1,8	2464649,86	2088,26	1180,24	D
№ 2	4172	-1,8	2485362,53	2342,2	1061,12	E
№ 3	6928	-4,1	3549775,10	2084,52	1702,92	E
№ 4	6627	-7,2	3492288	1996,77	1749,03	E
№ 5	6839	-8,1	2598912	1924,11	1350,71	E
№ 6	7669	-10,3	2713949,28	1947	1393,91	D
№ 7	8969	-13,9	3741508,8	2189,7	1708,69	E
№ 8	2850	0,5	1253081,66	1566,36	799,99	D
№ 9	1892	5,1	1364368,32	2909	469,02	C
№ 10	3960	-1	7191244,8	6036	1191,39	E
№ 11	3960	-1	2314137,6	2836	815,98	D
№ 12	2418	2,4	1111968	1418,56	783,87	C+
№ 13	1897	3,6	1466226,14	2570	570,52	C-
№ 14	6454/6575	-6,7/-7,1	4409267	10061,99	438,21	A
№ 15	6454/6809,4	-6,7/-7,1	2864062,99	5721,6	500,57	B+
№ 16	6454/6575,4	-6,7/-7,1	7750350,92	21081,1	367,64	A+
№ 17	6454/6809,4	-6,7/-7,1	2517139,72	4273,4	589,03	B+

* HSDD – heating season degree day by the method [6].
** The average temperature of the heating period [9–11].

The load on the environment from fuel combustion (coal, brown coal, natural gas) for heating residential buildings is shown in Fig. 1.



	№9	№13	№12	№8	№11	№10	№1	№2	№3	№4	№5	№6	№7	№14	№15	№16	№17
	-4	-13	-15	-19	-21	-21	-23	-23	-32	-40	-40	-43	-47	-37	-37	-37	-37
Hard coal	0,04	0,048	0,061	0,068	0,069	0,101	0,1	0,09	0,144	0,148	0,115	0,118	0,145	0,037	0,042	0,031	0,05
Brown coal	0,042	0,051	0,064	0,071	0,073	0,106	0,105	0,094	0,151	0,156	0,12	0,124	0,152	0,039	0,045	0,033	0,052
Natural gas	0,021	0,025	0,032	0,035	0,036	0,052	0,052	0,046	0,074	0,076	0,059	0,061	0,075	0,019	0,022	0,016	0,026

Fig. 1. Carbon dioxide emission from the combustion of various types of fuel for the buildings heating period of taken for construction in the period from 1977 to 2016

Analysis of carbon dioxide emission from building operation showed that the greatest heat loss is produced in objects with average negative temperatures of the heating period and the calculated value of HSDD> 4000. A close correlation can be observed between the emission and the SHDD parameter, which is the base indicator for the choice of the normalized resistance to heat transfer of the enclosing structures of buildings (Fig. 2).

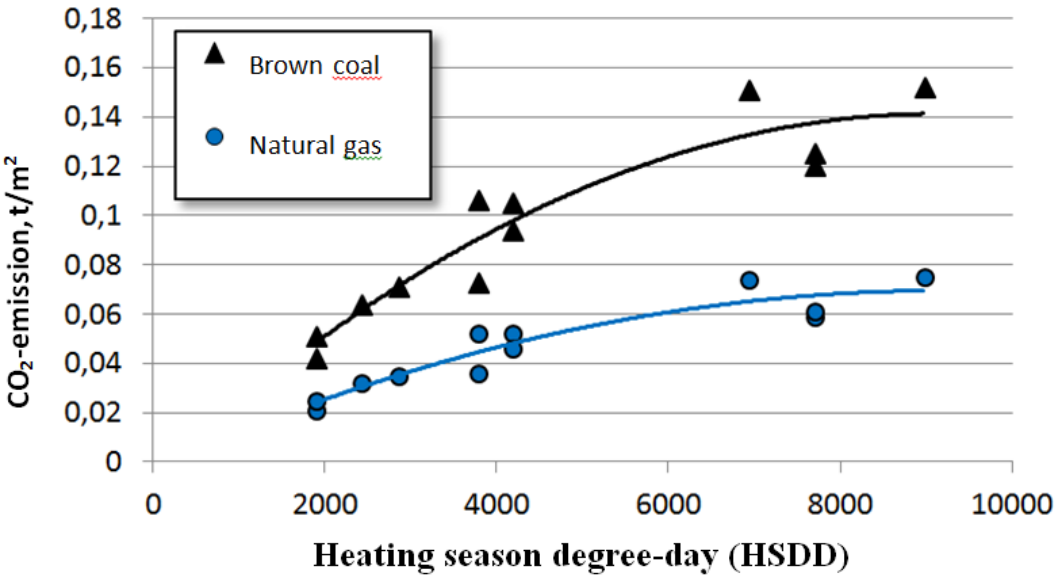


Fig. 2. Correlation between carbon dioxide emission and HSDD

The most environmentally friendly fuel for heating residential buildings is natural gas. Carbon dioxide emission during heating with natural gas is half as less as when heating with brown coal (Fig. 1).The analysis of the obtained data of the energy efficiency classes of the objects showed that the old buildings belong to the class below C on the basis of Table 15 CD 50.13330.2012 Thermal protection of buildings. According to the JV "Designing buildings with energy-saving class D, E" is not allowed. Classes "A, B, C are referred to newly constructed and reconstructed buildings at the stage of design documentation development."

In accordance with Federal Law No. 261-FL of 23 November 2009 (as amended on 03.07.2016) "On energy conservation and on improving energy efficiency and on amending certain legislative acts of the Russian Federation", "the commissioning of buildings, structures, constructions, constructed, reconstructed, overhauled, not meeting the requirements of energy efficiency is not allowed."

This suggests that there is potential for reducing CO2 emission by upgrading the class of such buildings with the help of special energy saving measures. The most effective and economically feasible way to reduce CO2 emission in the design of new buildings will be the introduction of a system of comprehensive environmental assessment of the full life cycle of buildings at the design stage.

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CARBON-NEUTRAL ENERGY AND CLIMATE CHANGE MITIGATION[1]

The problem of global climate change in recent decades is developing along with increasing interest in more eco-friendly types of energy generation. During the 20th century, the average air temperature on the earth's surface increased by 0.74°C and the average sea level increased by 0.19 m^2. In addition, global warming provokes melting of Arctic ice, changes in the acidity of ocean waters, an increase in the earth's surface average temperature and changes in the snow cover [1]. The main reason of the global warming is the change in the greenhouse gases concentration (mainly carbon dioxide). The amount of anthropogenic emissions of greenhouse gases has significantly increased over the last century along with the economic and population growth, and now this emission level is higher than ever. The world community came to the conclusion that the main cause of global climate change is the increasing concentration of greenhouse gases in the atmosphere.

Further development of this situation in accordance with the current trend can lead to long-term changes in all components of the climate system, increasing the likelihood of serious consequences for both population and ecosystems of our planet. The only way to solve the problem of global climate change in this context is to reduce greenhouse gas emissions, which can help to reduce the risks, associated with climate change, and contribute to the sustainability of ecosystem development.

Above mentioned problems and ways of their solution have been stated in many international agreements, including the Paris Agreements of 2015 [2], the main goal of which is to keep the increase in the global average temperature. There are many mechanisms for reducing greenhouse gas emissions, including the development of nuclear energy as it is an alternative source of electricity generation, characterized by high environmental efficiency. Thus, nuclear power can be considered as an instrument for achieving the goals of the Paris Agreements.

Nuclear power plants are safe, reliable and do not carry out greenhouse gas emissions, and therefore it is worth considering nuclear power as the most attractive sector for investment. A significant superiority of nuclear energy over the energy produced by burning coal in terms of environmental efficiency confirmed by many scientific studies [3–7]. The comparative analysis of environmental friendliness and safety of electricity generation types by a group of economic and environmental indicators was performed. Conclusions on the significant superiority of nuclear power plants in terms of environmental efficiency have also been confirmed by the report of the State Atomic Energy Corporation Rosatom at the IX International Public Forum-Dialogue "Nuclear Energy, Society and Security – 2014". Analyzing the contents of the report comparing nuclear energy and fossil fuels, one can single out the main economic indicators of energy resources for each of the two types of electricity generation considered (Table).

It is worth noting that nuclear power is preferable type of energy generation both in terms of the cost of electricity produced and, unequivocally, in terms of pollutant emissions into the atmosphere and the risk of occupational mortality. Capital costs for the creation of nuclear power plants are unquestionably large, but seeing the extremely high degree of safety and environmental

[1] The reported study was funded by Russian Foundation for Basic Research, the Administration of Krasnoyarsk Krai and the Krasnoyarsk Krai Foundation for Support of Scientific and Technical Activity according to the research project No. 17-12-24001 and Grant projects of ROSATOM's public councils under the initiative The Green Square.

friendliness, it can be said that the volume of capital expenditures is less important, especially in the context of the global climate change problem.

Table

The main economic indicators of energy resources by types of energy generation

	Fossil fuel (coal)	Nuclear energy
Capital expenditures, USD / KW	1 300	2 200
Electricity cost, cent / kWh	3,25	2,6
CO_2 output, g / kW	251	0
Emission of SO_2, mg / kWh	288	0
Emission of NO_x, mg / kWh	516	0
Risk of occupational mortality, the number of deaths / (GW / h)	7	0,7

Source: compiled by the authors, based on the report of Rosatom "Comparison of the environmental efficiency of various energy sources" [3].

As of 2016, the share of nuclear power in the world generation of electricity is about 4.5 % (Fig. 1). Despite the temporary reduction in the share of nuclear power in world energy consumption, we can not fail to note the growth of its absolute consumption. For example, in the first decade of the 21st century, the share of nuclear energy declined from 6.22 % to 5.14 %, however, over the same period, nuclear energy consumption in the world increased from 584.28 to 625.91 million tonnes in oil equivalent, and experts predict further growth of both indicators.

The analysis results allow drawing the following conclusions:

1. Coal-fired power plants are one of the main sources of CO_2 emissions into the atmosphere. It provokes a "greenhouse effect", which, in turn, is the cause of global climate change. In addition, waste from coal plants (ash) is discharged to an open air site, which is also associated with environmental risks.

2. Nuclear power plants are neutral in terms of pollutant emissions into the atmosphere. Nuclear power does not significantly affect the carbon balance. Thus, it can be said that the danger of nuclear power is artificially overstated in the public perception.

Nevertheless, the wide public response caused by accidents at nuclear power plants around the world (NPP Three Mile Island (1979), Fukushima-1 (2011), Chernobyl Nuclear Power Plant (1986)) led to the association of nuclear reactors with unreliability. In order to refute this statement, a comparative analysis of the causes and levels of danger of accidents at nuclear power plants was carried out.

Analyzing the causes of accidents occurring at nuclear power plants, it can be understood that most of incidents were caused by errors of employees in the maintenance and operation of nuclear power plants. The human factor has led to several serious accidents, such as the accident in Tokaimur, the ignition of the Siberian Chemical Combine. Also, a consistent chain of staff errors led to the Chernobyl disaster.

Another reason of the incidents is inadequate maintenance of reactor cooling systems. The corrosion and technical failure of the cooling systems were not installed and eliminated in time, which caused explosions at Kyshtymskaya NPP and in Three Mile Island. In turn, the recent accident at the Fukushima-1 nuclear power plant could be prevented by a more thorough analysis of the zone of high seismic activity in which it was built.

Another important issue in the construction of nuclear power plants is the need to store SNF (spent nuclear fuel) and nuclear waste. However, the risks associated with the storage of SNF and nuclear wastes are minimal, since environmental safety in the disposal of radioactive waste is ensured by the principle of multi-barrier protection. The complex multilevel design protects against the penetration of radioactive substances into the atmosphere, storage in specialized certified containers also enhances isolation, and continuous measurements of the level of radioactive substances and radiation on the surface provide continuous safety monitoring.

Summarizing all of the above, among the main causes of accidents occurring at nuclear power plants, it is worth noting the human factor as well as inadequate maintenance of cooling systems for nuclear reactors. It was found that with the development of nuclear power, plants' construction features were modernized in accordance with past technological deficiencies. Thus, nuclear power can be considered as safe and ecologically efficient.

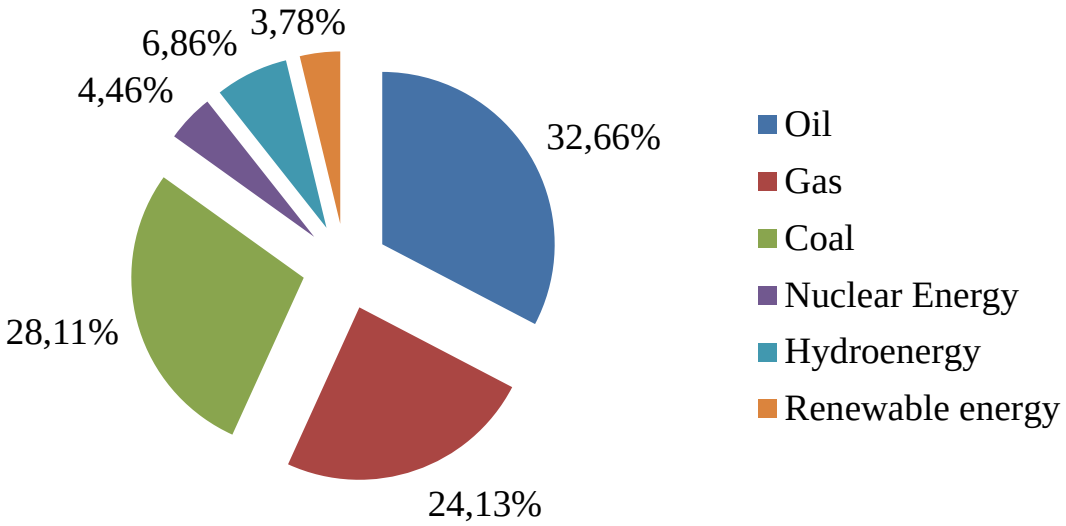

Figure. World consumption of electricity by types of generation, 2016.
Source: compiled by the authors on the basis of BP Statistical Review of World Energy, 2017 [8]

It is concluded that with careful design and well-trained work of highly qualified specialists, nuclear power plants are reliable source of energy capable of both providing large amount of electric power and significantly reducing the environmental load. Due to zero level of greenhouse gas emissions into the atmosphere, nuclear power plants can significantly affect the world ecological situation, which is extremely important in the context of solving the problem of global climate change.

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NODES DEGREE DISTRIBUTION ANALYSIS FOR THE NETWORK OF THE RUSSIAN SEGMENT OF WIKIPEDIA

Nowadays Wikipedia [1] is much more than the most popular online encyclopedia: it is a unique source of semi-structured knowledge about the world. It has a unique combination of structuredness of knowledge and information volume. In our research we created network of the Russian-language segment of Wikipedia and made basic analysis of its network structure using methods of complex network theory.

To define the scheme of our Wikipedia network, we need to identify essential Wikipedia structure which forms its semantic framework. All Wikipedia pages belong to various types defined by page namespaces. Wikipedia main namespace is used for Wikipedia articles – encyclopedia articles, lists, disambiguation pages and encyclopedia redirects. Pages from the category namespace are crucial for the formation of semantic relations between Wikipedia articles. Categories are used in Wikipedia to link articles under a common topic and allow readers to navigate through Wikipedia and find related articles. As well as an article, a category in Wikipedia must have at least one link to a parent category.

Based on the analysis given above, the following scheme of Wikipedia network is proposed. Essential semantic information from Wikipedia could be represented as a network of Wikipedia articles and categories. Articles and categories are considered as network nodes, which have the following attributes: name, type (article or category) and some additional attributes (e.g. length of page text). Full Wikipedia page text is not stored in nodes. References between Wikipedia pages are represented in the network as directed links between nodes. A link between two nodes in the Wikipedia network could be interpreted as the existence of semantic relation between terms. There are three main types of links: usual links from article to article; links from article to category (they mean that an article belongs to some category), links from category to category (they form hierarchy of categories). Links from categories to articles are very rare and could be omitted.

For creation of the Wikipedia network for the Russian-language segment of Wikipedia we gathered information about 5.3 million of Wikipedia pages and more than 150 million of links between them. As a data source, the official dump of Wikipedia database distributed by Wikimedia Foundation was used. MySQL RDBMS and SQL queries were used for data preparation.

As the result of these steps, the network of Russian-language segment of Wikipedia is built. It consists of 3 305 000 of articles and 405 000 of categories. Basic statistics of the network is reported in Table.

The next step was the analysis of nodes degree distributions. In fig. 1 there are node degree distributions' plots for links between articles and for outgoing article-to-category links. Tail of the node degree distribution for out-degree of article-to-category links complies with a power law because it is linear in a log-log plot.

There is quite a different situation for nodes degree distribution for out-degrees of article-to-article links. This distribution doesn't comply with a power law because its tail is concave in log-log plot (see fig. 4 and fig. 5). Also this node degrees distribution has a lot of artifacts in degrees' range from 300 to 1000. To describe nodes degree distributions for article-to-article links, especially for out-degree case, we need some special model of network growth sufficiently

different from a classical preferential attachment model. For these purposes, we propose to adapt Barabási-Albert model. Adaptation must consider multi-step process of Wikipedia articles formation instead of single-step process of adding a node to a network which is considered in the base Barabási-Albert model [5]. There is an example of such adaptation in [6].

Table

Basic statistics of the network built for the Russian-language segment of Wikipedia

Node types	Nodes' quantity (in thousands)	Links' quantity (in thousands)	
		to articles	to categories
Articles	3 305	92 167	9 187
Categories	405	–	770
Total	3 710	92 167	9 958

Nodes degree distribution for in-degree (article-to-article links) has two linear relationship ranges with different inclination. This distribution also has a lot of artifacts for nodes degrees' values more than 200.

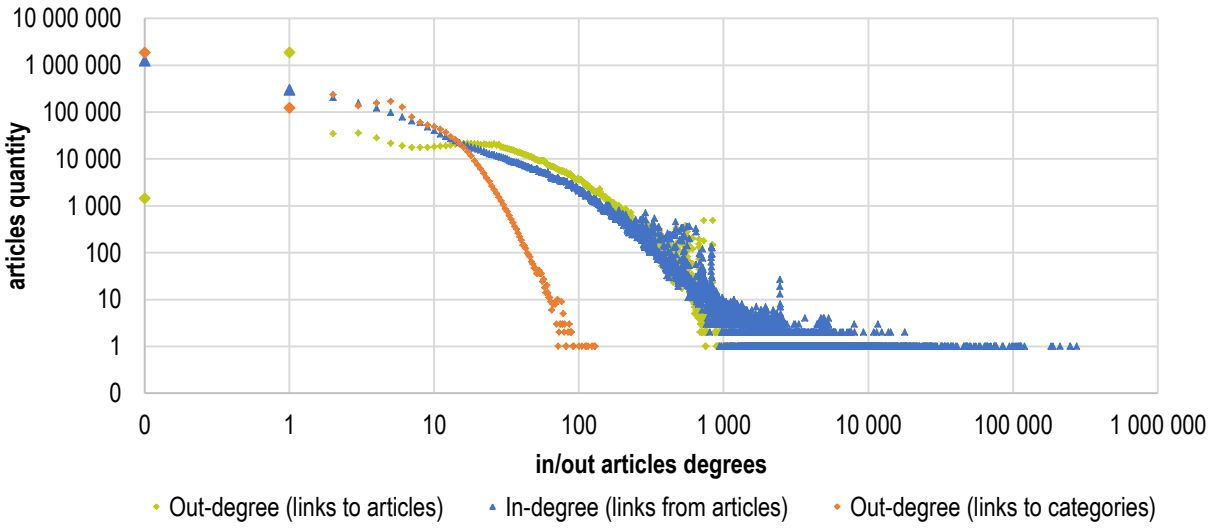


Fig. 1. Log-log plot of nodes degree distribution
for article nodes of the Russian-language Wikipedia

A nodes degree distribution is a distribution of a discrete random variable which takes non-negative integer values – node degrees (it is denoted ask in Fig. 1). Probability of the random variable taking a value is $p_i = P(X = k_i)$ which is a real number in range from 0 to 1. But a nodes degree distribution for an empirical network is an empirical distribution function which estimates a probability density function of a random variable by consideration of a sample containing n values. In the case of nodes degree distribution n is a quantity of nodes in the network. Hence for an empirical network we can get only empirical probability that a random network node has degree k_i:

$$\hat{p}_i = \frac{|\{n|k(n)=k_i\}|}{n}.$$

Since a sample size n is finite, values of $\hat{p}_i$ are discrete and the lower positive value of $\hat{p}_i$ is $1/n$. It means that for a certain sample size (a certain size of an empirical network) some p_i will be relatively low and $n\hat{p}_i$ – expected value of $|\{n|k(n) = k_i\}|$ (quantity of nodes with degree k_i in this network) − will be near to 1 or lower than 1. Hence in a range of k_i values, for which p_i are relatively low, values of $\hat{p}_i$ will randomly take values between several discreet levels. In particular, if k_i in certain k range has expected value $np_i \ll 1$ then $\hat{p}_i$ in this range will accept

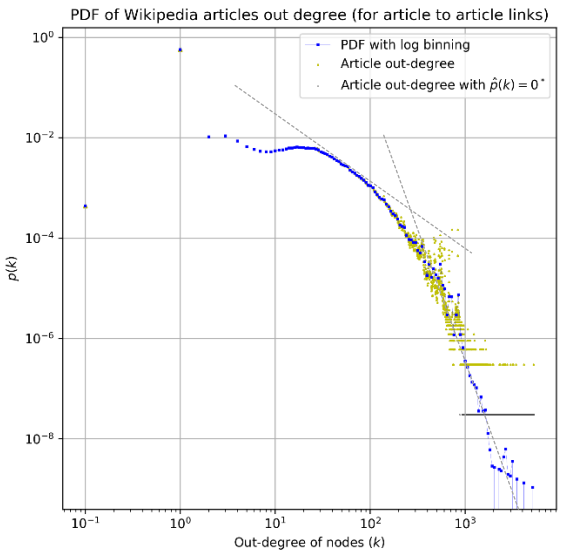
one of the two values 0 or 1/n by random. Moreover, there will be majority of 0 values but its real share will be dependent of certain p_i value. In our case this mechanism of appearance of several discreet levels of nodes degree distribution for relatively low p_i explains diffusion of tails of nodes degree distribution in plots in fig. 1.

There are several methods for clearing diffusion of tails of nodes degree distributions. One of the simplest is using log bin estimation (e. g. see [7]) of node degree distribution. We used this method for increasing quality of nodes degree distribution analysis for out-degree of article-to-article links (see fig. 2a). In this method empirical distribution function is replaced with normalized frequency histogram. Instead of a constant bin width in a log bin estimation each next bar bin width is q times wider as the previous one. In a plot with logarithmic scale of a horizontal axis it looks like a graph with constant horizontal step (width) of bars. In fig. 1a log bin estimation is shown for visual clarity in a form of a scatter plot instead of a histogram.

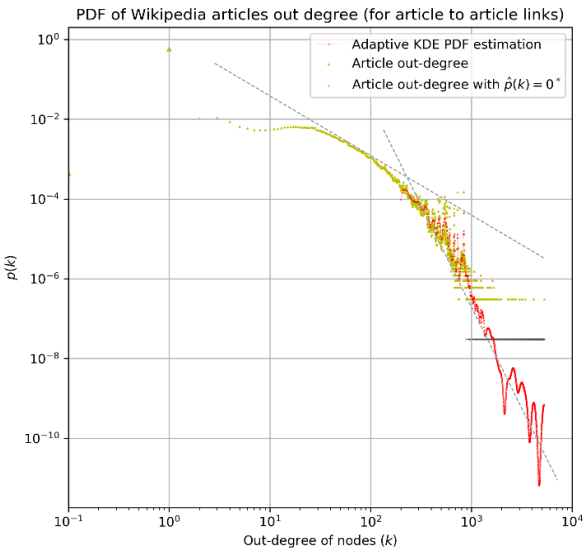
More precise analysis of this nodes degree distribution could be done with adaptive kernel density estimation method [8; 9]. This method selects the width of kernel to minimize mean integrated error between the estimated rate and unknown underlying rate. Like a log bin estimation of nodes degree distribution, the adaptive kernel density estimation method allows to clear diffusion of tails of nodes degree distributions. But this method is not constrained by exponentially growing step along horizontal axis, it allows to calculate probability estimation virtually for any point of distribution. Usage of gaussian kernel or other kernels with similar shape allows to get more precise estimation of probability for certain value of degree k. Moreover, this method can adapt the width of kernel to actual distribution probability. In particular it can use narrower kernel width, if in some range of nodes degrees probability $\hat{p}_i$ is increased with increasing k. This adaptivity for bin width is impossible in log bin method.

Figure 2 Plot of nodes degree distribution for out-degrees of article-to-article links of the Russian-language Wikipedia (because of impossibility to show values with $\hat{p}(k) = 0$ on a plot with logarithmic y axis, these values are shown with an artificial value, which is set an order of magnitude lower then minimum positive $\hat{p}(k)$)*

In fig. 2a log bin estimation of nodes degree distribution shows a lot of deviations around trend line for degree $k > 200$. More precise analysis of nodes degree distribution for out-degree of article-to-article links with adaptive kernel density estimation method sufficiently better shows (see fig. 2b) deviations of density function around trend line. For identification of these deviations' cause we need to made analysis of outlier points in the distribution.



a. plot with log bin estimation



a. plot with adaptive kernel density estimation

Fig. 2

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SUSTAINABLE DEVELOPMENT OF SIBERIAN INDUSTRIAL CENTERS: A NEW APPROACH TO ESTIMATION

Discussion of environmental problems has long gone beyond the agenda of international political events. Today, the need to mitigate the environmental consequences of intensive economic development is of no doubts among the population of industrial cities around the world. In this context, the task of the academic community and policy-makers is the organization of a permanent monitoring of the environmental situation of territories subject to intense environmental stress and an analysis of the economic aspects of this problem. Obviously, such monitoring should be based on a system of environmental and economic statistics that includes both primary observations of environmental conditions (emissions from different types of sources, concentration of harmful substances in the atmosphere and water basin, parameters introduced in enterprises-environmental users of environmental innovations, etc.), as well as complex indicators that allow assessing the level and pace of development of society in the economic, environmental and social aspects.

The quality of use, protection and reproduction of environmental resources largely determines the rates of economic growth and production efficiency. At present, there are already existing methods at the state level that consider the environmental factor in national statistics, but they have not yet been widely used in Russia, firstly, due to significant intra-regional differences in economic development, and, secondly, because they are only a tool for analyzing the current situation and are not built into the mechanism of managing specific territories. At the same time, increasing the technogenic pressure on the environment around the world and, in particular, in Russia, causes the need to include the environmental factor in the elaboration of regional development programs, the description of investment projects, as well as in making decisions on the conformity of the development trajectory of a region.

Despite the fact that many studies of the sustainability of the development of ecological and economic systems have been studied in the literature, questions of the development of the social sphere, one of the three equitable components of the known triad of the ecological economy, are rarely considered [Bobylev et al., 2017]. As a rule, all such studies are summarized at the macro level: national and regional, but practically do not descend to local problems of the development of small territorial entities. First of all, this is due to the lack of actual statistics for the calculation of certain measures of sustainability. Nevertheless, the analysis on the macro-level always gives an idea only of general trends, often not allowing to analyze the specific pressing social and economic problems of the population of the territory, which, as a rule, have their own specific genesis and cannot be solved with the help of universal approaches.

An important exception in this sense is the work (Bobylev, Porfiryev, 2016), in which the doctrine of sustainable development of large cities is formulated and an approach to the assessment of sustainability based on the concept of ecosystem services is proposed.

Earlier, we formulated an approach to a comprehensive assessment of the levels of sustainability of the development of regional and municipal socio-ecological and economic systems using the most common tools: the Genuine Progress Indicator, an environmentally adjusted gross regional product, a “genuine savings” index (Syrtsova et al. 2016; Pyzhev, Pyzheva, 2015; Zander et al., 2010). For the first time, it is proposed to use the Genuine Progress Indicator, which has proved itself well in studies for multiple countries and regions. The

developed methodology will be tested on an extended sample of Russian regions in order to identify those of them whose socio-ecological and economic systems are characterized by anti-sustainable development trends.

Currently, there are already methodologies at the national level that take into account the environmental factor in national statistics, but they have not yet been widely used in the Russian Federation, firstly, because of the significant differences in development between individual regions of the Russian Federation, and, in the first place, Second, because they are only an instrument for reflecting the current situation and are not built into the mechanism for managing specific territories. In addition, strengthening the technogenic burden on the environment around the world and, in particular, in Russia, calls for the consideration of an environmental factor in the development of regional development programs, justification of investment projects, and in making decisions on the conformity of the trajectory, development of the subject of the federation to the requirements of sustainable development.

In this regard, research is aimed at assessing the state of specific socio-ecological and economic systems (regions and municipalities), monitoring their development, identifying trends in development and, most importantly, developing a methodology on the basis of which can be developed recommendations that correct the trajectory of the development of the socio-ecological and economic systems under consideration in the direction of sustainable development. Such studies are especially needed in regions whose economy is based on a raw-material development model. At the same time, it becomes possible to identify the impact tools for application by the relevant government agencies, assess the expected effects from implementing measures to manage the sustainability of development, and develop effective policies that specify coordinated directions for the development of regional socio-ecological and economic systems.

We have analyzed the accumulated experience of research in the field of sustainable development of regional ecological and economic systems in Russia (Bobylev, 2017; Bobylev, Porfiryev, 2016; Glazyrina et al., 2014; Zabelina, Klevakina, 2016). It is noted that sustainability studies conducted for individual territories provide more accurate estimates, since they take regional factors into account, drawing on a wider range of sources. The most important obstacle for the full-scale use of indicators of sustainable development is the system of state statistics operating in Russia, which lacks sufficient data for the structure and power of environmental pollution.

The problem of sustainability of socio-ecological and economic development is especially relevant for single-industry towns (monotowns)-territorial socio-economic entities, a significant part of whose population works in a single city-forming enterprise. In accordance with the official criteria in the Russian Federation, these types of municipal entities include settlements with a population of more than 3 thousand people, of whom at least 20 % of the able-bodied population have worked in the city-forming industrial enterprise during the last five years.

Most of the Russian monocities emerged during the period of Soviet industrialization and, as a rule, were centers of concentration of qualified personnel working in large enterprises. In addition to providing high-quality jobs, in accordance with the distribution system of consumer goods that operated at that time, the monotown granted its residents access to a larger range of products with a relatively less severe shortage. In the post-Soviet period of the development of Russia, the attractiveness of single-industry towns as centers of gravity for quality labor has significantly decreased, which created a complex of socio-economic problems whose solution is necessary for the further development of these municipalities.

As of the beginning of 2018, there were 319 single-industry cities in Russia, divided into three categories. Monotowns of the first category are represented by municipal entities whose town-forming enterprises ceased to operate, which led to mass unemployment and emigration of the able-bodied population. Monocities of the second category include settlements in which city-forming enterprises have significantly reduced production volumes or are at the stage of bankruptcy or restructuring of production. In this case, the current social and economic situation

of the population can be quite stable, but there are objective risks of the city's transition to the 1st category. Monocities of the third category are represented by municipalities with a stable social and economic situation of the population and stable prospects for the functioning of the city-forming enterprise.

In total there are 65 monotowns in Siberia, with the largest part (24) located in the Kemerovo region. There are quite a few single-industry towns in the Irkutsk region (8), the Trans-Baikal Territory (8), the Republics of Buryatia and Khakassia (6 each). This distribution is due to the specifics of the location of resource-extractive and processing industrial enterprises. It is important to note that among the Siberian monocities only 10 out of 65 belong to the third category, that is, they are relatively prosperous and have development prospects, while the remaining 55 are in a tense socio-economic situation.

Thus, the problem of sustainability of the development of Siberian monocities is of great scientific and practical importance. Given the comparatively low degree of study of the real socio-ecological and economic situation of these municipalities, it is timely to conduct sustainability assessments, carry out the necessary classification and summarize the results obtained, and provide recommendations on the formation of a long-term regional policy for sustainable development of these territories.

Such an analysis can be carried out on the basis of the above approaches and tools: true savings, an indicator of true progress, etc. These approaches need to be clarified seeing differences in statistical accounting systems at the level of regions and municipalities. Specificity of single-industry cities is the impact of one enterprise on the entire socio-economic and environmental situation, therefore, in assessing the sustainability of the development of such settlements, along with the analysis of traditional indicators of sustainability, it is necessary to study in detail the current state and prospects for the development of the city-forming enterprise and its impact on the environment.

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UDC 656.072

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INEQUALITY OF KRASNOYARSK KRAI MUNICIPAL SUBDIVISIONS DEVELOPMENT AS A FACTOR OF MATERIAL AND PASSENGERS FLOW GENERATION IN REGION'S LOGISTICS SYSTEM

The issues of regional development continue to remain one of the most important tasks in the Russian Federation. Nowadays, one of the key problems in regional development is uneven or irregular development of certain municipal subdivisions of the region. It should be noted that the inequality of constituent subsystems is inevitable during the functioning of any socio-economic system. It is manifested in all areas of human life and activity: at the level of development of regions and industries, at the level of education and income of the population, at the level of consumption of food and non-food products, at the level of housing provision, etc. According to G.I. Orlov, "Any inequality with optimal parameters is absolutely normal and vital phenomenon that ensures the progressive and sustainable development of society. It is inequality that encourages people to be active, creates a motivational basis for the economic development of economic entities, creates the prerequisites for the acceleration and growth of the country's overall welfare level, its economic power" [1].

Regional infrastructure includes economic, social and institutional dimensions. The economic infrastructure is understood as a complex of engineering and technical facilities and conditions that provide the necessary material, technical, financial and information prerequisites for the placement and successful functioning of economic entities [2]. Institutional infrastructure serves other sectors as a control subsystem [3]. In terms of management functions in the system of social reproduction, it is divided into several levels: the region, the industry, the urban agglomeration, enterprises [4].

The social infrastructure includes a complex of facilities for the provision of housing and communal services, health, physical education and sports, trade, catering, consumer services, the education system, cultural institutions, etc. It objectively acts not only as a factor of the development of the city, but also as a form of the very existence of urban society, so as its harmonious development [5].

The main functions of infrastructures, according to B.Z. Milner, are:

- Ensuring the unity of the elements of the infrastructure of the social, economic and institutional subsystems;
- Integration of the capabilities of various sectors of the infrastructure complex to achieve a synergy effect in realizing the goals of the socio-economic development of the territory;
- Creation of necessary reserves for unforeseen circumstances and natural disasters in the territory;
- Regulation of the infrastructure in the region [6].

The analysis of Krasnoyarsk Krai subdivisions was assessed with the usage of Gini coefficient based on the average monthly nominal wages and salaries of employees of large and medium-sized enterprises and non-profit organizations, which allows quite clearly differentiate the regions of the Krasnoyarsk Krai in terms of socio-economic development. According to this, inequality of Krai's development remains very serious (Table).

According to the survey results, the Gini coefficient for Krasnoyarsk Krai municipal subdivisons as of 2016 was 0.603, which signalizes the serious instability of region as a system. Due to the fact that Gini coefficient for Russian Federation Regions average salary totally was, according to the authors researches, 0.477, we had to mention, that inner irregularity of region's development remains much higher than in other Russian Federation's regions.

Table

Analysis of the average monthly nominal salary of employees of large and medium-sized enterprises and non-profit organizations in the municipalities of the Krasnoyarsk Krai [7]

Municipal Subdivisions	Population, thousands	Average monthly nominal accrued salary of employees of large and medium-sized enterprises and non-profit organizations, roubles		Share in total population of the region	Share in average monthly nominal accrued salary fund of employees of large and medium-sized enterprises and non-profit organizations	Difference between population share and salary fund
Abansky District	20,2	23921,5	25110,1	0,70 %	0,45 %	–0,25 %
Achinsky District	15,3	27431,7	28618,5	0,53 %	0,39 %	–0,14 %
Balakhtinsky District	18,8	22942,1	24428,2	0,65 %	0,41 %	–0,24 %
Berezovsky District	41,2	30622,9	32616,0	1,43 %	1,20 %	–0,23 %
Birilyussky District	9,8	25930,2	26537,1	0,34 %	0,23 %	–0,11 %
Bogotolsky District	10,8	22955,2	24529,9	0,38 %	0,24 %	–0,14 %
Boguchansky District	45,5	39454,3	42327,2	1,58 %	1,72 %	0,14 %
Bolshemurtinsky District	18,3	24751,8	26212,5	0,64 %	0,43 %	–0,21 %
Bolsheyuluisky District	7,6	41942,3	44139,3	0,26 %	0,30 %	0,04 %
Dzerzhinsky District	13,4	22099,3	23278,1	0,47 %	0,28 %	–0,19 %
Emelyanovsky District	48,6	39073,3	41508,3	1,69 %	1,80 %	0,11 %
Yeniseisky District	23,2	29130,7	29879,5	0,81 %	0,62 %	–0,19 %
Ermakovsky District	19,5	23781,1	24899,6	0,68 %	0,43 %	–0,24 %
Idrinsky District	11,4	23330,2	24190,8	0,40 %	0,25 %	–0,15 %
Ilansky District	24	32179,8	33842,2	0,83 %	0,73 %	–0,11 %
Irbeysky District	15,6	23792,7	25184,1	0,54 %	0,35 %	–0,19 %
Kazachinsky District	9,8	23183,9	23846,2	0,34 %	0,21 %	–0,13 %
Kansky District	25,5	19120,4	20582,8	0,89 %	0,47 %	–0,42 %
Karatuzsky District	15,2	22197,9	23304,3	0,53 %	0,32 %	–0,21 %
Kezhemsky District	21,1	37096,1	40891,4	0,73 %	0,77 %	0,04 %
Kozulsky District	16,3	28679,9	30235,5	0,57 %	0,44 %	–0,13 %
Krasnoturansky District	14,2	20706,6	21292,6	0,49 %	0,27 %	–0,22 %
Kuraginsky District	45,5	23992,4	24720,6	1,58 %	1,00 %	–0,58 %
Mansky District	15,8	23789,1	24376,2	0,55 %	0,34 %	–0,21 %
Minusinsky District	26	21770,1	23100,4	0,90 %	0,54 %	–0,37 %
Motyginsky District	14,6	40059,1	43547,1	0,51 %	0,57 %	0,06 %
Nazarovsky District	22,4	19271,2	20707,9	0,78 %	0,41 %	–0,36 %
Nizhneingashsky District	29,8	24685,7	25080,2	1,04 %	0,67 %	–0,37 %
Novosyolovsky District	13,1	22721,0	23925,5	0,46 %	0,28 %	–0,18 %
Partizansky District	9,4	26541,2	27188,3	0,33 %	0,23 %	–0,10 %
Pirovsky District	7	24694,9	25123,6	0,24 %	0,16 %	–0,09 %
Rybinsky District	31,3	28649,9	30399,1	1,09 %	0,85 %	–0,24 %
Sayansky District	10,9	23182,8	23786,8	0,38 %	0,23 %	–0,15 %
Severo-Yeniseisky District	11,4	74392,4	82776,7	0,40 %	0,84 %	0,45 %
Sukhobuzimsky District	20	21404,5	22684,0	0,70 %	0,40 %	–0,29 %
Taimyr Dolgano-Nenets Okrug	32,3	59299,8	64811,8	1,12 %	1,87 %	0,75 %
Taseevsky District	11,6	22778,9	23792,5	0,40 %	0,25 %	–0,16 %

Turukhansky District	16,3	63241,2	66524,1	0,57 %	0,97 %	0,40 %
Tyukhtetsky District	8,2	23564,1	24063,3	0,29 %	0,18 %	–0,11 %
Uzhursky District	31,5	25642,1	27182,2	1,10 %	0,76 %	–0,33 %
Uyarsky District	20,9	28475,4	28284,7	0,73 %	0,53 %	–0,20 %
Sharypovsky District	14,4	45876,8	40803,8	0,50 %	0,52 %	0,02 %
Shushensky District	32,3	22953,0	23951,3	1,12 %	0,69 %	–0,43 %
Evenkiysky District	15,3	50385,8	53696,6	0,53 %	0,73 %	0,20 %
Achinsk	106,3	30391,1	32718,6	3,70 %	3,10 %	–0,59 %
Bogotol	20,2	33669,7	35395,0	0,70 %	0,64 %	–0,06 %
Borodino	16,2	30003,1	33230,6	0,56 %	0,48 %	–0,08 %
Divnogorsk	33,2	30265,1	31998,5	1,15 %	0,95 %	–0,21 %
Yeniseysk	18	32480,5	33214,8	0,63 %	0,53 %	–0,09 %
Kansk	90,2	26257,8	27339,0	3,14 %	2,20 %	–0,94 %
Krasnoyarsk	1083,8	39671,9	41715,3	37,69 %	40,36 %	2,66 %
Lesosibirsk	64,5	29704,2	32536,5	2,24 %	1,87 %	–0,37 %
Minusinsk	71,3	27315,1	28099,5	2,48 %	1,79 %	–0,69 %
Nazarovo	50,4	27801,0	28922,5	1,75 %	1,30 %	–0,45 %
Norilsk	178,7	76465,7	82991,9	6,21 %	13,24 %	7,02 %
Sosnovoborsk	39,4	27157,3	28397,7	1,37 %	1,00 %	–0,37 %
Sharypovo	46,8	27100,1	28767,4	1,63 %	1,20 %	–0,43 %
CATF Zheleznogorsk	93,1	40675,2	42679,5	3,24 %	3,55 %	0,31 %
CATF Zelenogorsk	62,5	36026,5	38197,6	2,17 %	2,13 %	–0,04 %
CATF Solnechny	10	25167,3	25428,3	0,35 %	0,23 %	–0,12 %
Kedrovy	5,5	21674,0	22568,6	0,19 %	0,11 %	–0,08 %

Source: Administration of the Federal State Statistics Service for the Krasnoyarsk Territory, the Republic of Khakassia and the Republic of Tuva.

Due to the fact that every functioning system tends to stabilize, the confirmed inequality has to generate the material and passengers flows in Krasnoyarsk Krai as a regional logistics system. The following districts with the largest superiority in salary fund demonstrate above the population share: Norilsk, Krasnoyarsk, Taimyr Dolgano-Nenets Okrug, Severo-Yeniseisky District and Turukhansky District – are becoming the points of concentration for passengers flows from other subdivisions, especially deindustrialaized industrial Krai's cities. In addition, the subdivisions mentioned had to generate the largest material flows directed to the subdivisions with the largest population share.

Taking everything into account, we had to mention that inequality becomes the factor that ensures system interaction within the region. However, it needs the up-to-date logistic infrastructure functioning to serve the material and passengers flows. Otherwise, inequality of region's subdivisions development will cause the depopulation of major part of the region, as well as their exclusion from region's economics.

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SUPPORTING AND STIMULATING MECHANISMS FOR THE DEVELOPMENT OF HIGH-TECH PRODUCTION IN COOPERATION WITH INTERNATIONAL PARTNERS: PROBLEMS OF CHOICE FOR THE TECHNOLOGICAL VALLEY

Presentation of the investment project Technological Valley to create a complex of enterprises of the aluminum production high redistribution products in Krasnoyarsk and Khakassia was held in April 2018 at the Krasnoyarsk Economic Forum [1].

The objectives of this project are:

- market development and stimulation of demand for finished products using aluminum;
- assistance in import substitution;
- creation of a favorable investment climate for new productions;
- reducing the risks of investors interested in this project;
- development of export of new aluminum based technological products;
- expanding the use of aluminum in new industries and new products creation.

Figure 1 shows a list of potential investment projects in the Technological Valley.

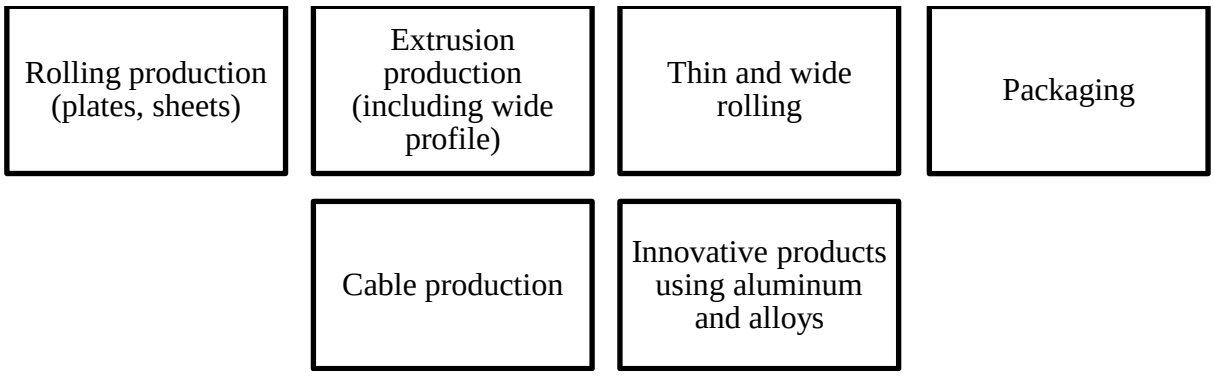

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Fig. 1. List of investment projects of the Technological Valley

The planned assortment of finished products of the Technological Valley includes 14 directions:

- Forged goods and forged wheels;
- Auto components (transmission, engines);
- Semi-finished products (sheet, profile) for transport engineering and shipbuilding;
- Rolling stock for freight rail transport (hoppers, gondola cars);
- Wide profile for passenger cars VSM (“swallow”);
- Furniture (including profile for office furniture);
- Consumer goods (tableware);
- Bridge structures;
- Building and finishing materials (facade panels, window and door constructions);
- Profiles for greenhouses;
- Cable products (including with the use of innovative materials);
- Frames for solar panels;

- Foil on paper or plastic basis to produce packaging;
- Sports goods.

The opportunities to establish an effective interaction of persons who can influence the development of the technological potential of Siberia through aluminum production are being considered for several years. Thus, the assessment of such opportunities in the Krasnoyarsk Krai showed the existence of the relevant prerequisites for establishing such interaction: the prerequisites on the part of aluminum industry business and manufacturing enterprises; prerequisites on the part of the authorities and the business environment, based on the infrastructural and regulatory prerequisites [2].

At the same time, the success of the Technological Valley project, which provides for the development of new high-tech competitive productions in demand on the domestic and foreign markets, is connected with the need to balance the interests of all participants in the Technological Valley cluster and the territory where it is located, and with the creation of attractive conditions for joining new Russian and international participants.

The authors identified the most perspective mechanisms for cooperation between high-tech aluminum industries with international partners. That classification is based on the analysis of existing mechanisms for supporting and stimulating participants in high-tech clusters in Russia and other countries.

The developed classification includes the following main directions:

Regulatory and legal mechanisms for supporting and stimulating the development of high-tech industries, which regulate the innovation cycle of converting scientific knowledge into innovation.

Each stage of the innovation cycle requires a legislative approach, as it involves the emergence of ideas, fundamental and applied research, the development of industrial designs, the commercialization of innovative ideas, the production and marketing of innovative products for the deep processing of aluminum and its alloys. Each stage carries a certain relationship that needs legal regulation [3].

At present, the capacity of the domestic market of non-ferrous metals and products from them is determined by the state of the main consuming sectors: construction, consumer goods and packaging, electrical engineering, engineering, and ferrous metallurgy (Fig. 2).

At present, the growth in aluminum consumption in Russia is possible only through the implementation of a comprehensive program to stimulate demand.

On November 28, 2016 the Russian government approved a plan to stimulate demand for high-conversion aluminum products. Starting from 2017 relevant Ministries and Departments have been working on a number of measures that, according to the conservative scenario, will lead to an increase in domestic consumption of aluminum by 505,000 tons per year by 2020.

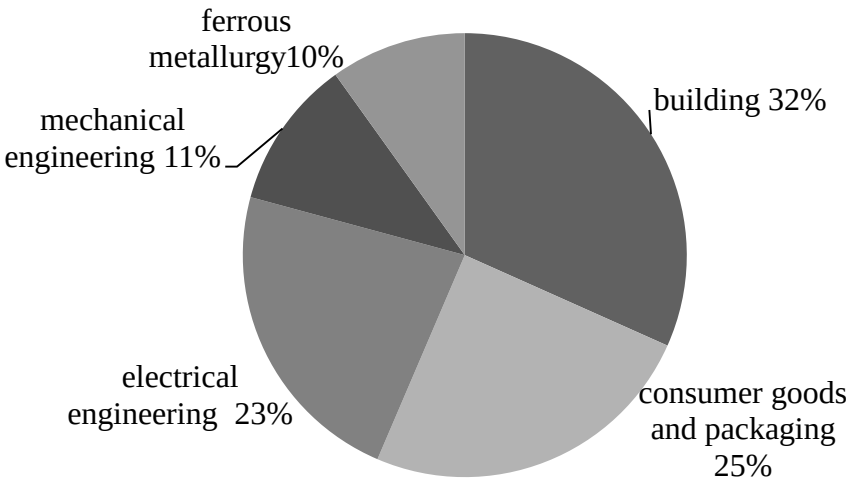

Fig. 2. Structure of aluminum consumer industries in the Russian Federation [4]

At present, the growth in aluminum consumption in Russia is possible only through the implementation of a comprehensive program to stimulate demand.

On November 28, 2016 the Russian government approved a plan to stimulate demand for high-conversion aluminum products. Starting from 2017 relevant Ministries and Departments have been working on a number of measures that, according to a conservative scenario, will lead to an increase in domestic consumption of aluminum by 505,000 tons per year by 2020.

The proposals under development relate to the measures aimed at increasing aluminum consumption in engineering, aircraft construction, shipbuilding, automotive and road construction, energy and car building. At present, the proposals are included into federal strategies and programs for the development of the above industries (Table).

Table

Federal sectoral strategies for the economic sectors development [5]

Industry	Document
Metallurgical industry	Order of the Ministry of Industry and Trade of the Russian Federation of 05.05.2014 No. 839 "On the Approval of the Strategy for the Development of the Russian Steel Industry for 2014-2020 and for the Future up to 2030 and the Strategy for the Development of Non-Ferrous Metallurgy in Russia for 2014-2020 and For The Future Till 2030."
Mechanical engineering	Order of the Ministry of Industry and Trade of the Russian Federation of 09.12.2010 No. 1150 "On the Approval of the Strategy for the Development of Heavy Machinery for the Period up to 2020."
Aircraft construction	Decree of the Government of the Russian Federation of April 15, 2014 No. 303 "On the Approval of the State Program of the Russian Federation on the Development of the Aircraft Industry for 2013-2025."
Shipbuilding	Order of the Ministry of Industry and Energy of the Russian Federation of 06.09.2007 No. 354 "Strategy for the Development of the Shipbuilding Industry for the Period to 2020 and for the Future."
Building	Order of the Government of the Russian Federation of 10.05.2016 No. 868-R "On the Strategy for the Development of the Building Materials Industry for the Period to 2020 and Further Prospects until 2030."
Electronics	Order of the Ministry of Industry and Energy of the Russian Federation of 07.08.2007 No. 311 "On the approval of the Strategy for the Development of the Electronic Industry of Russia for the Period Till 2025."
Power Grid Complex	Order of the Government of the Russian Federation of 03.04.2013 No. 511-R "On the Approval of the Strategy for the Development of the Power Grid Complex of the Russian Federation."
Power Engineering	Order of the Government of the Russian Federation of 13.11. 2009 No. 1715-R "On the Energy Strategy of Russia for the Period Till 2030."

In addition, measures to stimulate domestic demand for aluminum through the creation of import substitution programs are being developed. So, on April 25, 2018 the Ministry of Industry and Trade approved Order No. 1665, which includes a plan of measures for import substitution in the non-ferrous metallurgical industry of the Russian Federation. The plan provides a list of priority non-ferrous metals, their compounds and alloys, products of high conversion, new production technologies in non-ferrous metallurgy, as well as related products, raw materials and materials.

In addition to that, import substitution programs have been developed in the following areas, where it is possible to use aluminum and its alloys:

- building materials and building structures;
- heavy engineering;
- radio electronic industry;
- ferrous metallurgy;
- aircraft construction;
- power engineering, cable and electrical industry;
- automotive industry;
- shipbuilding.

According to the forecasts of the Ministry of Industry and Trade of the Russian Federation, traditionally high demand is expected for aluminum to produce cable products, with a characteristic feature of the predominant growth in consumption of this metal compared with copper. Taking into account the implementation of the program for the modernization of the electric power industry, the use of aluminum by 2020 will amount to at least 350,000 tons (a twofold increase compared to 2012) in the framework of the reconstruction of old and the construction of new overhead power lines using self-supporting wires.

The demand for high-tech aluminum products will also increase in connection with the implementation of the United Aircraft and United Shipbuilding Corporation's Development Strategy and the Strategy for the Development of Railway Transport until 2030, which will ensure a more balanced structure of consumption of aluminum semi-finished products by the types of products and economy sectors.

The forecasted development of the aircraft construction and shipbuilding, power engineering, road and rail transport will increase the demand for aluminum semi-finished products, primarily in the machinery sector. Its share in 2020 will increase to 20 %.

This will be accompanied by an increase in demand for the high-tech products: large-size aluminum plates (including for export deliveries to major aircraft-building foreign companies Boeing and Airbus) and forging and stamping production for the implementation of projects for aviation; aluminum drill pipes, including drilling for ultra-deep wells for the oil and gas industry development.

The trend of increasing demand for aluminum rolled products for the production of packaging, for pressed profile products and sheet products for construction (annual growth in demand for aluminum profiles is at least 10 %) will continue as well. By 2020, the demand for aluminum construction profiles may increase by 1.7 times to 400 thousand tons.

One of the most important tasks for developing the domestic market of aluminum construction structures is the substitution of the imported products by the domestic ones. Increasing the competitiveness of Russian products is associated with a fundamental improvement in its quality through the use of highly efficient equipment and technologies that allow the production of designs of any complexity category and a wide range of colors.

Thus, the extension is expected in the following areas:

- the use of aluminum products in the aircraft construction sector, taking into account the prospects for technological development and changes in the product line;
- the use of aluminum products in construction, in particular, pressed pipes and profiles of aluminum alloys, with the introduction of changes in national standards and building codes and rules with a view to unifying requirements with European technical standards;
- the use of high-temperature aluminum wires in the construction of overhead transmission lines, as well as aluminum wires in housing construction;
- the use of aluminum powders and powders in paint and varnish coatings when applied to industrial, transport and infrastructure facilities, as well as to increase the production and consumption of aluminum drill pipes.

1. Financial mechanisms for supporting and stimulating the development of new high-tech industries include direct or indirect financial investment in the creation of products for the deep processing of aluminum and its alloys.

Direct financing will include the budget allocations to the participants of the Technological Valley through the opportunities to provide government contracts for R&D, grants, loans for the implementation of innovative projects, contributions to equity capital, government guarantees for the issuance of loans, etc. The mechanisms of indirect incentives will create favorable conditions for the implementation and development of new high-tech industries that provide economic, financial or administrative benefits for the cluster members. Thus, it is planned to introduce a special mode of doing business in the Technological Valley in accordance with Federal Law No. 116 "On Special Economic Zones in the Russian Federation", which will reduce the level of tax

burden for local enterprises, import duties on equipment, components and materials imported into the territory, as well as export duties on finished products exported outside the Customs Union [6].

2. Public-private partnership as an instrument for stimulating the development of new high-tech industries for the deep processing of aluminum and its alloys.

3. Mechanisms for attracting foreign partners to a high-tech cluster: acceleration and increase of information transparency of transaction negotiation procedures, mechanisms for tax incentives for foreign investments, measures to develop the infrastructure for attracting foreign investments.

35 major projects are being currently implemented in the area of non-ferrous metallurgy alone, with the use of public-private partnerships and foreign investments.

The main task of the state here is to promote investment processes, develop project options for financing the new production facilities construction, create additional opportunities for participants, and solve tasks that a business can not solve on its own: the implementation of infrastructure projects within public-private partnerships that have a significant multiplier effect; implement measures to protect Russian producers in the domestic and foreign markets.

Thus, the use of these mechanisms will allow activating the value chains in the cluster management of the process of creating high-tech productions for the deep processing of aluminum and infrastructure for accessing the world's national commodity markets for potential participants.

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THE IMPACT OF NEW FACTORS OF ECONOMIC DYNAMICS ON THE RUSSIAN AND CHINESE ECONOMIES: THE COMPARATIVE ASPECT

Under conditions of contemporary world economic system transformation, some processes in global economy influence countries strongly [2; 4]. Structural and institutional changes have led to changes in the structure of aggregate demand and its sensitivity to various factors and, thus, to a change in the mechanisms of the crisis. The propagation velocity of the crisis and the cyclical vulnerability of national economies has increased due to globalization. Broader government intervention has raised the manageability of the economy, allowed to achieve some smoothing of fluctuations. However, the state control over the markets has not eliminated financial bubbles but has led to their complication.

The consequences of the world financial and economic crisis lead to the slowdown in the world economic dynamics, the upward revision of risk evaluation by economic agents, strengthening the state intervention in national economies. A large-scale nationalization of commercial companies was carried out during the crisis. It referred primarily to banks, that suffered most from the financial instability [5]. Macroeconomic dynamics decelerated in most countries due to these factors, but in Russia and China they imposed on different structural and institutional features.

GDP of China continues to grow faster than the global average, which shows the efficiency of the Chinese economic model. Russian GDP has overcome several downturns in 2009, 2015 and 2016. A serious challenge for the Russian economy was the fall in oil prices in 2014 and 2015. A higher share of industry in GDP is characteristic for China (40 % vs. 32 % in Russia in 2016), the country is a “global factory”. China has advantages in telecommunication, electrical household appliances, textile and food industry [6]. Raw materials occupy the largest share of Russian exports, but the country is a leader in some high-tech industries, such as nuclear energetics, defense and space industry. The importance of foreign trade for the two countries is almost equal – at the end of 2016, the foreign trade quota amounted to 37 % in Russia and 33 % in China. The major importance of foreign trade is typical for developing countries and corresponds to the results of the research [1].

The trade turnover between the two countries can be increased in the future. Reorientation of trade to the East is possible in Russia because of political conflicts and economic sanctions. The trade turnover between Russia and China in 2017 grew by 31.55 % compared with 2016. The main product of Russian export was mineral resources (67.8 %). The main product of Chinese export was machinery, equipment and vehicles (59 %). Possible technical dependence of Russia from China may cause a technical gap between both countries and the developed world.

The main trend for the Chinese economy is liberalization. This poses the problem of overcoming inflation, though its level is not very high (Fig. 1). For the Russian economy inflation is also a problem due to its inefficient structure. Both countries can share their experience of anti-inflation policy.

The share of household consumption expenditures is stable in both countries and is higher in Russia (Fig. 2). We can assume that China still has reserves of stimulating the aggregate demand, while in Russia its possibilities are exhausted.

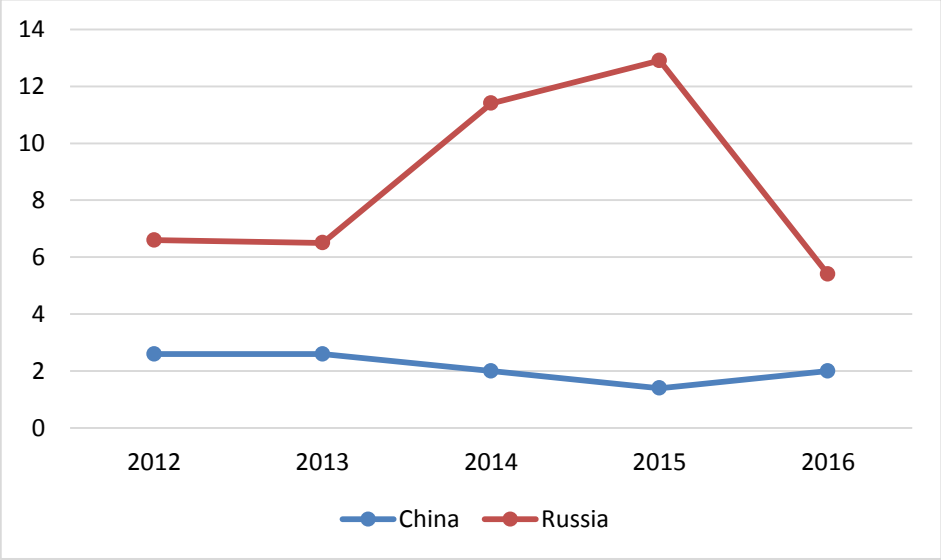

Fig. 1. The inflation rate in China and Russia, 2012–2016 [3]

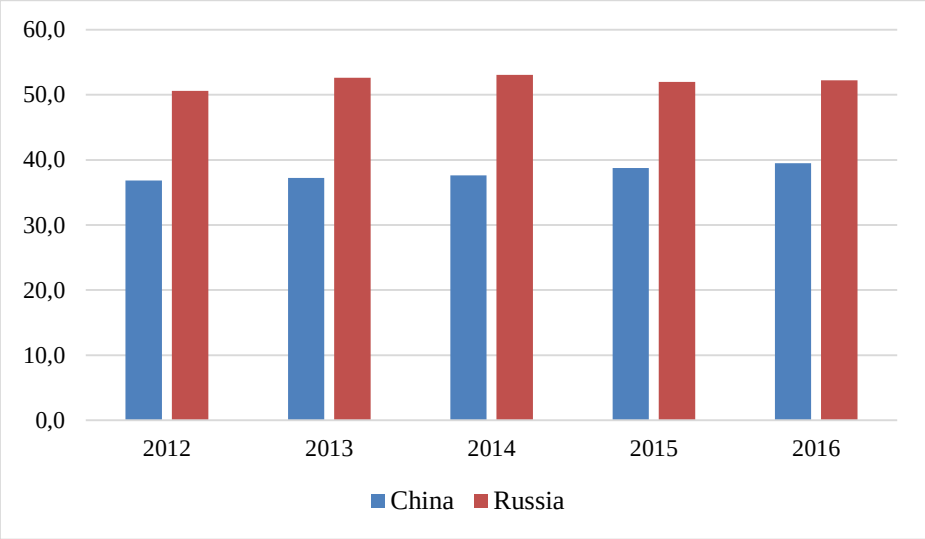

Fig. 2. The share of household consumption expenditures in GDP in China and Russia, 2012–2016 [3]

With global slowdown and declining terms of trade, the two countries – Russia and China – turned to domestic economies. China with large population and low standard of living placed a bet on stimulating domestic demand. PRC government develops social security, including pension provision, implements programs of subsidies to buyers, reduces import duties, carries out major infrastructure projects and creates access to credit for the private sector. However, the share of consumption in the GDP of China remains one of the lowest among developing countries. This fact shows an important structural imbalance that has not yet been overcome [7]. Low-income population tend to save more and spend less to prevent themselves from poverty. These people may not respond to the incentives to spend more. The development of the PRC's economy will be determined by the success of the measures to stimulate domestic demand and increasing the share of consumption in GDP.

Russia, which faced the imposed economic sanctions, choses promotion of domestic supply as a priority. State support was allocated to agricultural and industrial enterprises, administrative and financial costs of small and medium-sized business were reduced, programs of import substitution were implemented. However, the cost of the anti-crisis plan was reducing in 2015 –

2017 due to the lack of budget funds [8–10]. The anti-crisis measures were non-transparent according to the formation procedure, unconnected to specific goals and not thought out in advance. They contained risks of inflation acceleration, withdrawal of funds from the real sphere in the financial sphere, corruption and inefficiency.

Differences in the institutional environment force Russia and China to apply almost opposite measures to overcome the same crisis. The author of the present article argues that the selected anti-crisis measures in Russia and China were unerring and timely. Nevertheless, they contain certain dangers. Consumer demand stimulation in China can be unsuccessful because of the tendency not to spend, but to save, which is characteristic for the low-income population. In case of success these measures can cause overheat of the economy. Promotion of domestic supply in Russia may not work because of downsizing and haphazardness of the measures taken. Paying more attention to institutional and structural factors becomes an important part of strategy for the Russian and Chinese governments.

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ADVANCE IN PYROLYSIS AND GASIFICATION OF MUNICIPAL SOLID WASTE

With the development of urban construction, the level of urban population and residents has been continuously improved, and the generation of urban living garbage has increased day by day. The harm of garbage to the environment is also increasingly serious. This article analyzes the status of the global waste disposal technology, its development trends and related laws and regulations.

1. The production and pollution of municipal solid waste

1.1. Country situation

Japan's domestic waste production is about 45 million tons/year, western Europe is about 100 million tons/year, and the United States has exceeded 200 million tons/year. The annual amount of urban waste produced by countries in the world is not only large but also has a rapid growth rate. For example, the annual growth rate of the Netherlands is 3 %, Israel 5 %, Sweden 2 %, the United States 8.4 %, Japan 5. Overall, the annual growth rate of urban garbage in industrial countries in the world is 3.2-4.7 % [1].

2. Pyrolysis technology

2.1. Definitions and Inevitability

Pyrolysis is a fuel substance (solid carbon, combustible) that is heated to above 500 degrees and decomposed into smaller biomass molecules by thermochemical reactions in the absence of oxidants (air, oxygen, water). Rubbish contains a large number of perishable substances, and the gas generated by pyrolysis is neutral. In the absence of oxygen or low oxygen conditions, it can prevent the production of dioxins and has the characteristics of complete detoxification and sufficient resources [2].

2.2. Classification

2.2.1. The Purox system is a typical internal thermal moving bed. The process does not require the pretreatment of garbage, the process is simple, and the organic matter is completely decomposed [3].

2.2.2. CAO system. The CAO (Controlled Air Oxidation) system was developed on the Martin Furnace incinerator technology and by Canadian Reuters. It has more than ten years of operational experience. The CAO process features are: (1) refuse does not require pretreatment, but to control the moisture content; (2) compact structure, small size, the use of fixed grate, lower cost; (3) strong adaptability to waste changes; (4) emissions can meet national requirements.

2.2.3. Landgard system. This system is a typical rotary kiln pyrolysis system. It was designed and researched by the Monsanto Company of the United States. It has the characteristics of strong adaptability, large processing capacity, etc. However, rotary kiln is bulky and has large investment.

2.2.4. Multi-chamber heat storage waste heat solution process. This process features: (1) multi-compartment structure instead of single-chamber structure breaks through the single-chamber processing capacity is low, can not deal with the large-scale waste defects; (2) under high temperature conditions it can directly play a role in sterilization and disinfection; (3) this process can not only treat municipal waste, but also treat agricultural waste; (4) the use of advanced regenerative combustion technology not only greatly improves the combustion

efficiency and reduces environmental pollution, but can also reduce the use of gas and supply more gas to the outside world [4].

2.3. Advantages of pyrolysis technology

First, the organic matter in the pyrolysis process is converted into a usable energy form, which produces gas and tar that can be used for different needs;

Second, the pollution control can be simplified.

Third, most of the harmful components such as sulfur and heavy metals in garbage are fixed in carbon black, and metals can be recovered from them to further reduce environmental pollution;

Fourth, it can handle wastes that are not suitable for combustion [5].

3. Successful application of waste pyrolysis technology in Tehran power generation project in Iran

3.1. Project overview

The project was successfully connected to the grid in February 2015. From the perspective of the overall operation of the project, the use of pyrolysis gasification technology in line with Iran's national conditions, and reached the initial design of the indicators, was highly recognized by the Iranian government. As a demonstration project, due to the reliable and stable operation of equipment, Iran will continue to invest in the construction of a number of garbage incineration power generation projects in Iran to ease the growing domestic waste problems in Iran [6].

3.2. Project operation analysis

The Tehran project process system consists of a waste in-feed system, a pyrolysis gasification incinerator system, a waste heat utilization (power generation) system, a flue gas purification treatment system, an ash disposal and collection system, a fly ash solidification system, and a sewage treatment system (including landfill leachate processing), electrical systems, automatic control systems, and online monitoring systems. Through the use of waste heat from high-temperature flue gas, the recycling of waste incineration is implemented.

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POTENTIAL OF SOUTH SIBERIA FOR INTERREGIONAL COOPERATION

The article discusses the potential of South Siberia for inter-regional cooperation from the point of view of the potential development of the agricultural cluster in the South of the Krasnoyarsk Krai. In particular, the urgency of creating an agro-industrial cluster in the southern district of the Krasnoyarsk Krai, the Republics of Khakassia and Tuva is considered. The authors selected the types of priority raw materials for its further processing, based on the share in the volume of production in the Krasnoyarsk Krai to obtain finished products of high added value in the agro-industrial cluster.

***Keywords**: South Siberia, potential for interregional cooperation.*

The southern group of districts of the Krasnoyarsk Krai has a predominantly agricultural type of management: agriculture accounts for 2/3 of production and 1/3 of industrial production, the structure of which in turn is 60 % of food production, mainly in the enterprises of Minusinsk.

Most of the volume of agricultural production in this group of areas is formed of Kuraginsky, Minusinsky and Krasnoturansky districts.

The competitive advantage of the South of the Krai is the unique agro-climatic potential of the Minusinsk basin where it is located. Therefore, the key direction of the economic development of the territory in the long term will continue to be the agro-industrial complex.

Despite the significant amount of strategic documents at the level of the Russian Federation and regions for the development of agricultural production, competitiveness, creating conditions for the development of small business and presence of significant state support for investment projects of agribusiness development, there are no qualitative processes of technological transformations in the agro-industrial complex of the Krai and improving the quality of life of the population of rural areas.

The main problems of the low effectiveness of the implementation the support programs can be identified as follows:

- orientation of policy documents to support local investment projects that are highly specialized in certain types of agricultural activities, which often affect the complex nature of the production of certain local types of agricultural resources, deep processing and sale of products without interaction with other types of agricultural resources;
- completion of the state support financing after implementation of the investment project on the terms defined in the program document without further support before reaching stable profitability indicators;
- lack of developed mechanisms of network and cluster interaction, integrating highly specialized investment projects into a single complex, allowing to combine the resource potential (production, financial, economic, human, organizational) of various participants in closed cycles of deep processing of agricultural resources, promotion to the commodity markets and organization of work with different segments of consumers.

The lack of mechanisms of the agricultural production cooperation at the stages of the products life cycle in the strategic documents of the development of agriculture leads to:

- reduction in the number of large agricultural organizations and growth in the number of small farms and individual producers;
- increase of uneven conditions and level of development of territories, certain activities and organization of agro-industrial business;

- focus on own sources of financing due to high interest rates of credit resources;
- the lack of innovation by small businesses;
- the extremely low level of quality of life in rural areas and the outflow of young people, as the factors that are hindering the development of agro-industrial business.

These negative factors have an adverse impact on the production process in the agricultural sector of the Krai. These and other challenges require new approaches to address them, and they must be comprehensive.

According to the authors, the development of special management mechanisms and tools of network and cluster interaction aimed at effective cooperation of agricultural production at the stages of the product life cycle is a key aspect in ensuring the expansion and activation of the development of agro-industrial production in the Krai at a qualitatively new level.

To determine the promising directions for the organization of the agro-industrial cluster, a study was conducted of the largest agricultural enterprises engaged in the production of basic agricultural raw materials in the South of the Krasnoyarsk Krai.

Table 1 shows the dynamics of production of agricultural raw materials and products of its primary processing enterprises of the southern group of districts of the Krasnoyarsk Krai.

Table 1

Dynamics of production of agricultural raw materials and products of its primary processing enterprises of the southern macro district of the Krasnoyarsk Krai [1]

Products, centner	Period		
	2014	2015	2016
Grain	2 552 000	1 743 000	2 023 000
Flour, cereals, bran and other products of grain processing	474 000	633 000	360 000
Mixed fodder	438 610	302 270	171 993
Vegetables	92 000	129 000	145 000
Rapeseed	124 000	69 000	121 000
Meat and fat (including by-products) in slaughter weight	80 000	95 000	76 000
Potato	73 000	47 000	39 000
Soybeans			6 000
Sunflower		2 000	5 000
Leather raw materials of all kinds of animals	2 608	1 807	2 241
Vegetable oil	7000	10 000	2 000
Fruit and berries	200	300	600
Saffron milk cap	422		170
Honey	5	3	2

Among the presented products, the largest volumes of 100 thousand centner are rapeseed, vegetables and potatoes, fodder, flour, cereals, bran, grain and other products of its processing. It is worth noting that in 2016 compared to 2015 there was an increase in production volumes for such products as vegetables (growth rate of 12 %), grain (growth rate of 16 %), leather raw materials (growth rate of 24 %), rapeseed (growth rate of 75 %), fruit and berries (growth rate of 100 %), sunflower (growth rate of 150 %).

For the selected products for the purpose of its further deep processing in the allocated territory the authors made the decision to calculate their share in the general production in all areas of the Krasnoyarsk Krai. The share of 10 % was established as a threshold value. If the share of the products produced by the enterprises of the southern group of the Krai in the general regional production in 2015–2016 is more than 10 %, then this product is considered as a priority raw material for further deep processing.

Table 2 presents two lists of products – with a share of up to 10 % in the total production and with a share of more than 10 % respectively. Thus, the most priority types of the raw materials for further deep processing are rapeseed, soybeans, sunflower, fruit and berries, vegetable oil, meat and fat (including by-products), milk, ginger, flour and cereals.

Table 2

The share of production of raw materials and products of its processing in the southern group of districts of the Krasnoyarsk Krai in the total regional production, 2016 [1]

The value to 10 %	The value from 10 %
Potato – 7,9 % Leather raw materials of all kinds of animals – 4,4 % Mixed fodder – 4,2 % Vegetables – 2 % Honey – 2,7 %	Sunflower – 100 % Saffron milk cap – 100 % Soybeans – 95,4 % Fruits and berries – 80 % Rapeseed – 41,7 % Meat and fat (including by-products) in slaughter weight – 29 % Milk – 25,3 % Vegetable oil – 21,5 % Flour, cereals, bran and other products of grain processing – 13,8 % Grain – 10,5 %

As for sunflower oil, its market in the Krasnoyarsk Krai is saturated with federal brands. Therefore, in this case, it is necessary to consider the possibility of production of sunflower oil products such as phosphatide concentrate and lecithin, which are widely used in various sectors of food industry: confectionery, margarine and dairy, but are imported due to the lack of their production in the Krasnoyarsk Krai.

The development of the lecithin market is promising, as indicated by the positive dynamics of the world volumes of its exports and imports. Over the last 5 years the volume has grown to 42-45 % on average [2].

The developing market in the Krasnoyarsk Krai is the market of ginger oil. Although currently the culture of this product consumption has not been formed in Russia, but limited liability company “Zarya” has been engaged in its production in the South of the Krasnoyarsk Krai for three years.

Production of soybean in the South of Krasnoyarsk Krai takes place in four districts: Ermakovsky, Kuraginsky, Minusinsky and Shushensky.

Currently, the entire volume of soybean production is used as a feed additive (soybean meal) for livestock and poultry. While in addition to feed additives, the products of deep processing of soybeans with increasing production capacity can include oil, edible soy proteins (soy flour, textured soy proteins, concentrates, isolates) and traditional soy products (soy milk, tofu, etc.). There is a significant potential for the increased consumption of soy proteins in the baking industry, in the production of functional food and in pharmaceutical industry. Soy proteins in Russia are rarely used for technical purposes (production of plywood, paints, adhesives, etc.) [3].

In cooperation with the enterprises of the Republic of Khakassia it is possible to organize production and processing of fruit and berries (e.g. conservation), including growing fruit, berries and ornamental crops in the South of the Krasnoyarsk Krai, as Federal State Unitary Enterprise “Minusinsk” operates in Minusinsky district.

As for rapeseed, about 20 enterprises are engaged in its cultivation in the South of the Krasnoyarsk Krai. Every year a significant part of the rapeseed enterprises of the Krasnoyarsk Krai is exported to China. Foreign enterprises use rapeseed as a raw material to produce animal feed, oil and biodiesel. Rapeseed oil is also in demand on the world market [2; 4].

The share of meat production (including by-products) in the slaughter weight at the enterprises of the southern microdistrict was 29 % in the total regional production in 2016. The share of milk production in 24 enterprises of the southern district is 25.3 %.

On the border with the South of the Krasnoyarsk Krai, there are territories of the Russian Federation that dominate in the following areas:

Cattle breeding – enterprises of the Republic of Khakassia.

Sheep and goat breeding, horse breeding in herds, reindeer herding, Yak breeding – the Republic of Tuva.

Thus, the authors propose to consider the possibility of creating a meat and milk cluster in the South of the Krasnoyarsk Krai in partnership with these territories.

As for cereals, wheat accounts for the largest share of their gross harvest. The authors propose to consider the possibility of creating production for deep processing of wheat grain in partnership with the companies of the Western macro-district. The relevance of this direction is determined by the fact that based on different technologies wheat can be extracted in the following types of currently relevant products, both in Russia and abroad: dry gluten, glucose-fructose syrups, different types of starches, glucose, sodium glutamate, lysine, organic acids, bioplastics, etc.

Currently, the domestic market of lysine consumption is growing rapidly, which is associated with the development of poultry and pig consumption. Lysine is an essential amino acid that increases the digestibility of feed and affects the productivity, weight gain and intensity of fattening.

In addition, the consumption of citric acid, glucose-fructose syrups and modified starches is also growing. There is a wide scope of application for starches: food, pulp and paper, pharmaceutical, textile, oil and gas industries. According to various estimates, about 60 % accounts for non-food use.

Glucose-fructose syrups are used in the food sector as substitutes for sugar. The areas of glucose application are food, pharmaceuticals and biotechnology.

World markets for biofuels (bioethanol) and biodegradable plastics, based on lactic acid, are growing rapidly. Since the Russian legislative system does not provide an incentive for their development, it is worth considering the possibility of producing these goods for net exports abroad.

Thus, in the territory of the southern group of districts it is possible to organize production for deep processing of the following list of products: rapeseed, meat, milk, soybeans, sunflower, vegetable oil, fruit and berries, ginger and grain. The largest enterprises where the organization of these productions is possible are located in the Kuraginsky, Krasnoturansky, Minusinsky, Shushensky and Ermakovsky districts (Tab. 3).

Table 3

Number of large companies in the South of the Krasnoyarsk Krai, where it is possible to organize the production of deep processing products for these raw materials

Products/ raw materials	Kuraginsky	Krasnoturansky	Minusinsky	Shushensky	Ermakovsky	Idrinskiy	Karatuzsky
Rapeseed	6	2	7	2	1	2	
Meat		3	6	3		1	
Soy	1		1	1	1		
Sunflower	2		1				
Vegetable oil	1		1				
Fruit and berries			1				
Saffron milk cap			1				
Milk	7	3	6	2	1	3	2
Flour, cereals	7	3	4	3	1	6	1
Grain	11	16	16	4	4	12	3

It is assumed that the organization of agrarian cluster will strengthen the role of the agricultural sector as a key sector of specialization of the southern macro-district through the development of farming, small businesses, private farms and cooperatives, the construction of new processing enterprises of food industry on local raw materials.

In addition, the products produced by the agro-industrial complex of the district will be the basis for food security of the population of the Northern regions of the Krasnoyarsk Krai.

Areas of agricultural specialization, such as cultivation of grain and livestock in Krasnoturansky, Kuraginsky and Minusinsky districts, and livestock breeding in Shushensky district will remain.

Along with the preservation of the existing agricultural activities, a new branch of specialization – processing of fruit and berries in the territory of the Minusinsk district, as well as deep processing of grain in the territories of the Kuraginsky, Krasnoturansky, Minusinsky and Idrinsky districts will be developed.

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ASSESSING METHODS OF REGIONAL INVESTMENTS SUPPORT[1]

Investments are distributed between regions extremely unevenly, the share in investments of the large areas and weakly populated regions falls (Fig.1). The situation with investments for the remote regions becomes complicated not only due to the competition from the other regions, but also due to the high transport expenses, rarefied population, absence of developed infrastructure for a greater part of the territory, high concentration of manufacture and infrastructure in the large regional centers and absence of auto roads and railways.

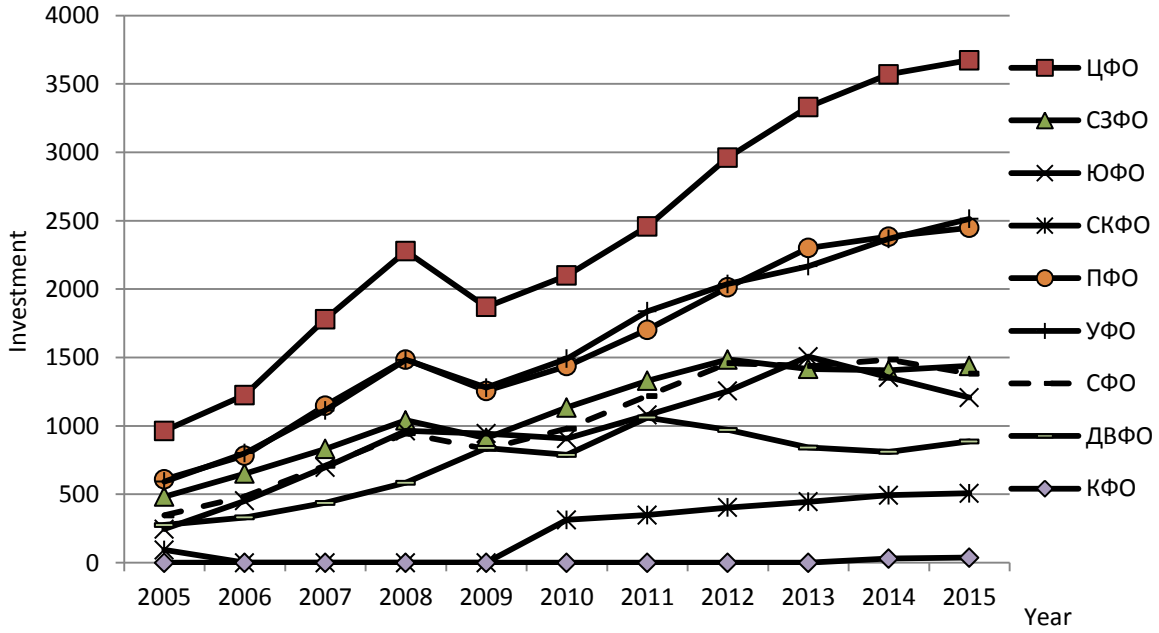

Fig. 1. Dynamics of investments into a fixed capital of federal districts (in actual prices; billion rbl.),. constructed according to [1]

The problem of attracting investments for the territories of the Siberian Federal District is complicated not only due to small population on the greater part of the territory, but due to the absence of transport and infrastructural networks and remoteness from the basic Russian and foreign commodity markets, both European and Asian (China, India, Japan, etc.).

Inflow of investments to the economies of the Russian regions is an absolute necessity for the survival of the national economy under conditions of growing competition, sanctions and external pressure of some countries. Internal sources of investments still prevail in the Russian economy. The problems constraining development of economy are often connected with the lack of investments into regional industrial and infrastructural complexes. The regions located in the Asian part of the country, in the Siberian and Far East federal districts lose competitiveness not only due to a weak home market and the big transport shoulder, but also from absence of

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developed industrial, transport, power and social infrastructure. Therefore, for the period of 2005-2015 the greatest part (more than 30 %) of investments into these regions directed towards development of transport and communication.

It is necessary to use more widely opportunities of private investments and to stimulate their arrival for attraction of investments into economy of the Russian Federation both in density populated areas, and sparsely populated territories.

The effective system of state and regional stimulating methods is required to support private investors. To attract investments, it is possible to use tools already accepted in legislation and reflected in the whole series of the state laws and programs, and also we can use new method of support caused by occurrence of sanctions. Under conditions of external pressure and limitations of financial resources the problem of investments stimulation in regions becomes the most actual as for import substitution, as for development of own manufacture.

In 2010 the order of the Ministry economic developments of the Russian Federation "About ratification of regulation about the order of preparation of conclusions about an estimation of regulatory control" from 8/31/2010, № 398 was published. There are requirements of legislative effect registered. Document was accepted at a federal level, and after a lot of even similar documents was published in regions.

There are proposed to spend calculations, foundations and forecasts of socio-economic, financial and other consequences of realization of offered decisions for estimation of regulatory control. Under estimation of the offered low it proposed to reveal and to trace the positions promoting occurrence of unreasonable charges of enterprises, other subjects and budgets of all levels in the Russian Federation. There is possible to conduct several kinds of estimation under preparing conclusion about adjusting influence: a) tentative estimation; b) the profound estimation; c) consultations.

Legal examination of laws in before and after situations and brings focus to corruption aspects of laws are basically applied for this goals, but new economic-mathematical and statistical methods begin to use. However, scale empirical researches of the Russian legislation as the tool of economic policy and its influence on economy did not meet.

The approach to research efficiency of the regional legislation on stimulation of investment activity had been developed by the author and the estimation is fulfilled. Studying of regional laws allows to collect scale statistical data about use of stimulation methods [3; 4].

The regional legislation on support of investments since 1st January of 2005 till 1th June of 2016 has been collected, processed and analysed. In total 758 regional laws and its updates have been found and processed. A source of legislative texts became a site of the Ministry of Justice of the Russian Federation, section Normative legal documents of subjects of the Russian Federation [2]. The surge of regional legislation updating is connected with innovations in the Russian economic policy. Nevertheless, it is obvious, that both peak of updating of the investments stimulation legislation in regions of the Russian Federation fall to the precritical periods 2007-2008 and 2014 (Fig. 2).

The quantity of accepted laws and their new editions strongly differs on regions. There are new versions appear in some regions every year and even several one in a year. Volgograd area is a leader by quantity of updating, it has 26 enacted versions of laws for the period, the Ulyanovsk, Vologda and Voronezh areas have more than 20 versions everyone (Fig. 3).

A dynamic panel regression of investments has allowed to estimate influence of regional legislative privileges on volume of investment. Results of estimation shows considerable number of privileges included in regional stimulated systems, which allow to significantly increasing inflow of investment in the economy of regions. The largest positive effect gives: marketing of region, retraining workers, grants for creation of infrastructure, budgetary credits and easy loans, tax privileges, industrial and other parks, budgetary investments, the state guarantees.

A line of stimulus has not significantly influence on investment, among them are state-private partnership, special economic zones and territories of advancing development, compensation to investors of the missed benefit and losses, a pricing regulation policy.

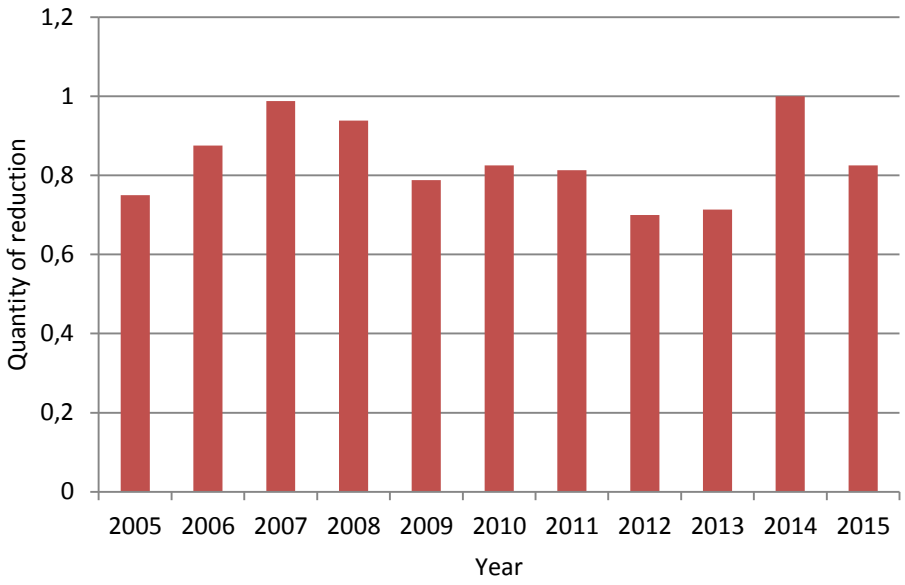

Fig. 2. Quantity of new laws and editions about stimulation of investment activity per one region, quantity of reduction / regions.

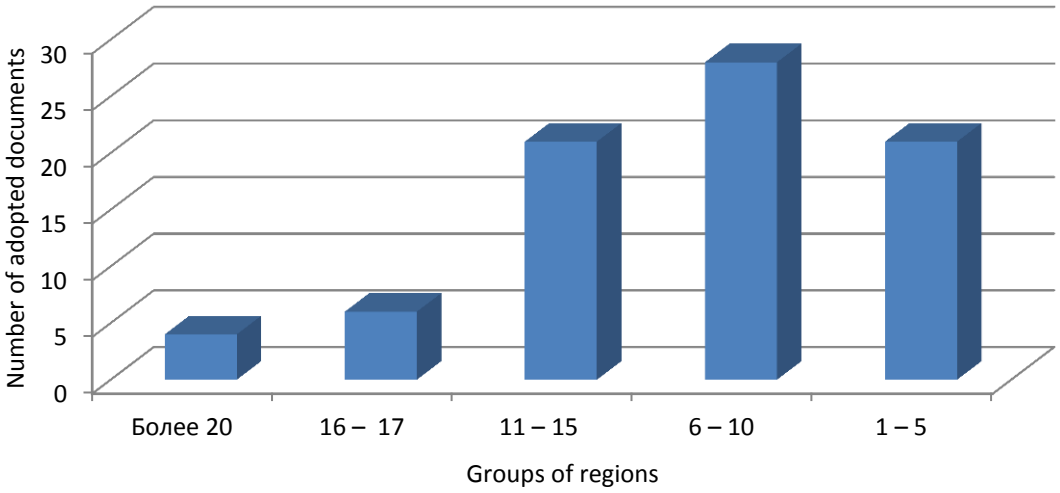

Fig. 3. Histogram of regions grouped by number of adopted documents

Same privileges have negative effect: grants from the budget, the state regional order, subsides on the electric power tariff. They are recommended to be excluded from an arsenal of support methods.

The received estimations help to generate a rating of efficiency of the stimulation methods (see Table).

Table

Rating of efficiency of the investment activity stimulation methods

Method of stimulation	Rating
Positive effect	
Marketing of region	24 (max)
Education and retrain of workers	23
Grants for creation of infrastructure	22
Budgetary credits and easy loans	21
Tax privileges (including subventions)	20
Industrial and other parks	19
Budgetary investments	18
The state guarantees	17

Method of stimulation	Rating
Collateral security	16
Indemnification of a part of leasing payments	15
Investment tax credits	14
The financial policy and the special tax mode which is not carrying individual character	13
Concessional agreements on property and confidential management	12
Unworsening conditions of investment activity	11
Concessionary terms of using the ground and other natural resources	10
Consultations, information, methodical and organizational support	9
Preferential rent of the ground areas and the real estate	8
Granting of the ground areas (building site) with the developed infrastructure	7
Formations of an investment infrastructure	6
Indemnification of a part of expenses for payment of percent under credits	5
Exhibitions and conferences	4
Assignment of the status to the investment project	3
Participation in development, promotion, appraisal and realization of investment projects	2
Subsidizing of the coupon income	1
Neutral effect	
State-private partnership	0
Special economic zones and territories of advancing development	0
Compensation to investors of the missed benefit and losses	0
Implementation of a pricing policy	0
Other forms of support	0
Customs privileges	0
Negative effect	
Grants from the budget	-1
The state regional order	-2
The tariff grant for the electric power	-3
The information on partners	-4
Re-structuring and conversion of debts in the budget	-5 (min)

It is expedient to improve mechanism of state-private partnership, special economic zones and territories of advancing development, customs privileges and pricing policy as theirs present form is not effective.

The regional support of investment is caused by economic problems: to making large structural shifts, maintaining priority directions of economic development, perfecting social and industrial infrastructure. The analysis of the economic situation in the Russian Federation and in Krasnoyarsk region says about impossibility to decide priority problems of investment development only by market mechanism. We must to improve forms and methods of state and regional support and stimulation of investment activity. Transition to effective methods and forms of state regulation and stimulation should be adequate to realities of a modern economic condition.

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FOREIGN CAPITAL IN THE TRANSITIONAL PERIOD OF RESIDENTIAL REAL ESTATE PROJECT FINANCING IN RUSSIA

The topicality of the study is derermined by the transitional period caused by the changes in the legislation in the field of housing construction.

Sanctions related to the restriction of access to the global financial market can be called as one of the negative factors affecting the development of the economy in Russia. Construction companies face great difficulties in getting bank loans. Due to the high key interest rate of the Central Bank in Russia, the volume of giving bank loans to construction companies in the country has significantly decreased.

In the first half of this year, investors have invested in real estate in Russia (residential and commercial) 60 billion rubles. ($1bn). This is 41 % lower than in the same period of the last year. These data are presented in the report of the international consulting company CBRE [1].

Due to the negative dynamics of the national currency exchange rate, the cost of construction products has increased, which affected the profitability of investment and construction projects of Russian developers, as there was an increase in the cost of imported materials and components.

Real incomes of the population according to Russian Statistics agency show a negative trend, while the share of the population with monetary incomes below the subsistence minimum increases, which may not but affect the indicator of housing security in Russia.

Thus, given the economic crisis in the country, as well as legislative changes, many developers due to the lack of consumer demand are forced to consider various options for financing the construction of multi-storey residential buildings, as well as the issue of cost optimization becomes relevant.

The authors propose to optimize costs through the asset structure and attraction of cheaper foreign asset of such countries as China, Kazakhstan, etc.

To choose the most appropriate asset structure for the construction business, taking into account the shortage of funds and the transition to project financing is becoming not an easy task, both from a theoretical and practical point of view.

The organization determinesindependently the priority of specific criteria for optimizing the asset structure. Therefore, there is no single optimal structure, both for different organizations and for one organization at different stages of its development. The optimization process involves the establishment of the target asset structure, i.e. the ratio of own and borrowed funds of the organization, which allows achievingfully the chosen optimization criterion [2].

According to the authors [2], the main criteria of such optimization are:

- acceptable level of profitability and risk of the organization's activities;
- minimization of the average cost of asset of the organization;
- maximizing the market value of the organization.

Based on the above and taking into account the related works of the authors of the article [2], we can identify the following criteria for optimizing the company's asset, following which can have a positive impact on the value of the company:

- internal sources of the company should prevail over external sources.;
- payments to the founders (shareholders) of dividends must be equal to the capabilities of the enterprise;

- if, against the background of an adequate dividend policy, there is a change in profitability ratios, it is necessary to pay attention to the funds received from own assets. In case they exceed the volume of asset's investments, it is advisable to either repay the debt or invest in securities;
- when choosing external financing, they should give preference to sources of lower cost and risk.

When choosing a strategy for financing investment and construction projects, it is necessary to be guided by the individual characteristics of this project and the factors that may have an impact on it. Attraction of foreign debt capital can be considered one of these factors.

Prior to the entry into force of amendments to the law on shared construction [3], the funds of participants in shared construction were one of the main sources of financing for the activities of developers.

In today's conditions, developers will be forced to adapt to new requirements, namely – to project financing. Moreover, from 01.07.2018 the transition to project financing of housing construction is voluntary, and from 01.01.2019-there is an obligation to use escrow accounts when attracting funds of participants of shared construction. This credit scheme has not been worked over yet; there are still many questions and difficulties [4].

Lending from banks is the most common instrument for debt financing. However, the terms of lending those Russian banks can offer are not acceptable for developers, who areaimed at their strategic plans at obtaining income and long-term ownership. For such participants of the real estate market (in particular residential real estate market) attraction of foreign capital can be a profitable option.

For example, consider lending to a Russian developer in a Chinese Bank. Initial data: construction of an apartment building, investment sum is 300 000 thousand rubles (30 025 612 yuan), loan term – 3 years, % rate – 9 % per annum.

With the same initial data, Russian banks offer the rate of 15.5 %.

Thus, when calculating the overpayment on the loan for the entire loan term, the overpayment in the Russian Bank will be about 72 million rubles, while under the condition of using foreign capital – 44 million rubles. The advantage of foreign capital is obvious, as in the end, the cost of the loan will have a more positive impact on the cost per square meter of residential real estate for the final buyer.

If we talk about the factors that can somehow influence the choice of financial instruments, it is necessary to take into account that they can be described both quantitatively and qualitatively. The values of these factors can serve as an information base for the development of a methodology for the formation of a financing strategy for an investment and construction project, taking into account the transition period for project financing in the construction of residential real estate (Table).

Table

Factors influencing the choice of financial instruments

Quantifiable described factors	Qualitatively described factors
company asset value (market value)	financial statements demonstrating the company's stable financial condition
annual turnover of the company for the reporting year	attractiveness of investment and construction project for potential investors
application (as a consequence – availability) of financial statements according to international standards	positive experience in the implementation of similar projects
result of independent audits	availability of permits (including land rights)
share of equity in the asset structure of the company	goodwill of construction company
investment and construction project readiness	positive credit history
amount of debt capital required	
place in the rating of international credit agencies	

Quantitative factors can be expressed in figures, percentages, availability.

Qualitatively described factors are possible to determine via an integral index, – K_{qual}. This indicator will reflect the total value of all factors that can be attributed to the construction company applying (or implementing) investment and construction project.

The advantage of the proposed financing strategy is the cheaper cost of borrowed funds, as well as providing the investment and construction project with the necessary amount of financial resources at the initial stage of its implementation.

Based on the fulfilled research it is possible to offer a technique of optimization of structure of sources of financing of the construction company (Figure).

However, it should be noted that the most attention of foreign investors is attracted by the market of commercial real estate, not residential, which is explained by the higher profitability of such projects.

For example, the purchase by American Fund UFG business center "Legion II", the Chinese Fosun – IFC "Voentorg" and the British investment Fund Raven Russia – two business centers and a warehouse in Saint-Petersburg [5].

Methods of optimization of the structure of funding sources construction company

Step 1 – identify a list of key economic indicators:
- investment volume (c.u.).
- duration of the investment and construction project (years).
- distribution of investment funds by stages of project implementation (c.u./year).
- project revenue (c.u.).
- distribution of cash proceeds from sales by project stages (c.u.).
- the amount of own funds for the project (c.u.).

Step 2-Identify and evaluate quantifiable factors

Step 3 – assessment of qualitatively described factors and determination of their cumulative impact on the availability of financial instruments – the Kqual -coefficient.

Step 4 – rating of existing financial instruments in the context of their economic feasibility.

Step 5 – Define criteria for each funding source:
- bank credit.
- issue of ruble bonds.
- placement of Eurobonds, including CLN, LPN.
- attracted equity financing (IPO)

Step 6 – formation of a strategy for financing of investment and construction project by selecting available sources of financing in accordance with the rating of economic feasibility of their use.

Figure. Methods of optimization of the structure of sources of financing of a construction company

There are not so many foreign investors in the domestic housing market. Among the largest and most famous, we should note the company Honka, which specializes in low-rise wooden house building (Finland); the company YIT, which specializes in residential and commercial construction. It is noteworthy that these companies do not operate in Siberia.

Market analysts call companies from China and Kazakhstan, Turkey, Serbia, Croatia, Sweden. Representatives of Korea, Japan, Europe and the USA appear on the housing market periodically [6].

The main reasons why foreign developers do not work in the Russian construction market of residential real estate, is, firstly, the lack of transparency (the complexity of the legislation); secondly, low profitability in comparison with commercial projects. If foreign investors take part in the construction of residential real estate, then, as a rule, with the help of Russian partners.

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ASSESSMENT OF THE POTENTIAL FOR HIGH-TECHNOLOGY ALUMINUM-BASED PRODUCTIONS

As as rule, innovation development of raw material Russian regions proceed from the new technologies intervention or usable technologies modernization in the regional specialty sectors on the basis of computer simulation, robotization and new nano-materials. The peculiarity of high-technology productions is extensive potential of by-effects, that can be transformed into independent innovation products, services, technologies, management models for other economic sectors. In these terms the potential for the development of new markets of demand for innovation solutions and intellectual resources.

International forum "The Future of Aluminum" that was held in Italy in May 2018, was devoted to innovation subject area, there the representatives of the biggest companies in the world introduced new technologies of the future in aluminum industry. Among them are: "Multi-metling" approach on the basis of thermal treatment digitization for achieving the maximum industrial efficiency; the inert anode technology in aluminum smelting for surroundings load decrease, reducing cost prices for minimum 10 % and production costs reducing for minimum a third; the aluminum waste products restoration technologies for recyclable materials dumps usage cancellation; and etc. As usual, the target market sectors new demands perform as the significant reasons for new technologies intervention; these demands appear on the world economics global risks crossing; for example, the forming new sector of the low-carbon aluminum market [1]. In the same, the technologies commercialization is expensive and extended process, where the government support (tax and financial) plays the main role on the start, including the support on the regional level [2].

The point of research is the reasoning of approach to valuation of potential of high-technology productions as the aggregate of promising technologies for building new sectors of a raw material region.

The global challenges analysis pointed out new potential opportunities for structural rebuilding of raw materials regional economics on the basis of usage of the innovation technological solutions in the sphere of new materials production, new output production technologies and new management systems and models, that allow to provide the new quality of the economic growth and the new quality of people life activity.However, the global challenges form the threatsfor regional development, conditioned on regional economic structure peculiarities (systemic risks for the main infrastructural life support systems appearance; the limitation of the regional government participation in the mechanism of regional management, the fragmentary nature of the regional environment and the fragmentary nature of technological development infrastructural provision) [3]. In the prevalentconditions the new approaches toperspective technologies examination, allowing to value the technology potential for regional innovation development, are necessary. As usual, in the resources regions economics the major share of technologies, having a claim for availability, is worked out and implanted in the raw resources sector, controlled by the national corporations. Therefore, these technologies intervention is not oriented for their potential maximization for the regions, does not assist regional economic transformation to the innovation growth model and does not assist the regional development effects integration to the national level. The investigationmade allows us to suggest the method (features, criteria) of perspective technologies selection, that have the potential of

new raw material economic sectors forming, taking into considerationthe multidirectional influence of global and national technological development trends.

We defined the term of "prospective technologies" as technologies aimed at both maintaining traditional resource and infrastructure sectors and creating booming sectors ("high tech" and "knowledge economy"). These new sectors are oriented towards the development of new markets and market niches, creation of products with new attributes, which results in substantial multiplicative effects on the region's economy [3].

The main features of priority technologies are:

- the ability to withstand "global challenges" of the world economics and to correspond the technological development world tendencies;
- the ability to provide the structural change of the regional economics on the basis of processes of 4th technological style diffusion;
- technologies belonging to the process of convergence;
- the ability to form and develop the new markets, also on the territory of the region.

Analysis of global and local technological development trends, technological lag risks detection and raw material regions potential detection allow the authors to work out the steps to examine the technologies that provide potential of forming the new sectors in regional economy:

- the technologies maximization for the aim of forming the economics of the future;
- the regional development effects integration to the national level.

The economic essence clarification and the perspective technologies assignment makes the point for usage of the three-level valuation, which allows to diagnose technologies for suiting global challenges and world trends of technological development; for suiting perspective and critical national level technologies; as well as for suiting priorities and main aims of the raw region's development. As a result, the steps and the algorithm of priority technologies choice (see the scheme #1):

Step #1: Compliance with scientific and technological priorities of development of Russian Federation on the basis of strategic documents taking into account "global challenges". The purpose of the step is to form the list of technologies, which correspond the main directions of technological development in Russia and are consolidated in the national strategic planning documents taking into account "global challenges" [4–7].

Step #2: Compliance with the world tendencies of technological development (digitization, materials revolution, lifestyle systems revolutions, cognitive science intervention, institutional transformation, anthropological shift, effective nature management), the ability to withstand "global challenges". The purpose of the step is to form the list of groups of technologies, which can withstand "global challenges" confronting Russian society and Russian government; by force of the new knowledge allocation to solving the tasks of the stable growth and protection (digitization, materials revolution, lifestyle systems revolutions, cognitive science intervention, institutional transformation, anthropological shift, effective nature management) [8; 9].

Step #3: Compliance with the main targets and priorities of regional social economics on the basis of strategic documents. The purpose of the step is to form the list of technologies, which correspond the priorities and main targets of raw material regions development, taking into account multi-sector economic structure.

Step #4: The valuation of technologies belonging to convergence processes. The purpose of the step is to select the technologies bringing together economic sectors, which intervention in the regional economics provides the maximum multiplicative effects of regional development [8; 10].

Step #5: The valuation of opportunities for transformation to new technological style, for new markets forming and development. The purpose of the step is to determine the equivalence between the technologies intervention processes and the scripts of regional technological development (e.g. niche leadership, local technological competitiveness, international technological competitiveness) [11].

Step #6: The valuation of potential to develop and to use the priority technologies in the region. The purpose of the step is to describe the existing potential to develop and to use the technologies concerning the centers of production, the centers of consumption (sales markets), research and development centers (life cycle management) by the scripts of regional technological development [12].

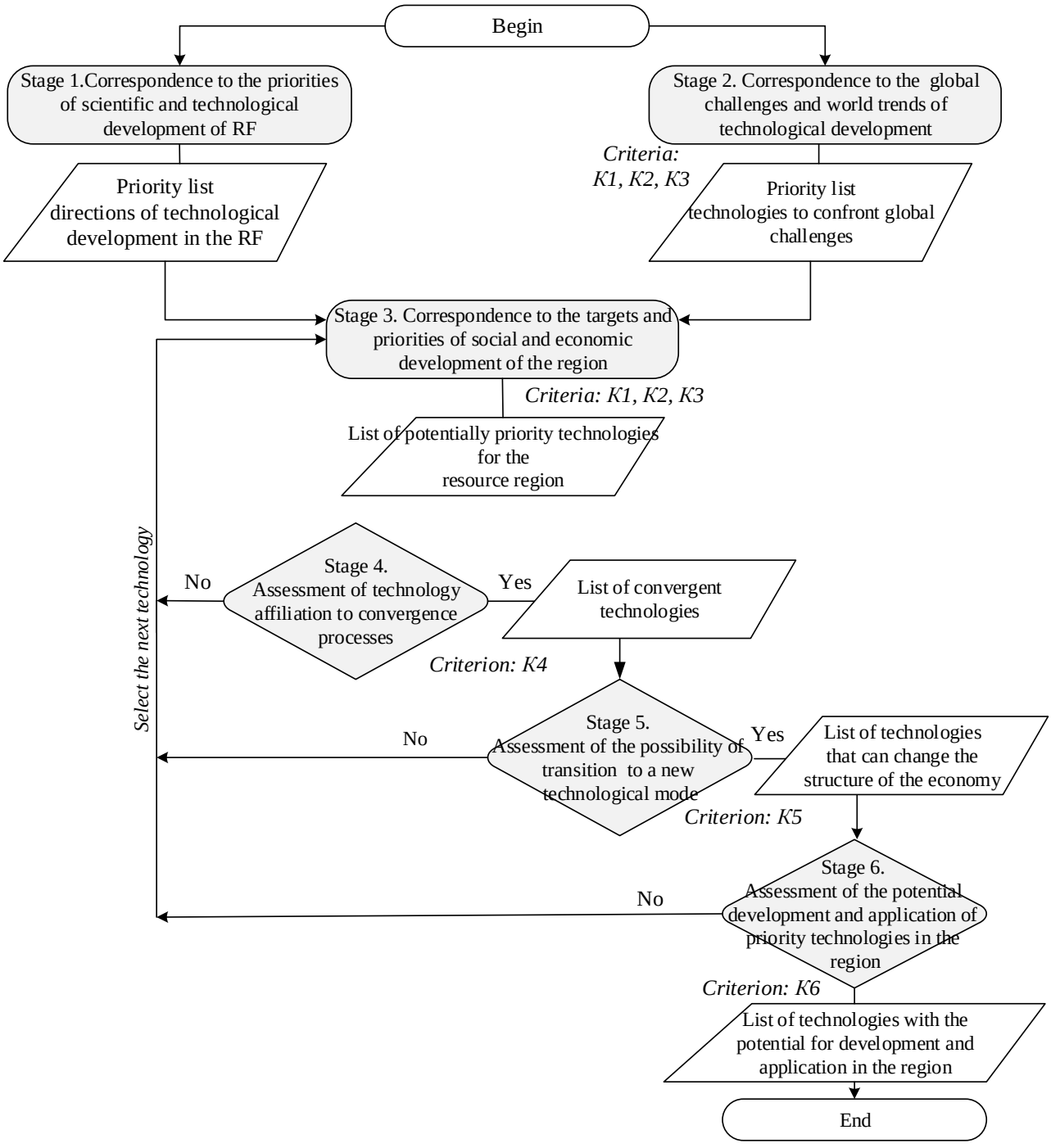

Figure. Algorithm for choosing the priority technology

The approach described above is based on the multi-criteria choice of priority technologies for raw materials region development. The items, which are examinedin the capacity of choice criteria, are (see the picture #1):

- Organizing new markets, which influence on the key factors of development on the main sectors of the regional economics (K1). For example, the inert anode technology in the

aluminum smelting; the technology of digitization of melting furnace thermal treatment; the technology of aluminum waste products restoration; the market of aluminum honeycombs; AION market in the spheres of ultra strong glass production, of jewelry production, instrument making, war industry;

- Increase of the share of leadership in the programs of international and inter-regional cooperation (international clusters, international innovation technique and production consortiums), and increase ofproduction sharein the global industrial-engineering chains (K2);
- Increase of the share of export of innovation and high-technology products and services (K3);
- Increase of the share of regional participation innew clusters and enterprises creation and functioning, formed on the rawmaterials regions territory (K4).
- Increase of the new productions share (the processes of 4^{th} and 5^{th} technological styles) with large value of extra costs;
- Increase of the share ofhuman potential with innovation competences and opportunities to take part in creative economics development (K6);
- The share of technologies readiness (the degree of readiness for realization; the degree ofproduction readiness; the degree of management readiness) (K7) [13; 14].

The intervention of these technological directions in the regional economics is described by the wideindustrial coverage (the major infrastructure brunches, raw materials brunches, high – technology economics sectors) and provides the maximum of synergy effects of development.

Synergy effects of major technologies valuation is formed on the basis of the matrix of perspective directions of technological development for raw materials sector, infrastructure sector, high-technology economics sector.

The article presents the approbation result of testing the suggested approach for valuation the high – technology productions, that are perspective for new industrial centers with aluminum processing enterprises for Krasnoyarsk Technology Valley establishing. The assessment of multiplicative effects of high-tech productions development is introduced. This assessment is formed on the basis of matrix of promising technologies in raw material, infrastructure and high-tech regional economy sectors.

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RESEARCH ON THE USE OF DIGITAL MARKETING FOR THE PROMOTION OF INNOVATIVE PRODUCTS ON THE WORLD MARKET

Despite the extensive use of digital technologies to promote innovations, the challenge of bringing products to foreign markets is complicated by the need to take into account several aspects. They include the priorities of industrial, scientific and technological development of countries determining the demand for innovations, cultural differences in consumer behavior, and the specifics of state regulation of Internet use.

The report is aimed to identify the key features of the use of digital marketing tools to promote innovative products on the world market. To achieve this aim the authors have performed the following tasks: the content of the concept of digital marketing is disclosed, the distinctive features and potential of using digital marketing tools to promote innovative products in different types of markets are highlighted, foreign and Russian experience in the use of digital marketing tools in international markets was studied, the risks of promoting innovative products are determined.

The report refers to the research by Russian and foreign scientists on different aspects of the theory of innovations, innovative products market, Internet marketing and digital marketing concepts. The methods of content analysis, synthesis, analogy and comparisons were used.

The results of the study allowed us to consider digital marketing as a stage in the development of the marketing concept where alongside with offline business and offline marketing digital data channels are used to provide the synergy from combining different ways of offering the product to consumers; to highlight the distinctive features of digital marketing which ensure the effectiveness of its tools in promoting innovative products to international markets; to reveal the differences and highlight the risks in using digital marketing to promote innovation in the markets of South-East Asia, Europe and America.

Internet marketing as an independent concept has appeared at the junction of two global development trends – marketing as a philosophy of business and information technology, and is manifested in the projection of the principles of marketing on the Internet. In this concept, the Internet is considered as an independent "over the world" market [1], which has distinctive features of development [2]:

- low entry barriers-low entry and exit costs, easy market access;
- a high level of competition between substitute products offered on offline markets;
- a complicated process of differentiation of goods, absence of geographical niches;
- high competitive pressure from suppliers and intermediaries-search engines, advertising platforms, hosting companies, etc.
- high price elasticity of demand with the increasing consumer demand for the reliability of Internet companies justified with certificates, permits, security systems.

As a result, marketing on the Internet is characterized by a high degree of personalization (targeting), the orientation of promotion to win single customers, customer involvement in the business processes of the company (reputation building, attracting new customers, the transfer of sales functionality in the formation of orders, access to online consultations, etc.), the possibility of using quantitative metrics to improve the accuracy in assessing the effectiveness of marketing.

In the 1990s, the term “digital marketing” began to be used [3] to refer to the active and interactive marketing of goods and services based on digital technologies to attract potential customers and retain them as consumers. Subsequently, the level of complexity of digital marketing tools has increased significantly.

Today, digital marketing is considered as a stage in the evolution of marketing development, using digital data transmission channels along with offline business and offline marketing to ensure synergy from the use of different ways of offering a product to consumers (omni-channel approach).

In addition to using the Internet as the main communication medium, traditional TV and radio digital marketing methods are actively using mobile technologies [4].

The main tools of digital marketing include search engine optimization (SEO); contextual advertising, advertising in e-books, applications, games, and other forms of digital products; search engine marketing (SEM); display advertising; industry and price aggregators; social media marketing (SMM), marketing in electronic commerce; e-mail marketing. Channels which are not directly connected to the Internet, such as mobile phones (SMS and MMS), reverse calls, QR codes are also used actively [5].

On the one hand, the effectiveness of tools in promoting innovative products to international markets depends on distinctive features of digital marketing. These features are, firstly, the possibility of simultaneous integrated work with potential customers and the target audience in various areas (market analysis, target audience identification, innovation testing, product market adequacy, innovation positioning, choice of methods, forms and channels of interaction with the client, search for investors and partners) and promotion channels. Secondly, the availability of digital marketing tools for small companies, which in most cases are the main developers of innovations in the Russian Federation.

On the other hand, there are features of promoting innovative products related to the specifics of product, the type and stage of the innovation life cycle. In B2C product markets, the main objectives of promotion are to identify potential customers and inform them about the advantages, main characteristics and new consumer properties of the product. In B2B markets the objectives are to establish personal contacts in the early stages of the development of an innovative product. According to experts of RIS Ventures, innovation promotion tools are most often selected based on two criteria:

- the type of innovative product is set in accordance with the level of technical complexity. The type of the product defines its utility for consumers and has an impact on the model of consumer behavior when choosing a product and the size of the company's costs in terms of marketing and sales,
- the market type (B2B, B2C) determines the criteria for consumer choice [6].

This approach allows us to identify the most effective digital marketing tools for the promotion of different types of innovative products in B2B and B2C markets in accordance with the following recommendations:

- the main task for technically simple products on B2C markets is to get feedback from consumers on products and sales organization. An optimal product promotion channel is a multifunctional web-site which functions simultaneously as a sales channel, a way to communicate with customers and a platform for research (product testing, assessment of the market adequacy of the product, demand assessment). The effective tools of promotion are contextual advertising, SEO, e-mailing, sales promotion (product samples, contests, and lotteries), PR in social networks, forums, blogs. The use of a set of these tools is advisable to promote improving innovations, when the product is an improvement of existing analogues on the market;
- when buying technically sophisticated mass-market products consumers need more time to find relevant information and to make a choice. Under these conditions, the company's website should contain the maximum amount of information about the product, a column

with consumer reviews, channels of communication with consultants, PR in social networks, forums, blogs with the involvement of industry experts;

- it is rather simple to get feedback from B2B market consumers about their needs and preferences. But the main problem is to sell a product due to the closeness of many companies and the complexity of approaching decision makers. Under these conditions the primary tasks which reduce the risks of the lack of demand are finding customers, establishing personal contacts with potential consumers at the early stages of innovation development, conducting free research on product testing and obtaining positive consumer feedback, participation in industry exhibitions and conferences, joint projects with potential consumer companies. One of the key areas of PR is Media Relations – interaction of companies with the media (creation of media kit, media maps, publication of press releases, media audit based on MediaAlerts service or news aggregators).

In recent decades, the most important qualitative change in the system of international economic relations was the formation of a global technology market [7]. Currently, the world technological pyramid can be represented as follows: the leading positions are occupied by the USA, Japan and several European countries – Germany, France, UK, Switzerland, and Netherlands; then there are countries with high potential in the technical development. Among these countries are China, India, new industrial countries (Singapore, South Korea, Taiwan, Thailand, Malaysia, Philippines), several European countries (Sweden, Czech Republic, Italy, Ireland, Spain, Belgium, Austria, etc.). At the third level is a dozen undecided countries (Argentina, Chile, Peru, Colombia, Turkey, etc.), which also includes Russia. At the bottom of the technological pyramid are all the other countries that have little chance of improving the technological status [8].

The problems of launching innovative products unfamiliar to the market are connected, first of all, with the risk of non-acceptance by its buyers. This may be typical for any company, but it is especially important for the market of innovative, high-tech products. High-tech products have the following features [9]:

- shorter life cycle compared to traditional products;
- the need to develop new knowledge and skills for consumers;
- creative approach in the development and application of innovative products;
- it is difficult to define the boundaries of the market;
- difficulties with implementation and adaptation;
- the complexity of pricing.

In this regard, an important issue in bringing innovative products to market is the definition of “opinion leaders”. Everett M. Rogers has originated the diffusion of innovations theory and identified several groups of consumers in their relation to new ideas. Geoffrey A. Moore has adopted the diffusion of innovations theory of to the market of high-tech products [11]. He identified five segments of consumers that perceive innovative products in a certain way, and two stages in the development of the innovation market: the early market and the main market. The key task of developers at the stage of bringing an innovative product to the market is to bridge the gap between innovators and early adopters. The main conditions for success are: to avoid overstated obligations and to learn how to make money in the main market. If groups of consumers in the early market are primarily interested in technological aspects, then consumers in the main market are already focused on economic, commercial benefits. So at this stage an innovative company should focus its efforts on forming a positive image and on the most complete satisfaction of customer needs.

However, in practice, bringing innovative products to international markets for small companies faces the following obstacles [6]: small experience in development, promotion and sales of domestic products in the world market does not allow to compete in product quality and service level; the majority of the existing Russian developers in the field of high-tech are not trying to enter the open market and are looking for funding from grants, state and commercial

venture funds; it is not always possible to use traditional positioning tools due to the uniqueness and technological complexity of the innovative product and the lack of many elements of the classical market (for example, direct competitors).

The company's brand and reputation are of particular importance for unusual and high-cost products, which is not applicable to start-up projects.

Bringing innovative products to the market, which requires taking into account consumer behavior and reducing the risk of expensive purchases, requires the use of an interactive business model, when the stages of design, development, production and marketing are carried out simultaneously (in parallel).

In conclusion, the report presents a number of specific features of the use of digital marketing tools for the promotion of innovative products in the Chinese markets, the account of which provides small and medium-sized businesses with the potential to attract strategic investors and search for partners at the stage of the startup (cultural characteristics of the country; priorities of technological development; legislation and information security, social sharing, analytics for web sites, etc.).

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UNDERSTANDING FINANCIAL CYCLES AND FORECASTING FINANCIAL CRISES TRANSMISSION

The main subject of research in the article is the monetary market as part of the financial market of modern Russia. The authors reveal the main characteristics of the Russian money market, highlight its features and associated contradictions of monetary policy in comparison with foreign experience. The actuality of the research is determined by the increasing influence of globalization processes in the Russian economy. In turn, the money market is closely linked to other macroeconomic indicators that estimate the current state of the economy. According to the authors' opinion, the mutual impact indicators need to be assessed and considered in the development of monetary policy instruments. The article describes such features of the money market of Russia as a high level of the key rate, a high proportion of cash in the structure of money supply, deficit of cash money and methods of influence on this indicator.

The research methodology was based on the study of statistic indicators, analytical reviews, scientific articles on the subject. To study the impact of adverse external factors on the state of the monetary market, the authors propose to use the correlation adaptometry.

The article concluded that the instruments of monetary policy are closely linked with socio-political characteristics of the state, a method of correlation adaptometry is proposed to analyze the national monetary market; the different ways of functioning of the market during the crisis were described. The authors hold the opinion of most analysts that the current situation requires adjustment of the interest rate and use other ways of regulating the money market (in particular, return to the transactions with assets). We consider the result of the study the conclusion that it is necessary to identify the moment of amplification activity of credit transactions on the money market for possible adjustments regulator consequences not in crisis, but at the stage of the active growth.

Fluctuations in nancial activity (risk taking, credit creation, asset prices, capital ows, spreads, leverage) on a global scale (Bruno and Shin (2015), Miranda-Agrippino and Rey (2015)). Particularly interesting to link the Global Financial Cycle to issues of nancial stability (waves of crises; see Reinhart Rogo (2008)) and to constraints it puts on monetary policy [1–6].

The relevance of the study of the features of the money market in Russia is due to its active integration with other foreign exchange markets. In addition, the scale of the reverse impact should be timely assessed and taken into account in the state monetary policy for the development of entrepreneurship. Moreover, according to the Bank for international settlements, which monitors activities in these markets around the world, the average daily volume of transactions exceeds $ 1.4 trillion, which is comparable to the money supply in the Russian Federation, serving the transaction of purchase and sale of products and services [7].

Monetary policy of the Bank of Russia causes mass disputes and discussions in scientific circles. As you know, the national Central Bank and the banking system ensure the supply of money for entrepreneurs in any country. Money supply as a macroeconomic indicator is closely related to other important indicators of the economy (business financial cyclist, inflation rate, GDP, interest rate, etc.).

The theory of mega-financial cycles, founded by the Austrian scientific school, is again relevant due to the fact that both Japan is in an incomprehensible and illogical stagnation, and the United States, a number of European countries repeat mistakes in the regulation of financial

markets. In addition, many researchers continue to consider business cycles and the problems of the real economy separately from the financial cycles [1– 4].

Indeed, the financial cycle refers to mega-cycles, it is much longer than standard business cycles (comparing 18 years and 5 years) and contains self-producing interconnections of our perceptions of asset values, risks, financial constraints, causes leading to a boom and then to a fall in markets [7].

After analyzing the structure and tools used by Central banks around the world, it should be noted that all of them are based on the social, political and cultural characteristics of States. Thus, China's monetary system is diverse and complex. Three types of monetary units are officially issued in various territorial entities of modern China: yuan, Hong Kong dollar and Pataca. In addition, the Republic of China (Taiwan) is issuing a new Taiwan dollar. Each territory has its own Central Bank. Historically, this diversity of institutions is due to political processes in the country itself. One of the major differences of the Chinese money market is that the budget of the People's Bank of China is not independent, but is a part of the Central budget of the country. The Bank is accountable to the state Council of China. He is obliged to transfer the received profit to the Central budget, except that part which can be directed to the General reserve, and its size is defined by the state Council of the people's Republic of China [8].

In accordance with the Bank of England act 1946 and its amendments of 1998, this is the oldest Bank needs instead of paying dividends to the Treasury of the United Kingdom half of the profit, remaining after taxation [9], and the Bank of Russia in 2010, increases the percentage of such payments up to 75 %. However, the scale of such transfers in relation to GDP at the Bank of England 20 times more (0.17 % of GDP) than the Bank of Russia.

The key rate for the money market of any country is the rate set by the Central Bank in order to influence the level of interest rates for entrepreneurs in the country. Changing the key rate is usually the main instrument of monetary policy. For different countries it is a special national instrument and varies from 0, 25 to 2, 5 %. The Bank of England has an interest rate on reserves of commercial banks on accounts in the Bank of England; the Bank of Japan – till April, 2013 the rate level in the market of interbank one – day loans. Since April 2013, the Bank of Japan does not set a Pro-cent rate, but sets a target level of the monetary base; the European Central Bank (ECB) has a minimum rate at REPO auctions with the ECB; the us Federal reserve system (US Federal reserve) has a target level of the interbank market rate for placement of funds held by banks in accounts with the US Federal reserve; the Bank of Canada has a target rate level in the interbank lending market; the Reserve Bank of Australia has a target rate in the interbank lending market [10].

The first important feature of the modern money market in Russia is the high level of the key rate, the impact of the processes of financial globalization on it, while the internal interest rate on loans for entrepreneurs is determined taking into account the risk premium laid down in it by foreign investors. The crisis of the national currency in 2014 was provoked by the need of large Russian corporations to make annual payments on international loans. This caused an increased demand for foreign currency (euros and dollars), which naturally led to an increase in their value. Thus, the inclusion of the Russian economy in the structure of the global financial market, in addition to the obvious positive consequences, carries obvious threats that the Bank of Russia cannot ignore when planning and implementing monetary policy.

The second feature is the high share of cash in total money supply. As a rule, there is a decrease in the share of cash in the world practice. Russia is significantly ahead of most advanced economies in terms of its share of cash.

The third feature is that the amount of money in current accounts is relatively small, both in terms of cash and in terms of GDP. In other words, the economy has long been experiencing a moderate deficit of non-cash money, which is the main means of payment. The banking system reacts to this by accelerating the speed of non-cash money circulation. On average, according to the banking system, the period of turnover of funds on current accounts is 7 calendar days [10].

That is, the amount of 1000 rubles per year manages to serve the transaction for about 50,000 rubles.

The Bank of Russia made a number of currency interventions in early December 2014, trying to ensure the stability of the national currency. These actions could have a faster and more predictable result if the money market in the country was formed by dominant national sources rather than foreign liabilities (external debt – $ 720 billion).

Finally, the main instruments and methods of the Bank of Russia's monetary policy in the 2000s include interest rates on the Bank of Russia's operations, the Bank of Russia's intervention in the foreign exchange market within the framework of the dual currency basket, which stimulate speculative, by no means creative beginnings. After increasing the key rate to 17 % on 16.12.2014, the Bank of Russia notes the liquidity crisis in the Russian market and develops a new list of measures to overcome it, which gives rise to foreign rating agencies to insist on the deterioration of the country's rating position.

Banks in different countries are trying to create an effective money market for business and a credit system that would provide capital more profitable and less risky premises and, at the same time, would satisfy all the conditions and needs of reproduction, economic growth. At the same time, the unavoidable openness of economies and credit systems in the era of information technology leads to the interpenetration of money markets, banking models and standards.

Recent global financial crises have led to changes in the credit activity of banks, drawing the attention of many scientists to the causes, tools for predicting and preventing crises. In prosperous periods, any system [11] behave the same, in moments of crisis, the behavior begins to vary. In other words, to paraphrase Tolstoy's aphorism from the novel Anna Karenina: "All well-adapted systems are similar, all unsuitable systems are difficult to adapt each in its own way", and A. N. Gorban adds: "It seems paradoxical, but when the difference between systems increases, they simultaneously become more correlated".

So, there is an order in the chaos of reverse adaptation-in crisis, the systems become more dissimilar, the "Anna Karenina principle" is used in the method of correlation adaptometry. In Economics, it is used to analyze various objects: from individual banks to national economic systems.

The distinctive feature of the proposed approach is not focused on the ratio of credit growth rates to GDP, money supply, Bank assets or other indicators characterizing the static state of the economy, monetary and banking subsystems, but on the determination of the degree of interconnection of these subsystems based on the methods of correlation adaptation and evaluation of integration of subsystems not previously used in economic models, which allows to ensure consistency and efficiency in decision-making in the field of monetary regulation.

The essence of the proposed method of correlation adaptometry is that the system of objects under the influence of adverse factors causes to experience tension, approaching the crisis [12]. It is proved that the relationship between the data characterizing the investigated system of objects increases simultaneously with the increase of dispersion. After the crisis reaches its peak, the system can develop in two directions:

- or adapts to new conditions and already operates at a higher level of adaptation, with a decrease in correlations and data dispersion;
- or it can not adapt to the negative impact of the pressure factor and goes into the stage of self-destruction (there is a decrease in correlations, but the variance continues to grow).

We believe that the monetary and banking systems in the process of their development, like the systems of living organisms, undergo the same stages of growth, crisis, adaptation, are equally exposed to external influences of mega-business cycles, develop according to their internal rules and laws. Systems evolve and become either stronger or destroyed.

We consider the result of the research to be the conclusion that the most important benchmark is the simultaneous positive deviation of the credit indicator to GDP and real estate prices. In our view, it is necessary to timely neutralize credit booms and the activity of credit

institutions through fiscal, monetary and macroeconomic policies. This will help to contain the development of imbalances and quickly cope with their consequences.

The effective method to reduce the activity of credit institutions is to strengthen the requirements of the mega – regulator to reserves for possible losses on all issued loans and liquidity of banks in the downward phase of the megacycle and increase the responsibility of business for its credit obligations, except for those for which mixed financing of state programs is provided. For example, the application of Basel III recommendations, but not during the crisis, and before. At the same time, we believe that we need, first of all, tools to identify the very moment before the crisis and strengthen the activity of credit operations in the money market.

Analysis of the dynamics of the weight of the correlation graph of the dispersion values allows to estimate the tension in the banking and monetary systems as a whole. We believe the result of research is the conclusion that as soon as the mega-cycle reaches its top point, the banking crisis begins. The most important benchmark is the simultaneous positive deviation of credit-to-GDP and asset prices, especially bonds and real estate. The current situation in the money market in the Russian Federation requires both adjustment of the key rate and the use of other methods of regulation of the money market (in particular, the return to operations with securities) to eliminate the deadlock in business. We believe the result of the study is the conclusion that it is necessary to identify the moment of strengthening the unjustified activity of credit operations in the money market for possible adjustments by the regulator of the consequences not during the crisis, but at the stage of growth of such activity.

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UDC 630*905:347.23(47+57)

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PROPERTY RIGHTS INSTITUTIONS TO FOREST LANDS IN RUSSIA: LESSONS FROM FOREIGN EXPERIENCE[1]

Effective long-term development of the Russian timber industry is impossible without structural and institutional reforms. The issues of regulating relations regarding the use of forest resources and the formation of state forest policy play a decisive role in the development of the country's forestry complex and, accordingly, the prospect of solving the indicated problems essentially depends on the quality of this work. In our opinion, the core of the entire set of constraints on the forestry complex development is the problem of incomplete transit from non-market type institutions that emerged in the Soviet period to the institutions based on market relations. Obstacles to this transition, of course, are associated not only with sectoral (technological) constraints, but also with cultural problems of the national level, including the ineffective interaction of government, business and society.

Within this context, one of the key issues is the problem of ownership of forest resources. To date, Russia is the only state of the top 10 countries-world leaders of timber industry, where a state monopoly on the ownership of forest lands is established.

The new institutional economic theory states that the development of institutions determines the quality of economic growth. One of the key issues is the effective allocation of property rights. In addition, the qualitative development requires the creation of a system for protecting property rights for these resources. This paper analyzes the world experience of leading forestry countries in the context of creating a regime for the most efficient allocation of property rights on forest lands.

Problems of forestry complex in Russia are highlighted in a number of studies in which a description and a general analysis of key contradictions and structural disproportions of the current stage of the industry development are given [1–4]. Meanwhile, only a small part of the researches on this subject use the achievements of modern economic theory and economic and mathematical modeling that can provide a powerful theoretical and methodological foundation for solving pressing economic problems.

The experience of forestry industries development in leading timber-producing countries is widely studied in detail in the world literature. The most valuable examples of successful reforms can be obtained from countries that have similar origins institutions, for example, China [5–6], as well as states located in similar climatic conditions: Canada [7] and Scandinavia [8–10].

Pioneer economic research, which justifies the decisive role of institutions in economic development, goes back to the works of D. North [11]. In accordance with this approach, the development effectiveness is determined, basically, by the reliability of the property rights protection and the performance of contracts. In particular, ineffective system of property rights distribution and their weak protection deprive economic agents of incentives for development, which leads to a decrease in investments, extensive development of production without the introduction of new technologies, the lack of a desire to expand the sales markets. Numerous empirical studies show that it is the nature of the institutions development that is the determining factor in the socio-economic development of various states [12–13].

The new institutional economic theory proceeds from the fact that property rights determine the way natural resources are used and can significantly influence the incentives of nature users

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[14]. From this point of view, one of the most important reasons for the extensive use of natural resources in developing countries appears to be the shortcomings of the system for determining and protecting property rights [15].

Our empirical analysis showed that in all leading world logging countries a mixed type of ownership of forest land is observed. According to the Food and Agriculture Organization of the United Nations [16], only 14 % of the world's forest area belongs to private owners. The data on the volume of logging, the forest area, the share of private forests in the total for the world's leading logging countries is presented on the graph (Figure).

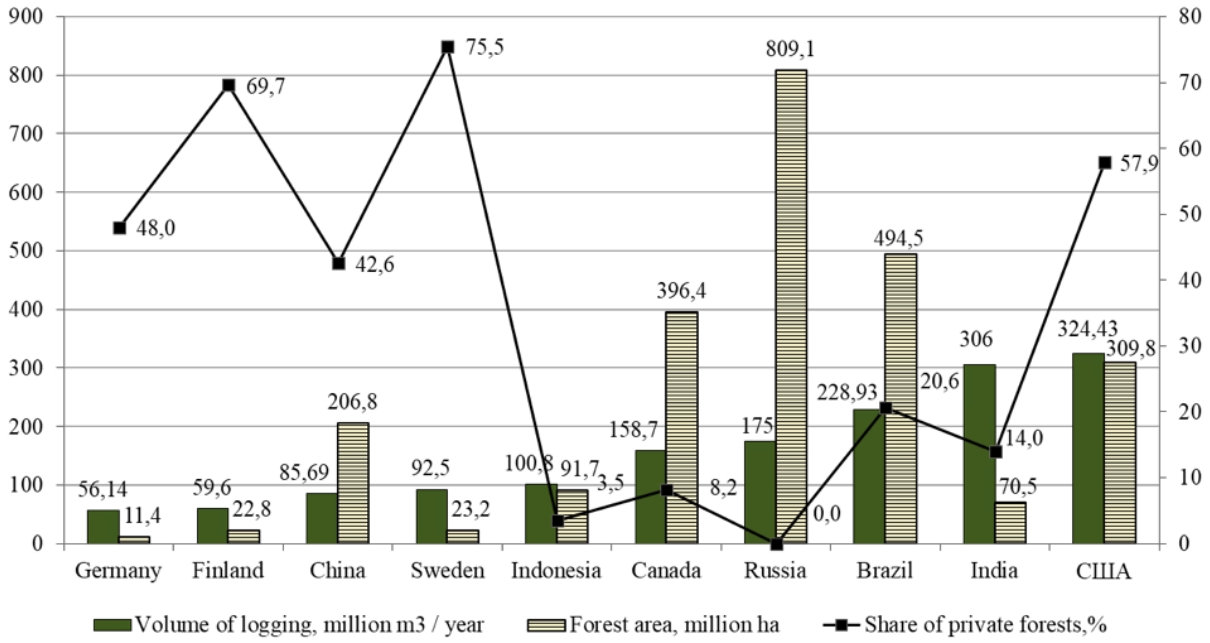

Figure. The volume of logging, forest area and share of private forests
for the world's leading logging countries
Source: compiled by the authors on the basis of the Food and Agriculture Organization
of the United Nations data [16]

All considered countries (except Russia) have a mixed ownership regime for forest lands, with private forests ranging from 3.5 % (Indonesia) to 75.5 % (Sweden). It is indicative that in the countries with the largest logging volumes (Indonesia, Canada, Brazil, India), the share of private forests is much less than in the countries that harvest less wood (Germany, Finland, China, Sweden) – 3.5 ... 20.6 % against 48 ... 75.5 %. This conclusion does not apply to the largest logging company in the world – the United States of America. Apparently, this is due to the historical dominance of private property in this country and significant successes in the development of the economy.

According to a number of experts, in countries with dominant state ownership of forest land (for example, in Mexico and most African countries), the efficiency of the industry is low, leading to deforestation [17]. On the contrary, private ownership is an effective mode of forest use in economies with high quality of public administration institutions and low corruption level. Nevertheless, the discrete and widespread privatization of forests in developing countries is likely to lead to aggravation of existing problems, therefore, as the authors of the cited paper note, before moving to private ownership of forest land, measures should first be taken to combat corruption, improve quality public administration, and so on.

The above analysis of the world's leading loggers' experience gives an idea that in the countries examined, effective forest management is achieved through private ownership of the bulk of commercial forests. We emphasize that not only the form of ownership determines the

effectiveness of the economic system of nature management — it can be considered that this is just a necessary condition for efficiency. A sufficient condition is associated with the development and implementation of effective institutions, that is, norms and rules and enforcement mechanisms for their implementation [18].

Nevertheless, the abrupt transition from state property to private ownership, in our opinion, will not solve the set task of Russia's forest industry exit from the crisis, but it can lead to its aggravation. Considering the restriction we mentioned earlier, related to the need to build an effective system for protecting property rights, the development and implementation of the forest resources' ownership institution reform requires special care.

In most cases, even for a very small percentage of forest land transferred to private ownership, it is possible to achieve intensive and high-quality forest management and, which is especially important for Russia in the context of solving the problem of the connectivity of its territory and maintaining the social and economic stability of the regions, to provide high-quality jobs for small towns residents. It is proposed to launch pilot projects to develop and implement an interim institution that implements the procedure for the transfer of private commercial forest areas to private ownership, subject to certain requirements for the experience of the potential owner, as well as the ability to control its activities by the state. Such requirements may include a mandatory long-term forest management plan and officially confirmed forest management practices. On the one hand, such an approach will not drastically change the current rules, on the other hand, it ensures the creation of incentives for bona fide forest owners to manage sustainable forestry.

The above experience suggests that partial privatization of Russian forests can create prerequisites for the successful development of the industry. In our opinion, Russia's forestry complex needs the development and implementation of interim institutions that will be able to provide a phased transition to a mixed type of forest lands' ownership considering contextual factors for specific areas and features of regional politics and economy. In particular, it is proposed at the pilot project level to develop and implement in practice the transfer of commercial forest areas into private ownership, subject to certain requirements for the experience of the potential owner, as well as the ability to control its activities by the state.

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SESSION 4

DEVELOPMENT OF SINO-RUSSIAN TRADING COOPERATION BASED ON TECHNOLOGICAL AND EDUCATIONAL INNOVATIONS

UDC 339.1+331.101.23(510)(392)

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STUDY ON THE TRADE DEPENDENCE BETWEEN CHINA AND WEST ASIAN COUNTRIES

With the development of "the Silk Road Economic Belt", economic and trade exchanges between China and West Asian countries have attracted great attention. This paper is based on the empirical research methods of Xuefeng Qian and Xiong Ping (2010) and uses the HS-6 international trade data to objectively study extensive and intensive margins in export from China to 20 West Asian countries from 2007 to 2016. The empirical analysis shows that both the extensive margin and intensive margin have impact on Chinese export to the West Asian markets, but the effect of extensive margin is greater. There are following factors affecting the extensive and intensive margins: economic scale and infrastructure have significant impact on intensive margin, labor productivity and fixed trade cost have no significant impact on intensive margin. Economic scale has significant impact on extensive margin; the impact of labor productivity, fixed trade cost and infrastructure are not significant for the extensive margin. Based on the conclusions of empirical research, policy recommendations to improve the trade structure between China and West Asian countries for better promotion of the bilateral trade development are proposed.

***Keywords**: West Asian markets, extensive and intensive margins, influence factors.*

INTRODUCTION

Due to the reforms and opening up policies in the past 4 decades, China has actively merged into the international economic activities, and experienced rapid development, and played a more and more important role in international trade.

The economic and trade exchanges between China and West Asian countries can be traced back to Zhang Qian's journey to the Western Regions more than two thousand years ago. The deep historical origin has provided a solid foundation for re-cooperation between China and West Asian countries. In 2013, China initiated "the Belt and Road" suggestions, which provided a historic opportunity for the coordinated development of both China and West Asian countries.

"The Belt and Road" initiative aims to benefit countries along the route. As China and West Asian countries, supported by strong inclusiveness and fairness, the initiative can further make full use of comparative advantages of each country in every area which is opened to each other, and enlarge cooperation and international trade, contribute more economic growth. The international trade data tells the story more convincingly.

The total trade volume was 60.717 billion US dollars from China to the West Asian market in 2007, by analyzing the bilateral trade volume and major trade goods between China and the 20 west Asian countries along. After 2013 the year of launching "the Belt and Road" initiative, the trade between China and West Asian countries has shown a good momentum of accelerated growth. In 2016, the total export trade reached 124.527 billion US dollars. In 2007, Chinese total import trade from the West Asian counties was 49.443 billion US dollars, and it increased to 89.259 billion US dollars in 2016. However, while international trade between China and the West Asian countries has grown tremendously, there are also some problems. For example, trade structure is somewhat simple, China mainly import primary industrial products, and the main trade partners are oil-producing countries, such as United Arab Emirates, Saudi Arabia, Turkey and Iran.

Most of the products traded between China and West Asian countries are low value-added primary industrial products and energy products, and the products exported from China are more highly substitutable in the international market. It shows that there is lack of deeper trade contacts

between China and West Asian countries. Therefore, studying extensive and intensive margins changes between China and West Asian countries is of great significance to a deeper and high-quality trade between China and the 20 west Asian countries. In addition, there are also important implications for the current research on the status quo of Chinese manufacturing industry by analyzing the structure of Chinese export products.

So, the paper will use United Nations trade data to study the above issues from 2007 to 2016 to explore whether the goods trade flows along extensive or intensive margins from Chinese to Western Asia, and what are the factors that influence the extensive and intensive margins.

1. RELATED LITERATURE

The methodology of extensive and intensive margins analysis has been widely used in academic research at domestic and abroad. In the latest international trade study of internal characteristics of trade flows, Hummels and Klenow (2005) decomposed export value into two aspects: extensive and intensive margins. The extensive margin of export means product diversification, measuring the number of export types; the intensive margin of export means specialization, measuring market share of export value. The increase of export value in the target market may be due to an increase in export category of the extensive margin represented, or an increase in the export value of the existing varieties represented by the intensive margin.

1.1. THE EFFECT OF THE EXTENSIVE AND INTENSIVE MARGINS IS DIFFERENT

There is no unified view on the effect of the extensive and intensive margins on trade growth, it differs among different scholars. Hummels and Klenow (2005) based on the research resulted from Feenstra (1994) firstly, using the trade data of more than 5,000 products of 126 countries in 1995, found that countries with the larger GDP, the more kinds of products were exported, the extensive margin contribute more to export, especially for developed countries, the contribution rate reached 60 %. Tibor Besedeš and Thomas J. Prusa (2010) compared export growth of inter-countries by investigating the impact of extensive and intensive margins on export profit margins, and argued that developing countries' exports would increase significantly by improving intensive margin conditions. Marianne Matthee (2016) explored how intensive (a mature exporter exports existing products to existing markets) and extensive (new exporters, products or markets) profit margins exchanges led to export growth and the degree affected by the global financial crisis. It was found that the intensive margin was an important factor in export growth, accounting for more than three-quarters of observed growth. Xuefeng Qian (2010), Benye Shi and Yongliang Zhang (2014), Sheng Bin and Lu Yue (2014) also argued that the growth of trade mainly comes from the intensive margin, and the contribution of extensive margin are relatively limited. Joachim Wagner (2014) analyzed the role of the extensive margin in Germany's massive export recovery in 2009 and 2010. Altan Aldan (2016) concluded that the growth of trade mainly caused by the expansion of emerging markets in Turkey from 1995 to 2013, namely the extensive margin.

1.2. AFFECTING FACTORS OF THE EXTENSIVE AND INTENSIVE MARGINS

Melitz (2003) proposed enterprise heterogeneity model and explained factors that affecting the extensive and intensive margins firstly. He thought that enterprises productivity determined the extensive and intensive margins. Later scholars studied on this basis. Foster et al. (2011) found that signing of preferential trade agreements would lead to an increase in extensive margin through a case study of a large number of countries, which would promote trade growth. Domestic scholars Xuefeng Qian (2008) and Xuefeng Qian and Xiong Ping (2010) pointed that economic scale, economic resistance, fixed costs, productivity levels, regional economic integration, and intermediate product attributes had no the same impact mechanism on the extensive and intensive margins. Pushan Dutt; Ilian Mihov and Timothy Van Zandt documented the impact of WTO/GATT members on extensive and intensive margins respecting to trade product profit margin through 6-digit bilateral trade data. Stéphane Auray (2012) studied the impact of the European unified

currency on the decline in extensive margin volatility. Xiaoheng Zhang; Yingheng Zhou (2017) et al. explored that the affecting factors of extensive and intensive margins of Chinese agricultural product export and argued that larger trading partners led to reduce export growth of new and existing products, the target markets were the countries with higher labor productivity and lower fixed trade costs. In the latest research, Rishav Bista and Rebecca Tomasik (2017) explored time zone differences as trade cost had impact on the extensive and intensive margins. The results showed that time zone differences mainly had a negative impact on export through the extensive margin and had no effect on the intensive margin.

In the existing literature, the extensive and intensive margins analysis mainly focused on the measurement of trade growth patterns and the influencing factors. In China, most of them analyzed agricultural products exported to European and Southeast Asian markets. The literature about the extensive and intensive analysis is obviously insufficient from China to West Asian countries. While in this paper, we find that the trade growth is mainly brought by the extensive margin from China to the West Asian countries, but the contribution of the intensive margin is relatively limited. In analysis of factors affecting the extensive and intensive margins, the result shows that economic size and infrastructure have impact on the intensive margin and extensive margin; labor productivity and fixed trade costs have no effect on the intensive margin and extensive margin; and infrastructure has no effect on the extensive margin.

2. THE STATUS QUO OF BILATERAL TRADE BETWEEN CHINA AND WEST ASIAN COUNTRIES

During the decade from 2007 to 2016, the exported volume from China to 20 West Asian countries increased from 60.717 billion US dollars to 124.527 billion US dollars, with an average annual growth rate of 8.31 %. In the same period, the import volume from West Asian countries to China increased from 49.443 billion US dollars to 89.259 billion US dollars, with an average annual growth rate of 6.78 %.

During the past decade, the trade between China and the 20 countries has maintained a good momentum of development. The annual average trade growth rate remained at a relatively high level for a long time. Affected by the unfavorable factors such as the expanding Syrian war, the Kurdish armed forces seeking independence, the Houthis armed rebellion and the Iranian nuclear issue, the economic development in West Asia countries was severely constrained and economic base was severely damaged. The turbulent social environment led to a significant decline in the total import and export trade between China and West Asia from 2014 to 2016, deviating from the long-term economic development trend. It is the “the Belt and Road” initiative that enabled China to have strong support for trade with West Asian countries, avoid a more serious downturn and slow down the rate of negative growth.

2.1. BILATERAL TRADE VOLUME IS GENERALLY ON THE RISE

From Fig. 1, it can be concluded that trade volume is developing at a good momentum from China to the 20 West Asian countries, and the overall trend is on the rise. In 2007, Chinese exports to West Asia were only 60.717 billion US dollars, and in 2008 it increased to 76.356 billion US dollars. Due to the impact of the global financial crisis, China’s export was greatly adversely affected in 2009, and total export fell to 65.586 billion US dollars to the 20 West Asian countries. Subsequently, gradually stepping out of the impact of financial crisis, China’s trade with the 20 West Asian countries continued to grow steadily, reaching 125.956 billion US dollars in 2013. China proposed the cooperation project of “the Silk Road Economic Belt” and “the 21st Century Maritime Silk Road” in September and October, 2013. In 2014, the trade volume increases to 23.459 billion US dollars between China and 20 West Asian countries, reached 10-year’s peak with 149.415 billion US dollars. However, due to the rapid deterioration of political environment in West Asia, the regional situation has become increasingly tense, and the global economic recovery has been continuing to become worse. The concentration of multiple unfavorable factors had led to a slight decline in the total volume of China and West Asia in 2015 and 2016, falling to 124.527 billion US dollars until 2016.

It can be seen from Fig. 1 year-on-year growth rate that the change of average trade annual growth rate is large from China to West Asia. For example, the growth rate is as high as 25.76 % in 2008; but due to the global financial crisis, the growth rate drops to -14.10 % in 2009. Overall, the total trade volume shows a steady upward trend between China and West Asian countries from 2007 to 2016, with an average annual growth rate of 8.31 %, showing the rapid growth of Chinese trade with West Asian 20 countries. Especially from 2007 to 2013, the international political situation was relatively stable, China economic growth rate rebounded strongly. So, the average trade annual growth rate is 12.93 % between China and West Asia, which is higher than the average growth rate from 2013 to 2016.

It can be seen from Fig. 2, the perspective of total trade volume, that overall import trend is on the rise for China imports of West Asian 20 countries. In 2007, the trade volume is 49.443 billion US dollars, and it rises sharply to 82.394 billion US dollars in 2008. In 2009, affected by the financial crisis, external demand declined, China economic growth rate slows down markedly. The total trade volume falls to 58.862 billion US dollars, reaching a lower level during the 10-year period. From 2009 to 2014, China total imports trade volume continues to rise in West Asian markets. In 2014, the total trade volume reaches 166.622 billion US dollars. Similar to export trade of adverse regional situation, the total amount continued to decline since 2014. However, the decline rate slows down significantly in 2016, and there is a bottom rebound trend.

It can be seen from Fig. 2, the perspective of change in growth rate, China exports to West Asia 20 countries that has a relatively large annual growth rate. Among them, the growth rate reaches 66.64 % from 2007 to 2008. In 2009, with the sharp decline in trade volume, the growth rate becomes -28.56 %. In 2010 and 2011, the average growth rate exceeds 50 %. In 2013 and 2014, with the trade volume reaching a historical peak, average annual growth rates slow down to 7.94 % and 2.72 %. The volume of trade is still considerable in 2015 and 2016, but compared to the peak in 2014, average annual growth rates turning to -36.45 % and -15.71 %.

According to Tab. 1, the trade imbalance between China and West Asia 20 countries, we could learn that trade surplus and trade deficit alternately appear with small trade volume, and overall trade growth is relatively stable from 2007 to 2010. From 2011 to 2014, the trade imbalances increase sharply, with trade deficits of 34.244, 39.272, 36.260 and 1.206 billion US dollars for four consecutive years. The reason for this phenomenon is due to the fact that China has purchased large quantities of oil and gas resources at that time. On the other hand, it is because that West Asian political system has led to unfair income distribution. At the same time, social purchasing power couldn’t rise when export income increased. In turn, import demand remained unchanged. Under dual factors, trade deficit rises rapidly and lasts for four years.

From 2015 to 2016, China trade imbalance with West Asian 20 countries is significantly reversed, emerging trade surplus of 37.461 billion US dollars and 35.268 billion US dollars in two years. The reasons for this phenomenon: at first, political situation deteriorated rapidly after 2014 in West Asian. The Syrian crisis was further aggravated by the collapse of Russian currency. The Kurdish armed forces became stronger and stronger with the support of Western power. The Iranian nuclear issue caused Iran to face Western severe economic sanctions again. Headed by Saudi Arabia, the Sunni Muslim coalitions were deeply mired in the Yemeni battlefield and the Turkish military coup in 2016. These reasons have made long-term complex and volatile political situation in West Asia. Under the influence of unfavorable factors, production capacity significantly declined in major oil producing countries. At the same time, the oil price has been locked at low level for a long time, due to Saudi Arabia's cooperation with the United States to combat Russia economic. It has caused many oil-producing countries in West Asia to bear double blow of oil price reduction and reducing production. So, the ability of foreign exchange earnings for oil exporters has fallen sharply. Second, the RMB exchange rate has declined, made China export products steadily rising. Therefore, from 2015 to 2016, China trade with West Asian 20 countries becomes surplus again more than 30 billion US dollars.

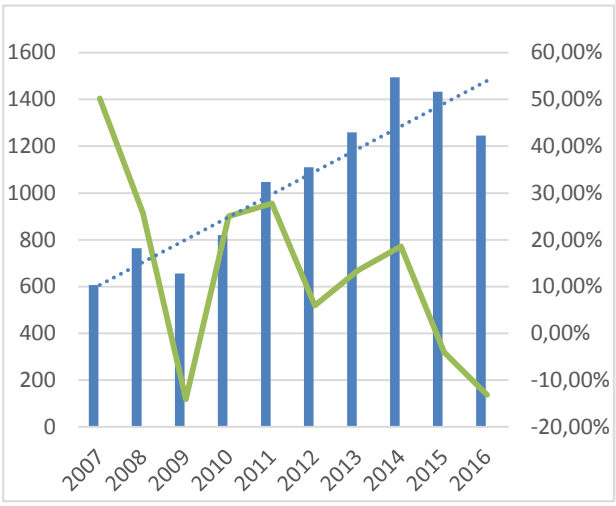

Fig. 1. 2007–2016 China exports to West Asia trade volume and growth rate

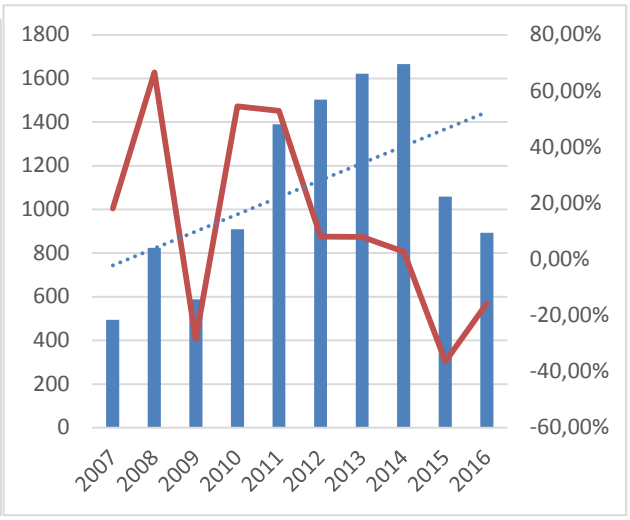

Fig. 2. 2007–2016 China imports of West Asia trade volume and growth rate

Table 1

2007–2016 Trade imbalance between China and West Asia (unit: billion US dollars)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Imbalance	11.275	–6.038	6.725	–8.921	–34.244	–39.272	–36.260	–17.206	37.461	35.268

Source: United Nations Commodity Trade Statistics Database

2.2. LARGE DIFFERENCES IN IMPORT AND EXPORT

According to Tab. 2, it shows that China exports to West Asia growing rapidly, but the proportion of the 20 countries is different and extremely uneven. The United Arab Emirates consistently ranks first. In 2016, China export to the United Arab Emirates is 30.067 billion US dollars, accounting for 24.14 % of China export to West Asia. Saudi Arabia, Turkey and Iran rank in sequence, all of them with total trade volume exceeding 16 billion US dollars. The proportions are close, which were 14.98 %, 13.40 % and 13.18 %, respectively.

Among West Asian 20 countries, the top 10 countries account for 93.22 % and the remaining 10 countries account for only 6.78 %, total export volume of 13 countries more than 1 billion US dollars. In 2016, China export trade to Palestinian is the lowest, less than 60 million US dollars, accounting for only 0.05 %. It can be seen that the trade volume is gradually increasing, and the growth rate is relatively rapid. However, the proportion of countries is uneven and varies greatly.

According to Tab. 2, it shows that China import from West Asia 20 countries are quite different and the distribution is uneven. In 2016, China total trade value of import from Saudi Arabia is 23.626 billion US dollars, accounting for 26.47%. Iran, Oman and Iraq rank next, accounting for 16.61 %, 13.49 % and 11.95 % respectively, and the total trade volume exceeds 10 billion US dollars. The United Arab Emirates total trade volume is 9.994 billion US dollars, accounting for 11.20 % among total trade volume from West Asia. The proportion of Kuwait, Qatar, Israel, Turkey and Egypt is relatively low, for less than 10 %. The sum of other 10 countries account for only 1.36 %.

It is not difficult to draw from the data in Tab. 2 that China trade with West Asian 20 countries is mainly concentrating among the major oil producing countries, importing mainly energy products. The gap between the rich and the poor is very significant in West Asian markets. Expect oil-producing countries, other countries have low import capacity, and effective demand for China goods is obviously insufficient.

Table 2

2016 China import and export to West Asian Countries Percentage, %

Country	United Arab Emirates	Saudi Arabia	Turkey	Iran	Egypt	Israel	Iraq	Kuwait	Jordan	Oman	others
Export	24.14	14.98	13.40	13.18	8.38	6.56	6.06	2.41	2.37	1.72	6.78
Country	Saudi Arabia	Iran	Oman	Iraq	United Arab Emirates	Kuwait	Qatar	Israel	Turkey	Egypt	others
Import	26.47	16.61	13.49	11.95	11.20	7.14	4.50	3.55	3.12	0.62	1.36

Source: United Nations Commodity Trade Statistics Database

2.3. TRADE PRODUCTS ARE SINGLE, TRADE VOLUME INCREASES RAPIDLY

According to Tab. 3, in 2007, the top 10 products trade volume is 38.64 billion US dollars exported from China to the West Asian market, accounting for 63.65 % of total trade volume, mainly capital goods and intermediate processed products, which are relatively stable. Among them, the number of 84 (nuclear reactors; boilers; machinery and mechanical appliances; parts thereof) and 85 (electrical machinery and equipment and parts thereof; sound recording and replay equipment) account for relatively high, reaching 28.25 %. The number of 61 (articles of apparel and clothing accessories, knitted or crocheted), 72 (iron and steel), 73 (articles of iron or steel) and 87 (vehicles other than railway or tramway rolling stock) proportions rank second, total trade value is 16.16 billion US dollars. The number of 62 (articles of apparel and clothing accessories, not knitted or crocheted), 54 (man-made filaments), 39 (plastic and articles thereof) and 94 (furniture; bedding, mattresses, cushions and similar stuffed furnishing) account for relatively low, only about 2 %. In 2013, total export trade volume of top10 increases rapidly, reaching 76.682 billion US dollars, accounting for 60.89 % of total trade volume to West Asian markets. The trade varieties remain basically stable. In 2016, the total trade volume of top10 is 76.424 billion US dollars, accounting for 62.98 %.

Through the analysis of trade varieties, it is not difficult to see that general economic foundation is relatively weak in West Asian 20 countries, and domestic industrial production capacity is insufficient, and a large number of industrial and agricultural production materials need to be imported. China provides a large number of basic products and production equipment for the economic development of West Asia. As the economies continue to grow in West Asian countries, so does the demand for industrial finished goods.

According to Tab. 3, in 2007, China import products is mainly the number of 27 (mineral fuels, mineral oils and products of their distillation) from West Asian market, with 39.278 billion US dollars, accounting for 79.98 %. The number of 29 (organic chemicals), 39 (plastics and articles thereof), 26 (ores, slag and ash), 25 (salt; sulfur; earths and stone; plastering materials), 85 (electrical machinery and equipment and parts thereof; sound recording and replay equipment), 74 (copper and articles thereof), 71 (natural or cultured pearls, precious or semi-precious stones) and 90 (optical, photographic, cinematographic, film, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof), total import value is only 9.01 billion US dollars, accounting for 18.33 %. In 2013, the number of 27 (fossil mineral fuels, mineral oils and products of their distillation) total trade volume increases to 139.808 billion US dollars, accounting for 82.47 %. The number of newer 31 (fertilizers) is 453 million US dollars, accounting for less than 1 %. The other eight categories account for 16.12 % and total trade volume is 54.640 billion US dollars. In 2016, China total imports products are 86.632 billion US dollars from West Asian market, accounting for 98.10 %, adding newer of 84 (machinery and mechanical appliances; parts thereof) and 28 (inorganic chemicals).

Table 3

2007–2016 China major import and export commodities[1] with West Asia (unit: billion US dollars)

Year	Export			Import		
	HS2	Amount	Proportion, %	HS2	Amount	Proportion, %
2007	84	9,440	15,55	27	39,278	79,98
	85	7,709	12,70	29	3,005	6,12
	61	5,944	9,79	39	1,816	3,70
	72	4,510	7,43	26	1,405	2,86
	73	2,890	4,76	25	1,051	2,14
	87	2,801	4,61	85	0,564	1,15
	62	1,460	2,40	74	0,339	0,69
	54	1,418	2,34	71	0,325	0,66
	39	1,256	2,07	31	0,258	0,53
	94	1,212	2,00	90	0,238	0,48
2013	84	20,985	16,66	27	139,808	82,47
	85	17,340	13,77	29	9,223	5,44
	61	8,172	6,49	39	8,012	4,73
	94	7,140	5,67	26	4,875	2,88
	73	5,860	4,65	25	2,157	1,27
	39	5,284	4,20	85	1,057	0,62
	87	4,319	3,43	71	0,807	0,48
	62	3,111	2,47	74	0,675	0,40
	72	2,456	1,95	28	0,514	0,30
	54	2,015	1,60	31	0,453	0,27
2016	85	20,810	16,71	27	64,276	72,77
	84	20,262	16,27	39	7,883	8,93
	61	6,344	5,09	29	6,712	7,60
	87	5,431	4,36	26	2,685	3,04
	73	5,293	4,25	25	1,707	1,93
	94	4,900	3,94	85	1,144	1,30
	39	4,683	3,76	90	0,637	0,72
	72	4,490	3,61	71	0,614	0,70
	62	4,354	3,50	84	0,527	0,60
	64	1,857	1,49	28	0,447	0,51

Source: United Nations Commodity Trade Statistics Database

[1] China exports to West Asia:84 (nuclear reactors; boilers; machinery and mechanical appliances; parts thereof) 85 (electrical machinery and equipment and parts thereof; sound recording and replay equipment) 61 (articles of apparel and clothing accessories, knitted or crocheted) 72 (iron and steel) 73 (articles of iron or steel) 87 (vehicles other than railway or tramway rolling stock) 62 (articles of apparel and clothing accessories, not knitted or crocheted) 54 (man-made filaments) 39 (plastic and articles thereof) 94 (furniture; bedding, mattresses, cushions and similar stuffed furnishing) 64(footwear, gaiters and the like; parts of such articles).
China imports West Asia:27 (mineral fuels, mineral oils and products of their distillation) 29 (organic chemicals) 39 (plastics and articles thereof) 26 (ores, slag and ash) 25 (salt; sulfur; earths and stone; plastering materials) 85 (electrical machinery and equipment and parts thereof; sound recording and replay equipment)74 (copper and articles thereof) 71 (natural or cultured pearls, precious or semi-precious stones) 39 (plastic and articles thereof) 90 (optical, photographic, cinematographic, film, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof) 31 (fertilizers) 28 (inorganic chemicals) 84 (machinery and mechanical appliances; parts thereof).

Differenced from China export industry, China has very obvious concentration in the process of importing goods from West Asia. West Asian countries have concentrated on the most important oil-producing countries in the world. China has increasingly strong demand for energy resources in the process of sustainable and rapid economic development. Therefore, the most important factor to promote import total amount is energy resources from West Asian market.

3. MODEL DECOMPOSITION OF EXTENSIVE AND INTENSIVE MARGINS

At present, there are a variety of methods for measuring extensive and intensive margins, mainly Feenstra index method, FR index method, HK index method (Hummels, Klenow (2005) and other methods. The more commonly used methods are the Feenstra index method and the HK index method.

3.1. EXTENSIVE AND INTENSIVE MARGINS MODEL

The growth model in this paper is measured by extensive and intensive margins, defined by Hummels and Klenow (2005), first proposed by Feenstra (2004).

Extensive margin : $\frac{\sum_{i \in I} M_i}{M}$

Intensive margin : $\frac{M^*}{\sum_{i \in I} M_i}$

The extensive margin indicates market share of bilateral trade products varieties in the import market. “i” is the trade variety. “I” is the collection of China exports to West Asian 20 countries. “M_i” is the value of “I” import products from all over the world for West Asian 20 countries. “M” is the West Asian 20 countries total imports in the world. For example, the extensive margin of China exports to West Asia in 2007, which is the sum trade volume of the same species for both China exports to West Asian 20 countries and West Asian 20 countries imported from all over the world in 2007, then divided by the total imports of the West Asia 20 countries from all over the world in 2007.

The intensive margin indicates that bilateral trade volume accounts for the proportion of the total import volume of the other party on bilateral trade varieties. “I” is the trade variety. “I” is the collection of China exports to West Asian 20 countries. “M_i” is the value of “I” import products from all over the world for West Asian 20 countries. “M*” is the total amount of Chinese products imported from West Asia 20 countries. For example, the intensive margin of China exports to West Asia in 2007, which is the total products amount of West Asian 20 countries imports from China in 2007, then divided by the sum trade volume of the same species for both China exports to West Asian 20 countries and West Asian 20 countries imported from all over the world in 2007.

3.2. THE EXTENSIVE AND INTENSIVE MARGINS ANALYSIS

Based on the above definition, this paper obtains data in United Nations Commodity Trade Statistics Database from 2007 to 2016. The most detailed classification of goods is the six-digit code in the Code Coordination System (HS) classification, using the HS2002 version of classification standard. According to this, the growth of trade products and trade pattern between China and West Asia from 2007 to 2016 were obtained. The calculation results are shown in Fig. 3.

As can be seen from Fig. 3, China exports to West Asia from 2007 to 2016, the extensive margin is significantly higher than the intensive margin, but the extensive margin and the intensive margin fluctuate less. This shows that it mainly depends on the extensive margin growth for China exports to West Asia 20 countries. That is to say, China export growth is more dependent on the number of product categories growth, not just the increase in trade volume of a single product. From 2007 to 2016, the number of products remained at a certain level exported by China. Apart from some war-torn countries, bilateral trade policies are basically stable.

From the perspective of intensive margin, China export to West Asian 20 countries is only 0.11 in 2007. In 2008, it is basically flat at 0.12. Later, due to the financial crisis, it declines

to 0.08 in 2009. There is an upward trend after 2010, reaching 0.15 in 2012. May be affected by "the Silk Road Economic Belt" initiative, which increases to peak of 0.18 in 2014 during 10 years. In 2015 and 2016, there is a slight decline, which remains at around 0.15.

The change of extensive margin is opposite to the intensive margin. The extensive margin is 0.74 in 2007, following a slight fluctuation in the next two years, reaching a peak of 0.76 in 2009. In 2010 and 2011, it remains at around 0.75. The extensive margin has a large decline, falling to 0.66 in 2012. However, it begins to grow slowly in 2013 and gradually recovers to a level around 0.72.

Analyzing the total trade volume of West Asia 20 countries import from China accounts for the proportion of total trade from entire world. In 2007, West Asia total import trade from China accounts for only 8.05 %. In 2008, there is a slight increase, reaching 8.74 %. But in 2009, West Asia total import falls 2.17 %, reaching lowest level during 10-year of 6.57 %. After 2009, due to global economy gradually recovered, also the proportion of West Asia total import from China gradually recovered. From 2009 to 2014, the growth rate almost doubles, increasing by 6.04 %. Especially after 2013, influenced by China development initiative, bilateral trade appeared good news. In 2014, the total trade amount reaches the highest point 12.61 % in 10 years. Then, there is a slight decline in 2015 and 2016, but it remains at 11.00 %.

On the whole, China export to West Asian markets has a large extensive margin and a small intensive margin. This reflects the fact that there are fewer Chinese companies exporting the same kind of products in a single direction. It also shows that the status of Chinese enterprises in the Middle East market needs to be improved, and there is room for further cooperation between two sides. The total amount accounts for a small proportion of West Asia import from Chinese products compared with the world. China export trade competitiveness with West Asia 20 countries has yet to be improved. "The Silk Road Economic Belt" initiative has promoted the expansion of Chinese companies' market share in West Asian market.

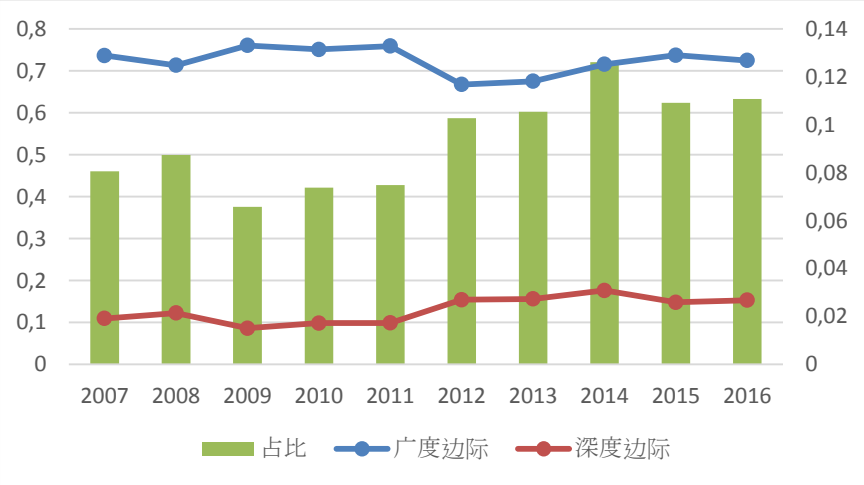

Fig. 3. 2007–2016 China export to West Asia extensive and intensive margins

4. ANALYSIS THE EXTENSIVE AND INTENSIVE MARGINS OF AFFECTING FACTORS

4.1. MODEL SETTING AND VARIABLE SELECTION

This paper draws on the influencing factors selected by Xuefeng Qian and Xiong Ping (2010) to conduct an empirical study on the trade growth pattern of China exports to West Asia. Due to the differences between countries in West Asia, the data loss is more serious, and the variables that can be included in the regression model are more limited. Given the availability of data, only 4 variables can be selected. Therefore, the regression model is constructed as follows:

$$LnIM = \alpha_0 + \alpha_1 \text{gdp} + \alpha_2 apro + \alpha_3 fct + \alpha_4 \text{inf} + \mu$$

$$LnEM = \alpha_0 + \alpha_1 \text{gdp} + \alpha_2 apro + \alpha_3 fct + \alpha_4 \text{inf} + \eta$$

To estimate the above formula, it is necessary to determine variables, that are the extensive margin and intensive margin, economic scale, labor productivity, fixed trade costs, and infrastructure. This paper selects data that China products export to West Asian 20 countries from 2007 to 2016. The countries are: Afghanistan, Iran, Iraq, Kuwait, Saudi Arabia, Bahrain, Qatar, Yemen, Sultanate of Oman, United Arab Emirates, Turkey, Syria, Georgia, Lebanon, Egypt, Jordan, Azerbaijan, Armenia, Palestine and Israel.

4.1.1. Intensive margin and extensive margin (IM、EM)

IM represents the intensive margin of China exports to the West Asian market, and EM represents the extensive margin of China exports to the West Asian market. The intensive margin and extensive margin data interpretation is calculated by the formula in the intensive margin and extensive margin model. The data is processed into the model using Ln (IM) and Ln (EM) forms, indicating independent variable changes 1-unit absolute quantity, causing percentage of intensive margin and extensive margin variation. Import and export commodity trade data comes from the United Nations Commodity Trade Statistics Database.

4.1.2. Economic scale(gdp)

The scale of economy is an important export influence factor. The larger economy, the larger domestic market, the greater demand for Chinese products, and the positive correlation between economic scale and intensive and extensive margins.

This paper selects the GDP of West Asian 20 countries to represent each country economic scale from 2007 to 2016, using Ln (gdp) form in model when processing data. GDP data comes from the World Bank WDI database.

4.1.3. Labor productivity(apro)

Labor productivity measures national production capacity, the quality of economic development. If a country with high labor productivity, the level of product demand is higher. This paper selects the GDP per employed represent labor productivity from 2007 to 2016. GDP per employed data comes from the World Bank WDI database.

4.1.4. Fixed trade cost(fct)

Fixed trade costs are sunk costs required for a country product to be exported to another country or region. It is mainly affected by the extent of the multilateral trading system, trade barriers, and trade liberalization. Existing scholars have cited the methods of Xuefeng Qian and Xiong Ping (2010) to measure fixed trade cost by using the Economic Freedom Index jointly published by The Heritage Foundation and The Wall Street Journal. The higher economic freedom index, the higher degree of openness, the smaller trade resistance, and the stability of export trade. This paper also uses economic freedom index of West Asia 20 countries to represent fixed trade costs from 2007 to 2016.

4.1.5. Infrastructure(inf)

Infrastructure construction is the foundation for economic development, affecting enterprises production capacity, and thus affecting product exports. This paper uses the number of fixed broadband subscriptions to represent the level of infrastructure in West Asian 20 countries from 2007 to 2016. Fixed broadband subscriptions data comes from the World Bank WDI database.

4.1.6. α_0、α_1、α_2、α_3 and α_4 are matrices of coefficients to be estimated; $\mu$and$\eta$are error vectors.

4.2. EMPIRICAL OUTCOME

In this paper, we use software Stata14.0 to regress panel data of above model finding that the random effect model should be used to estimate the influencing factors of the extensive and intensive margins. Iran is subject to economic sanctions, Iraq is controlled by many countries, and Syrian civil war has led to a serious lack of data on import and export trade. The true estimate is 17 countries. The estimate results are shown in Tab. 4.

From the regression results, in the regression model of intensive margin influencing factors (1), economic scale (gdp) is significant at the 10 % level and symbol is positive. For every 1 %

gdp increases in West Asian import countries, and the intensive margin increases by 0.452 %, so trade volume will grow with the expansion of economic scale of China export to West Asian market. This is mainly because the expansion of economic scale has led to an increase in domestic import demand, and China export products have increased to West Asian countries. Labor productivity (apro) has no significant effect on the intensive margin, and the correlation coefficient is small, but the sign is positive. Although the regression results are not significant, the results are in line with the theory of enterprises heterogeneous trade, that is, the productivity level of the importing country is higher than that of the exporting country, and the amount of products that the exporting country can export is less. The differences between West Asian 20 countries are large, but the special natural endowments make most of them over-reliant on export natural resources in the process of economic development.

Under "the resources curse", the labor productivity of West Asian countries has always been stagnant. Compared with China, the impact of social labor productivity on economic growth is very weak. Under the influence of such special conditions, the result of labor productivity in West Asian countries is extremely insignificant. The fixed trade cost (fct) has no significant effect on the intensive margin, and coefficient symbol is negative. Explaining that economic freedom index cannot directly affect intensive margin of Chinese exports. The intensive margin changes are relatively stable for China exports to West Asia, which is closely related to unique political structure and historical culture of West Asia and is in line with actual conditions. The infrastructure level (inf) is significant at the 5 % level and the sign is positive. It shows that for the infrastructure level substitution variable, the number of fixed broadband subscriptions increases by 10,000, and the intensive margin increases by 0.196 %. The special historical culture and geographical conditions have severely restricted infrastructure construction in West Asia. Due to the insufficient long-term development of infrastructure, infrastructure construction has always been an important indicator for promoting and measuring economic growth, and its impact on import trade volume is large.

As can be seen from the regression model of extensive margin influencing factors (2), the economic scale (gdp) is significant at the 1 % level with positive coefficient. For every 1 % increase in economy scale, the extensive margin will increase by 0.0905 %, indicating that the larger economies scale, the more product diversities export to West Asian market. At present, it seems that correlation coefficient is small, which correspond to the current situation that China export products to the West Asian market are very stable and relatively concentrated. Labor productivity (apro) has no significant effect on extensive margin, and correlation coefficient is small, but the sign is positive. This is similar to the intensive margin, indicating that the impact of overall labor productivity increase of West Asian 20 countries on China export products types is not clear. This is also closely related to the special nature of West Asian countries. The coefficient of fixed trade cost (fct) is negative but not significant, indicating that the economic freedom index of West Asian 20 countries does not directly affect the extensive margin of China export to the West Asian market. The demand is very stable in West Asia, also the demand for products types is low. The infrastructure level (inf) coefficient is small and not significant. It shows that the correlation is very low between China export extensive margin and the level of infrastructure construction in West Asian markets.

Analyzing from the supply side, after the economic crisis broke out, China adopted a strong stimulus plan and the economy took the lead in recovery. However, the drawbacks of strong stimulus policy gradually became prominent after 2012. According to Rothbard's book in *America's Great Depression*, when the economy is in a recession, active fiscal policy and expansion of monetary policy will delay the self-adjustment of the economy, leading to more serious resource mismatches and affecting market clearing. In turn, it takes longer for the economy to adjust itself. In 2012, a large number of enterprises were already in an unfavorable situation: a large amount of investment, high output and coexistence of huge receivable loans and the disadvantage of a rapid increase in bad debt rate.

The four major elements of supply are: labor, land, capital, and innovation. China supply-side reform have changed significantly between 2007 and 2016, especially during the period from 2009 to 2013.

In terms of labor supply, as the baby boomers gradually enter old age and the role of family planning national policy, the demographic dividend for the Chinese economy is gradually disappearing, and the reduction of labor supply will inevitably push the rise of labor prices. China as a large manufacturing country, especially, there are many labor-intensive enterprises. The changes in prices of export products have a significant impact on corporate exports. The excessive rise in labor prices will have an adverse impact on Chinese export. In addition, the China government has continuously raised the minimum wage for workers and various welfare expenditure standards, which has caused labor prices continue to rise, which in turn affects the final price of Chinese products entering market and corporate profits.

In terms of land supply, with the continuous economic growth and the continuous advancement of urbanization, most of Chinese regions are in a situation where land supply is difficult to meet the needs of rapid economic growth. The rapid rise in land prices has caused the production costs of enterprises to rise, which in turn affects the price of products. In this context, some companies choose to move out, which will cause new investment and transportation costs.

In terms of capital supply, China monetary policy has changed from relatively loose to stable in recent years. While exerting the effectiveness of monetary policy, it has paid more attention to policy inclinations in key areas of key industries. Since China is in the stage of economic development where the public ownership economy and the private ownership economy coexist for a long time, there are significant differences in the capital environment faced by different ownership enterprises. Private-owned enterprises still face high disadvantages of financing costs and financing difficulties, which will obviously limit the development of Chinese enterprises.

In terms of innovation, the long duration of economic crisis is closely related to the lack of innovation. The global slowdown in innovation has made the new economic growth point not appear, and the economic recovery lacks strong support. Among the products exported by China to West Asian 20 countries, the proportion of low value-added goods is relatively large, and in the market of high value-added products, the competitiveness of Chinese enterprises needs to be strengthened.

Table 4

Regression results

variates	(1)	IM	(2)	EM
gdp	0.452**	(0.224)	0.0905***	(0.0347)
apro	5.14e-06	(5.06e-06)	1.24e-06	(8.09e-07)
fct	-0.0181	(0.0252)	-0.00506	(0.00380)
inf	1.96e-07*	(1.16e-07)	2.53e-09	(1.60e-08)
_cons	9.873	(6.208)	-2.587***	(0.910)
N	148		148	
Country	17		17	

Standard errors in parentheses

* p < 0.05, ** p < 0.01, *** p < 0.001

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

5.1. CONCLUSION

From the overall situation of trade status, firstly, total import and export trade volume between China and West Asian 20 countries is generally on the rise, and continues to maintain a high annual growth rate of 8.31 %, especially from 2007 to 2013, the average annual growth rate reaching 12.93 %. The extent of trade imbalance increases with the growing in bilateral trade volume between China and the West Asian 20 countries, and reached a historical peak of 39.272 billion US dollars in 2012, but neither side had a long-term surplus or deficit. Second, Chinese

market share of imports and exports in West Asia is quite different. Bilateral trade is mainly concentrated in the United Arab Emirates, Saudi Arabia, Turkey, Iran, Egypt and Iraq. China trades more frequently with Middle East oil-producing countries. Third, China exports products to West Asia are mainly capital goods and intermediate processed products. Due to the weak economic foundation and low productivity of West Asia, the demand for Chinese goods has increasing with the economic growth of West Asian countries. The products of West Asia exports to China are more single, and fossil fuels account for more than 80 %. As the worldwide most important oil-producing region, China demands for fossil fuel is rising rapidly with economic growth from West Asian countries.

In the extensive and intensive margins analysis of China export to West Asia from 2007 to 2016, the extensive margin is always greater than the intensive margin, and this situation is very stable, with little change in ten years. Among them, the intensive margin remains basically stable from 2007 to 2011. In 2012, the intensive margin decreases slightly, and then after four years of slow growth, it returns to the pre-fall level in 2016. After analyzing affecting factors of the extensive and intensive margins, China exports to the West 20 countries, it is found that the economy scale and infrastructure have a significant positive impact on the intensive margin of West Asian countries, labor productivity and fixed trade costs have no significant impact on the intensive margin. The economy scale has a positive and significant impact on the extensive margin, but labor productivity, fixed trade costs, and infrastructure on the extensive margin are not significant.

5.2. POLICY SUGGESTION

Based on the above research conclusions, this paper proposes the following suggestions for developing trade structure between China and West Asia:

China should expand the extensive margin and increase the types of export products.

The types of products have not increased with the increase of the total trade volume exported by China to West Asia 20 countries. In order to improve the quality of China export trade to West Asia, it is necessary to promote more varieties of goods in export trade. As a manufacturing country in the world, China has a comparative advantage in many tradable products compared with countries in West Asia. Chinese companies have the ability to enter more varieties of products into the West Asian market.

China can strengthen infrastructure construction in West Asian countries

The implementation of“the Belt and Road”initiative will help Chinese companies to participate in the infrastructure construction of West Asian countries. China is a leader in infrastructure construction in the world, and China “going out” initiative can better serve the improvement of local infrastructure. As Chinese infrastructure construction is widely spread in West Asia, more auxiliary products will be exported to West Asia. In addition, the infrastructure of Western Asia built by Chinese companies will become a business card made in China, which will make the people of West Asia trust China to manufacture, which will provide a solid material foundation for Chinese products to enter the West Asian market.

Fully promote entrepreneurship

The export trade between China and West Asia, needs to be implemented by export enterprises. Entrepreneurs will be the most central driving force for the growth of international trade. To create a freer and open export environment for enterprises, and enable entrepreneurs to give full play to their unique talents in economic and trade, which is the most important factor for trade growth.

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INTERNATIONAL COOPERATION AND EMPLOYMENT REGULATION POLICY IN RUSSIA AND CHINA

Employment is the main socio-economic problem of the market economy. It reveals one of the most important aspects of a person's social development, related to the satisfaction of his/her needs in the world of work. The People's Republic of China is one of the largest countries in the world, which population, according to the UN Department of Economic and Social Affairs (Population Division) is 1394.1 billion people, while the number of able-bodied population doubles the number of people of incapable working age and at the beginning of 2018 it was 73.6 %. Over the past 10 years, China's population growth was 5.5 %. The rapid growth of the population in China leads to an excess of supply over demand in the labor market. It is obvious that the greatest contribution to the decline in the standard of living of the population and the deterioration in its quality is made by the growth of unemployment, especially dangerous for its social consequences for modern China, where most of the population does not have wide access to social support systems.

The important problem in the last decade is the presence of the unemployed, which is replenished both by young people entering the working age, and at the expense of those who lost their jobs for different reasons. In addition, young people experience great pressure and competition in the process of employment. The unemployment rate for the few years is just over 4 %, but with the growth of the total population, including the working age, the number of unemployed citizens is increasing.

In Russia, the unemployment rate is higher than in China (Fig. 1). Let us notice that in China for the last ten years the unemployment rate has been on the same level – about 4 %, while in Russia there are fluctuations of the indicator, the largest value in 2009 was 8.2 %, the smallest in 2017 – 5.2 %.

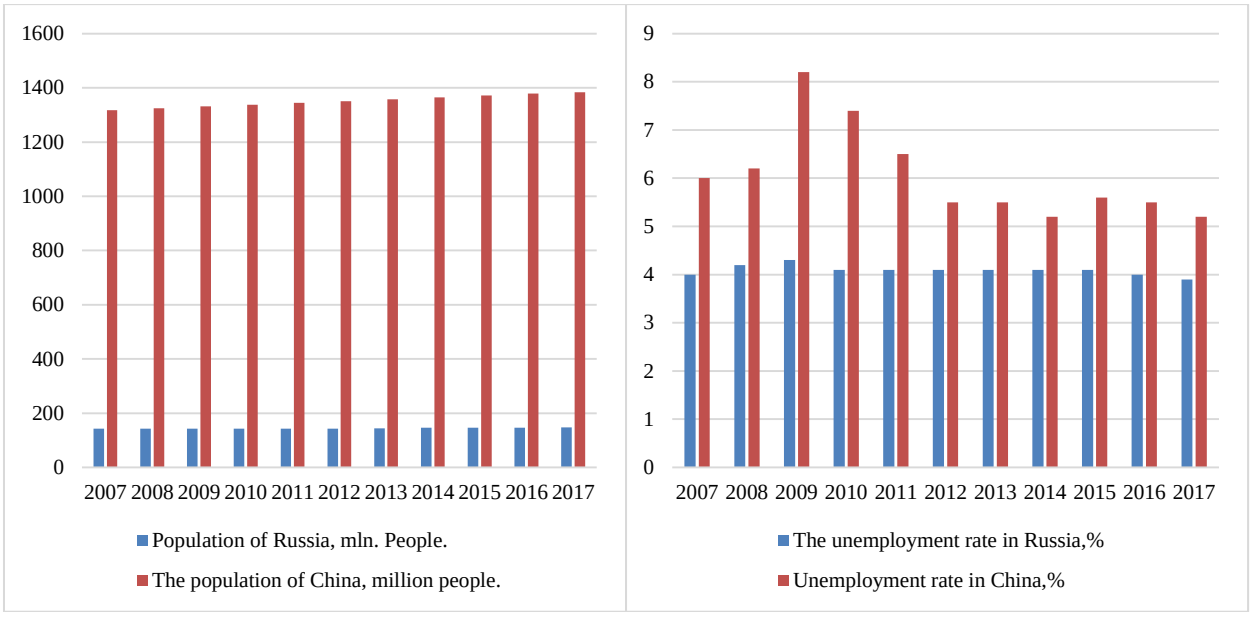

Fig. 1. Population and unemployment in Russia and China 2007–2017

Under the circumstances, the Chinese government is interested in sending part of the unemployed able-bodied population abroad, and to Russia as well. The creation of free trade zones with the participation of the PRC also provides for the free movement of labor. According to the Federal Migration Service of Russia 108513 people arrived from China in 2017 to find jobs, and in the quarter of 2018 – 27205 people.

It is possible to assess this fact from the positive side, since Chinese workers make a significant contribution to the development of the country's economy, which allows solving the economic problems of many regions of Russia. In addition, due to labor migrants from China, the issue of covering the labor shortage is being solved, especially in agriculture, trade, and construction.

Over the past few years, close cooperation has been established between Russia and China, including regulating the employment of the population. The main documents are presented in Fig. 2.

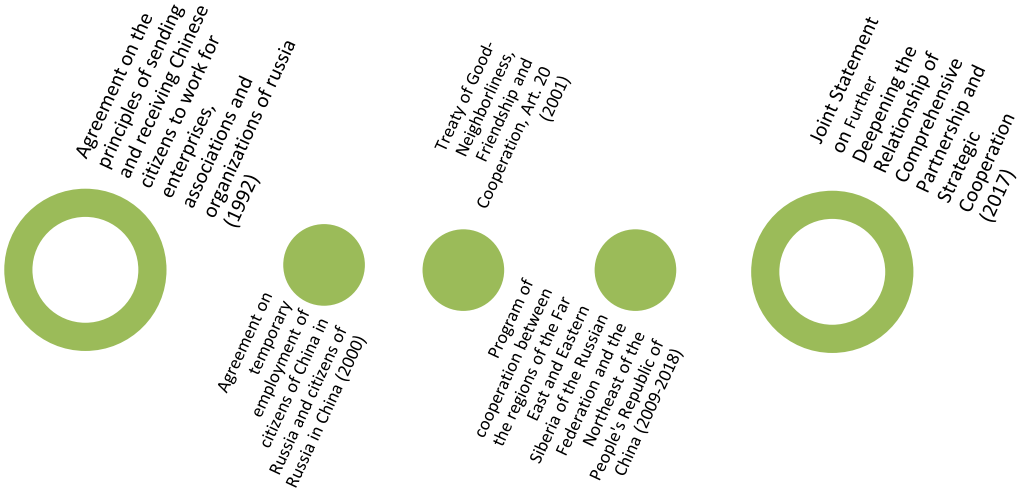

Fig. 2. Basic documents on cooperation between China and Russia, including those regulating employment

Despite the international cooperation of our countries, the socio-economic analysis of employment problems in modern China and the state and prospects of employment have become the object of increased attention of the entire world community.

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DIGITAL TECHNOLOGIES IN THE BANKING SYSTEM OF CHINA AND RUSSIA: NECESSITY OF DEVELOPMENT

In recent years, issues of the development of the Chinese economy, as well as a combination of many factors that ensure high rates of its growth, are being discussed by experts in economic literature, which is especially important today under conditions of the "predominant economic doctrine" formation, proclaimed in Russia.

In this respect, the "Open Lessons" about the development of the Chinese economy are associated with the spread of a new technological order that differently solves the problems of increasing the efficiency and competitiveness (leadership) of not only the system as a whole but its traditional industries.

The banking sector of China as well as the Russian banking sector belongs to the category of traditional spheres which have currently made a transition to the new forms of structural and digital transformation. There are following important landmarks of the Chinese experience in implementing changes in the banking sector: firstly, self-reliance (as opposed to foreign investment); secondly, the historical development of the country and evolutionary forms of development; thirdly, the continuity of development in time and space and the preservation of their own identity while striving to achieve the harmony of the past, the present and the future.

This experience and theoretical component are not so widely represented in Russian and Western books. Therefore, in modern time, it not only deserves attention, but also presents an actual field for study.

The key role in the development of China's economy (as well as in Russia) was the strategy developed by the country's leadership in the development of the banking sector. The strategies were as follows: firstly, prevented the monopoly position of foreign capital, through strict restrictions on the size of shares capital and on the conditions for the integration of foreign capital into commercial financial organizations of mixed forms of ownership; secondly, controlled capital operations in a liberalized and open economy as an effective tool to prevent attacks from foreign capital; thirdly, supervised the stock market in order to prevent its collapse.

The development of China's banking sector based on these provisions, were aimed at servicing the real sector economy and the multi-million population as well as enriching modern financial instruments and strengthening the state for the stability of the economy under conditions of new normality [1].

A normal and effective way of functioning of this sphere is its adaptation to the speed and level of the real economy. Lagging of financial development processes will lead to the accumulation of financial risks, and later to economic and financial crises.

One of the international challenges of the 21st century is the structural modification of the multipolar world development pattern.

The Chinese financial system as a whole, and its banking sector in particular, has become a certain "claim" of the renminbi on the status of the world currency. This, on one hand, has increased the role of currency in individual developing countries in the world economy, and on the other hand decreased the influence of traditional world centers [2]. Experts predicted a decline in the share of the latter from 40 % (in 2009) to 28 %, and an increase in the share of China (together with India) to 25 % (world economy by 2020) and up to 30 % (by 2030).

In this experience, the prerequisites for the transformation of the national currency into the world economy include the following:

- the priority of developing the production sector,
- accelerating economic growth,
- attracting foreign investment and national capital investment abroad,
- export leadership and the accumulation of international foreign exchange reserves.

However, the practice of introducing the Chinese currency into international circulation differs from the transformation of other national currencies into world currencies. So, the Chinese experience shows the priority of the formation of economic and currency potential in the country first, and then the internationalization of the national currency – yuan. World practice differs historically in the simultaneous nature of these processes.

Another feature is the rigid state regulation of the Chinese currency in international processes. The Chinese model of combining the state and the market within the country does not correspond to the Western pattern of the similarity of both forms of regulation.

Characteristic of the reform processes in the currency sector of China is a serious scientific foundation, the presence of which unquestionably accompanies this process and testifies to the serious developments of Chinese financial scientists not so known as their American and European counterparts. In China these reforms are based on the concept of an independent exchange rate policy in the national interest (by Deng Xiaoping).

Experiments on the use of the renminbi in international settlements, which China has been conducting for many years on the border territories, have made it possible to formulate a regulatory framework to test various forms of settlements (swaps, savings, offshore renminbi, etc.) [3].

The State Council of the country carries out and controls the movement towards free conversion, the creation of a global financial center in China. All this contributes to the implementation of the strategic goal of the country – the formation of a special Chinese model of currency circulation, creating a competitive environment for dollar and euro.

The Chinese experience of scientifically based state-controlled forms and documents on economic and monetary policy shows that the development of the Russian concept of the internationalization of the national currency should also be based on a system, experimentally verified methodology, reproductive theory and practice [4].

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HIGH-TECH EXPORTS AS A TOOL FOR ECONOMIC DEVELOPMENT OF THE REGIONS' POTENTIAL

The article deals with the importance of developing export of high-tech products in the context of limited international commodity markets and global economic structural changes. Challenges of export are designated, directions to improve the forms and methods of hi-tech export support are formulated. The approaches of creating E-infrastructure providing network interaction and communications, expansion of trade and economic potential, as well as integration of Russia into the international market are offered.

***Keywords**: export, import, high-tech products, State support, e-infrastructure.*

The Russian economy is facing global technological challenges, which in the context of structural imbalances and restrictions on the export of energy and raw materials are becoming real threats to its future development. In this regard, it is important to increase GDP, including by the foreign economic factor of the innovation component.

The share of the knowledge-intensive sector in Russia's GDP is less than 1.5 % [4], but in the future there are opportunities for its growth to 2 % by 2020 [6]. The Road map adopted by the Russian government requires doubling exports of industrial high-tech products, thereby increasing the number of exporting companies, 75 % of which are regional.

The main direction of inertial diversification of exports in terms of export-oriented import substitution is involving the regions of the Russian Federation and local territorial entities into export foreign economic activity. The quantitative and cost parameters of national exports are determined by the RF subjects' economic potential, which is determined by the specific features of the resource base, infrastructure, the level of socio-economic development, the state of enterprises, the level of entrepreneurship development and support of its regional authorities [1].

Russia's participation in the structure of the world market of high-tech products (HTP) is insignificant – 1 % [7], the dominant position is still occupied by the USA, Japan, Great Britain and Germany. Payments on technology imports far exceed revenues from technology exports, only R&D exports exceed imports, for the rest components (patents for inventions, utility models, know-how, etc.) exports is dominated by imports. Domestic high-tech industries, in comparison with world leaders, are ineffective, and the export price of Russian technologies is lower than the price of a foreign analogues.

The conducted research reveals the system problems of export interfering participation of the Russian producers in the international market of hi-tech production, such as [8]:

- significant volume of requested documents;
- lack of possibility to submit a number of documents in electronic form (exclusion of companies working with the Customs Union countries);
- additional requirements for the export of engineering products;
- difficulties in finding partners abroad and high cost of participation in international exhibitions;
- problems of interaction with Rospatent: it is difficult to obtain a license directly in the organization, it is easier, but twice as expensive, with patent Trustees;
- unreasonably high fines for minor violations of customs procedures.
- There are following directions and tools of the national system of high-tech exports support [3; 5] and development:

1. *Financial support* – stimulating investors willing to invest in research and development enterprises (grants, guarantees, preferential loans, tax benefits, duties, insurance, leasing, etc.).

2. *Non-financial support* – performing certain public services aimed at creating an export environment: creating conditions for international cooperation and exports; providing information on the conditions for access of goods and services, including promising ones, to the markets of foreign countries; improving the system of electronic declaration and customs administration processes; developing the system of improving the qualification of exporters; improving the negotiating mechanisms to eliminate tariff and non-tariff barriers to exports; certification in foreign markets of Russian high-tech products.

A key condition for the implementation of the proposed support measures is creation of an appropriate electronic e-infrastructure, providing conditions for networking, communication and integration of participants in the export of VTP (exporters, importers, brokers, financial consultants, insurance companies, partner banks, Eximbank, etc.).

This subject of foreign economic activity represents the spatially distributed telecommunication system united by the network geoinformation resources: GIS server, Web server, Geoportal, Catalogue service, the Service data Base of the thematic objectives of the export HTP, Client support GIS applications (Clients) [2]. Effective navigation in applications will provide a quick search for relevant information of export participants, expand the trade and economic potential of the regions and the possibilities of Russia's international cooperation in the market of high-tech products.

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INTERNATIONAL FOREST PRODUCTS TRADE: COMPETITIVENESS ANALYSIS[1]

The global trend of replacing the fossil fuels with inexhaustible or at least renewable sources of energy determines the new challenges for the world economy. In attempt to make economic development more sustainable, which means no harm to next generations, policy makers all over the world have to find new economic incentives for producers to force them to make production environmentally friendly.

Among the obvious candidates to replace the fossil fuels in producing energy for various purposes one should mention the forests. In addition to this role forests provide different ecosystem services, ensure conservation of biodiversity and play an important role in restraining the consequences of climate change as carbon sinks. Thus, forests are indeed vital for humanity and the world economy. Under these conditions effective managing of timber industry seems to be a very important issue for each country with abundance of forest resources.

According to the global forest resources assessment of the Food and Agricultural Organization of the United Nations in 2015 the world forested area was about 3 999 million hectares [1]. About 20 % of these resources are located in the Russian Federation. Undoubtedly, not all of these forest resources can be used for producing commercial timber, but still Russian wood stock is large. In fact, Russia is one of the largest world exporters of the timber commodities and therefore plays an important role in the international wood trade.

However, nowadays the Russian timber industry is an example of extensive branch development. The largest shares of export from Russia belong to industrial roundwood and sawnwood – low-processed commodities, which do not require many innovations or qualified workforce. Stable high demand on roundwood and sawnwood from Asian countries, especially from China, determines specialization of timber industry in Siberian and Far Eastern regions. Therefore, most of the producers are not interested in increasing the value added in production chains. The other reason for that is lack of domestic demand on high-yield wood products in these regions which makes capital investments in big plants for deep timber processing rather risky and economically ineffective.

Another restriction of the timber industry development in Russia is lack of information about competitiveness level of forest products produced in different regions. This situation might cause ineffective decisions concerning forestry management and trade policy on regional and country levels. This study is aimed to fill in this gap and to provide a brief overview of methods which can be applied for assessing competitiveness of Russian timber products against the international timber markets.

There are various approaches to define and to estimate competitiveness of a product, a firm, a region or a country. For instance, M. Porter's view on competitiveness as a sum of several components such as factor conditions, domestic demand, related or supporting industries and a firm strategy is one of the most popular in the business environment [2]. However, in academic literature the term "competitiveness" is usually related to competing on global markets and, therefore, to the international trade theory. This subfield of economics takes its origin from the studies by A. Smith and D. Ricardo.

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A. Smith argued that under conditions of free trade any country should export goods in which it spends less resource than other states and import products that were produced by other states at lower costs. D. Ricardo developed these ideas, postulating that even without having an absolute advantage in production of any specific product, a country can successfully participate in international trade, specializing in the export of goods in the production of which it has an advantage in relative terms. In fact, the Ricardian model of comparative advantage became the basis for further trade theories.

As for quantitative measures of evaluating competitiveness, one of the most popular is the indicator of revealed comparative advantage, proposed in the mid-1960s by B. Balassa [3]:

$$RCA_{ij} = (x_{ij}/\sum_{i=1}^{n} x_{ij})/(\sum_{j=1}^{m} x_{ij}/\sum_{i=1}^{n}\sum_{j=1}^{m} x_{ij}),$$

where x_{ij} – export volume of country j for commodity i. The results of the index calculation are interpreted as follows: if $RCA_{ij} > 1$, then country j has a comparative advantage in the production of goods i. However, this indicator is criticized by some researchers due to the fact that only export flows are used in the calculation, while the impact of imports on competitiveness remains unaccounted. As a result, a significant number of modifications of this indicator appeared, in particular Aquino index [4], static [5] and dynamic [6] indices of intra-industry trade, relative trade advantage index [7].

Nowadays there are a lot of successful examples of applying these methods for evaluating competitiveness of forest industries in different countries. In particular, noteworthy studies in this field were conducted by Chinese researchers.

For instance, Han et al. [8] applied several indicators and inter alia Balassa index and Grubel-Lloyd index for assessment of global competitiveness of the Chinese wooden furniture industry from 1993 to 2007. These indicators demonstrated trends of comparative advantage in China's wooden furniture, which underline that during past two decades China managed to shift from comparative disadvantage to a rather strong position in furniture industry. However, its comparative advantage has started to slow down over the last few years. One of the key findings is that current export leaders in furniture industry with large market share are gradually losing their comparative advantage to the developing economies in Asia, East Europe and Latin America with lower labor costs.

Regarding the competitiveness evaluation at regional level one should mention the study by Li and Zhao [9] who investigated peculiarities of development strategies in Chinese provinces through Data Envelopment Analysis (DEA) approach. Authors construct a competitiveness index of the groups of factors including institutions, market structure, production inputs and technology. They claim that in long-term perspective they crucially affect income per capita in Chinese provinces. As a result, statistical evidence for the link between competitiveness and real GDP per capita was found and, therefore, various possible strategies of regional development were proposed.

For the purpose of estimating competitiveness of Russian regions' forest industry in this study we use relative trade advantage index which takes into account both export and import trade flows:

$$RTA_a^i = RXA_a^i - RMA_a^i = (X_a^i/X_n^i)/(X_a^r/X_n^r) - (M_a^i/M_n^i)/(M_a^r/M_n^r),$$

where X_a^i, M_a^i are export and import volumes of region i for commodity a; X_n^r, M_n^r are world export and import volumes excluding region i for all products excluding commodity a.

The results of the competitiveness assessment of Russian timber products show the presence of significant comparative advantages in trade considering low and medium processed wood products. Along with that, products of paper and furniture sectors are uncompetitive in the world market in comparison with other countries. It is also revealed that all regions are involved in foreign trade in goods with high value added and almost all medium-processed forest products, but 18 % of the regions do not have trade flows for raw wood.

At the moment, Russian forest sector possesses a unique combination of factors that can contribute to the sustainable development of timber industry. The low actual cost and significant

volume of forest raw materials determine the comparative advantage in the cost of production of processed forest products relative to foreign competitors. In the short term, the devaluation of the ruble also stimulates the industry to create high-yield products. Information about the presence of comparative advantages and disadvantages in trade of products of timber processing complex can be used to improve the effectiveness of forest management.

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MARKET RESEARCH OF MEMBER COUNTRIES OF THE "ONE BELT, ONE ROAD" INITIATIVE PROJECT AND THE POSSIBILITY OF EXPORT DELIVERIES FOR THE ENTERPRISES OF THE KRASNOYARSK KRAI

The analysis of the markets and opportunities of individual countries participating in the project "One Belt One Road", and the resources of Siberia and the Krasnoyarsk Krai from the standpoint of the opportunities to participate in the implementation of this global project in some countries and to promote their food markets for the implementation of the UN Agenda for sustainable development until 2030 are considered in the article. The existing and possible resources for the production and sale of food in the regions of Siberia are given taking into account the significant changes in the climate in the densely populated territories of the project participants and especially the growing shortage of water and water resources as the basis for the production of food resources in these territories. The available resources of Siberian regions, the Yenisei Siberia and potential consumers of crop, animal products and wild plants are shown. The necessity for the economic formation of modern cooperation and network interaction within and between the countries for the rapid growth of the food market and exports to global markets, taking into account the new opportunities of transport solutions in the system of the countries-participants of the New Silk Road and the Northern Sea Route projects, is substantiated.

***Keywords**: New Silk Road, Northern Sea Route, sustainable development, food, Siberia, food resources, export.*

The Agenda for Sustainable Development until 2030 adopted at an anniversary session of the UN (September, 2015) as the purposes coordinated by the member states of the UN and the program, induces the leading countries of the world to form large-scale interstate projects on development and preservation of the civilization world on the planet. Seven of seventeen purposes of the Sustainable Development Goals are aimed at the solution of a food problem and fight against hunger and malnutrition.

In these new purposes, relying on positive experiment of the world community on realization in 2001-2015 "United Nations Millennium Development Goals" considerably statement of problems of development – from overcoming hunger and malnutrition – to steady models of production and consumption, a healthy lifestyle and the balanced food, providing with clear water, preservation of the nature and ecology extends [1].

Historical experience shows that sustainable development and living in peace is possible with active cooperation of the countries in transfer of administrative technologies, development of socially oriented programs, education systems and so forth.

One of the best ways of cooperation and development modern practician this active economic interaction of the states and formation on this basis of the active environment of changes.

In current trends of information and communication processes, possibilities of such cooperation and network interaction for implementation of the agreed programs are actively extend.

Understood in that way, the global offers stated by a number of the countries connected with implementation of large complex projects are very important for implementation of modern programs of sustainable development including development of economies of the countries – participants of these programs.

The authors selected projects which can be included into the list of participants of realization a large number of the countries and territories, including various level of development of economy and the social sphere among a large number of various projects.

Situation of an essential difference in development of the certain countries and territories on the planet are observed throughout the long period. One of them is the centers of new technologies, the educated population and as result – formations of high standards of life.

Among them – North America and such countries as the USA and Canada, the most part of Europe, the Mediterranean and Scandinavian coasts – the countries of the European Union and Great Britain, a part of territories of Asia – Japan, South Korea, China, Singapore, and the Euroasian space – Russia and also a part of the new states which have arisen after the collapse of the USSR.

Distribution of experience of successful territories to developments of less safe countries, can and has to be carried out through decrease in customs and administrative barriers, the coordinated trade policy, development of a transport component and conditions of successful trade and communications and also through system personnel training which can transfer and develop the best experience.

It is promoted by acting practice of cooperation and interaction of the countries, including the WTO, the regional trade unions and agreements. which creative and integration purposes try to correct in the interests by the countries losing now the hegemony.

However, most the states seek to create transport corridors, hubs in the territories, than create conditions of a common advantage and employment of the population of member countries of projects. So now there is a construction of the second turn of the Suez Canal, the project of the Nicaragua Canal, on the agenda construction of the channel through Iran, the channel parralelny to Bosphorus, declared by the President of Turkey, expanding a transport corridor on the South is implemented.

Among all global, realized on the basis of intercountry cooperation,there is the New Silk Way project which is also called “One Belt One Road” . The project synthesizes the ideas of the different countries about the directions of interstate cooperation. It including the Euroasian initiatives of the Republic of Korea, “Steppe Road” project of Mongolia and Kazakhstan as the logistic center of Central Asia, the Russian-Eurasian Economic Union (EAEU) and creation of “the Trans-Eurasian Corridor”, development of the Northern sea and subpolar sea way, the project of transpolar flights through the North Pole to the countries of the South of Asia, America, Canada.

The analysis of contents and practice of implementation of the existing projects of Transatlantic and Pacific partnership, “Baltic-Adriatic-Black Sea” and a row other shows their orientation on strengthening of hegemony of one country. In difference from them the “One Belt One Road” project and projects of Russia interfaced to him выступаютя as the leading projects of transition to the multipolar world which priority purpose is elimination of natural geographical obstacles for multilateral cooperation. Construction of uniform Euroasian economic space where the most part of the population of the planet lives is represented to the most dynamic. During negotiations with the Chinese President the President of Russia has noted that “… projects of EEU and “A New Silk Way” are meant by an exit to the new level of partnership and, in fact, means the Common Economic Space on the continent”.

The analysis of capacities of the countries interfaced to the “One Belt One Road” project shows that 60 states, with the population more than 4,5 billion, persons, and total economic potential more than a half of a world gross product can be integrated into the project.

Influence of the analyzed project will be shown on three continents – Asia, Europe and Africa, and also island states of Japan, New Zealand, somewhat – Australia, including the largest countries on population, including China, India, Indonesia, Pakistan. On modern indicators 60 countries where more than 60 % of the population of the planet , their GDP – 64.65 trillion US dollars are connected with the project.

Table 1

Capacities of the countries interfaced by the One Belt One Road project [2]

Country	Population of one million people of 2017	GDP billion $ (2016–2017)	Foreign trade turnover billion $
China	1 430, 075	21 286,0	> 4 000,0
India	1 339, 127	8 701,0	642,7
EU	513, 000	17 278	3 5000,0
Russia	146, 880	3 862,0	587,6
Iran	79, 966	1 459,0	110–120
Tajikistan	8, 600	25 810,0	5,0
Uzbekistan	30, 85	202,3	25,0
Kazakhstan	17, 05	460,7	77 646
Vietnam	94, 569	594,9	> 300,0
Indonesia	266, 357	3 028,0	> 250,0
Greece	11, 127		29,5
Italy	60, 495	2 221,0	782,7
Netherlands	16,992		620,0
Germany	81 365	3 979,0	1 279,0
Kyrgyzstan	6,0	7,16	5,2
Pakistan	207, 774	988, 2	около 80
Ukraine	42, 216	349,8	90, 9
USA * (reference)	329, 000	18 624,0	>3 500,0 including with China nearly 1 000,0

Implementation of interstate projects, priority for development of cooperation of China and Russia draws the attention of regional, especially Siberian territories to practical actions for inclusion of the resources in general purposes of projects.

Assessment of economic capacity of Siberia and the Far East of Russia shows concentration of resources:

- more than 15 % of GDP of Russia;
- 25 million inhabitants;
- 144 higher educational institutions;
- more than 700 thousand students ;
- not less than 50-70 thousand foreign students can study here;
- potential for institutions and cultural figures and art with world recognition;
- The foreign trade turnover of Siberia in 2020 will be 165-173 billion dollars.

Siberia is characterized by the considerable territory, a variety of climatic conditions, existence of reserves of diverse minerals of ore, gas and nonmetallic stocks.

Concentration more than 50 % of the woods does Siberia (along with the woods of Amazon) like planet lungs where there is an enrichment oxygen and absorption of uslekisly gas on the benefit of all mankind. Besides Siberia is one of the largest carriers and a source of annual reproduction of fresh water supplies.

In Siberia the large volume of gas, oil, non-ferrous and ferrous metals, coal is made, there are rare-earth metals, gold, platinum.

In Siberia:

- Coal – 80 % of the all-Russian stocks;
- Copper – 70 % of the all-Russian stocks;
- Nickel – 68 % of the all-Russian stocks;
- Lead – 86 % of the all-Russian stocks;
- Zinc – 77 % of the all-Russian stocks;
- Molybdenum – 82 % of the all-Russian stocks;
- Gold – 41 % of the all-Russian stocks;

- 99 % of the all-Russian reserves of metals of platinum group;
- Hydro Energy resources and reserves of wood – more than 50% of the all-Russian stocks.
- Also in Siberia there are big capacities of mechanical engineering:
- modern rocket and defensive direction;
- production of nuclear materials for medicine;
- the construction organizations having experience of development of new territories including in difficult climatic conditions.

All this can and has to be involved at realization large analyzed interfaced for Russia and China of projects – "A New Silk Way" in combination with the Trans-Siberian Railway, Northern and subpolar maritime routes, Cross-polar flights and gas highways – East cooled "Force of Siberia" and Western through Altai.

For the analysis of such opportunities we will be limited in this article to three directions:

- possibilities of production and realization of food and environmentally friendly products and wild plants;
- possibilities of supply of pure fresh water;
- possibilities of training and the organization of network training of experts for the countries of participants of the global interactions.

According to the CEO of the World food organization to José Gratsian da Silva, by 2050, around 10 billion people will be living on the planet and in order for them to maintain a balanced diet, a 50 % increase in food production is required. At the same time conditions of production of crop production and livestock production significantly worsen. As a result, if similar tendencies remain, the planet can not cope – the CEO of FAO in the preface to the report has warned [4].

Modern economic theories define need of use of new resources, first of all, of economic and social tasks, information and communication for the decision. It is a basis of the theory of cooperation and network interactions developed by us as modern resource of economy. The development of cooperation and network interactions should be considered as a modern direction for obtaining an economic and social result for countries and enterprises participating in global projects.

Our researches which confirm conclusions of a number of scientists (Rolf Vayber from Germany) in the modern economy take place the high-quality processes leading to basic changes including:

- The dominant of economic growth is information, the base for innovations is digital and computer technologies.
- Instead of the functional specialization based on division of labor there is an integration of labor processes on the basis of technological networks.
- Transition to network economy is provided by telecommunication infrastructure.
- Growth of constant expenses and reduction of limit costs force the producer to do quickly sale of the greatest possible volume of goods.
- The industrial economy is guided by scale effect of production, and information – by network effect.
- In information economy there is the law of the increasing profitability with positive communication works [5; 6].

Acceptance of these approaches to the analysis of the present stage of cooperation during implementation of the global interfaced projects induces to revision or specification of methods of the organization of business, understanding of a role and the place of the separate used resources, including information and communication, the increasing value of human potential and new structures of a organization of business.

According to us, cooperation and network interactions of the enterprises, organizations it is processes of interpenetration and harmonization due to simultaneous platform action on this platform of producers, consumers, intermediaries, in forms of hierarchies, the market and networks as whole, on the basis of recognition of common goals and values, cooperation of the

resources or their parts, when maintaining independence of participants and their leaderships, at respect for voluntary coherence, at possible interaction with power and public structures and on the basis of use of modern information technologies and communications, including social networks [7].

Such interaction creates multilateral network effect, including with positive feedback, effect of a brand and effect of virality of large active structure that in total forms key interaction – participants – units of value and the certain selection (filter) allowing to keep interaction value.

Cooperation network interaction is use of the best the practician of management and coordination, sharing of resources of different businesses, use of the general information, exchange of experience between participants for achievement of competitive advantages and obtaining synergetic effect at all partners.

It is analysed from positions of cooperation and network approach, three directions of cooperation in implementation of projects earlier allocated with us.

Resources of Siberia on production of food, including environmentally friendly products are rather high. There are fertile lands, excess of clear water, enough the sun and rainfall for successful agriculture and livestock production in Siberia.

Only in Siberian Federal District uniting 12 regions of Russia acreage make more than 15000,0 thousand hectares now that makes nearly 19 % of all cultivated area of Russia. The high resource of development of production of food is available also in regions of the Far Eastern Federal District where acreage are nearly 2000 hectares, there collecting 52 % of soybeans from all their production in Russia. Great opportunities are for further development of livestock production [8].

In Siberia and regions of the Far East:

- 50 % of all collecting a buckwheat in Russia;
- about 40 % of oats;
- more than 15% of wheat;
- great opportunities for production of meat and milk.

Also, there are opportunities for expansion of arable lands and agricultural grounds. More than 5 thousand hectares of the earth aren't used now.

Also, it is important to have considerable opportunities for expansion of arable lands and agricultural grounds. These lands were completely restored from the fertilizers used earlier and represent a good basis for production of environmentally friendly production [8].

In the new globalized world, Siberia represents a considerable resource as from positions of availability of minerals, and her natural resources, including a resource for production of food.

The most significant tendencies of the new world from positions of food supply are:

- fast development of the most densely populated territories of Earth, emergence of the People's Republic of China on the first positions in world development as countries with the leading economy of the world , fast development of India, Indonesia, Vietnam, Brazil and some other countries the world;
- essential decrease in resources of a number of the leading countries on production of traditional food. So, according to forecasts of the report of Council of intelligences of the USA published in 2014 "Global tendencies –2030: Review." it is noted megatendencies "Substantially, with growth of the world population the need for resources will increase. The solution of problems of area of products of mass demand, will be connected with level of consumption of other products."

Against the background of all complex of changes of the population and climate, especially important is a growing demand for water and food. Nearly a half of world's population will live in the areas suffering an acute shortage of fresh water, this problem will be in China and India [9].

Siberia is one of the most water – saturated regions of the world, (after Brazil). The total river drain averages 2 350 cubic kilometers (55 % of similar Russian size). At the same time, it is

important that 90 percent of a river drain of Siberia are a local drain (55% of all Russian drain are formed territories of Siberia), and the rest (a transit drain) arrives from adjacent territories.

In the territory of Siberia there are nearly 1,5 million rivers, with a total length about 5 million kilometers, including Yenisei, Lena, Ob, the largest lakes – Baikal (volume 23000 km3), Taimyr (13 km3) and Chany (4,3 km3), and less large – Pyasino, Teletskoye, Lama, Agata, Goose, Ubinsky, etc.

Also Siberian reservoirs Angaro-Eniseysky territories and about 3 thousand glaciers of the Arctic islands and mountains, marshy reservoirs and the horizons of underground waters belong to water fund [10].

Taking into account the available resources – more than 5 million hectares of arable lands which weren't used more than 20 years, presence of almost same volume of lands which many years practically did not receive mineral fertilizers, pure existence, a good ecological situation in the majority of territories, lack of the big cities creating an ecological background, sufficient level of the sunny days and temperature conditions suitable for cultivation of many agricultural plants in the southern part Siberia is one of the most important resources of the planet for providing her fast-growing population, including Southeast Asia, the People's Republic of China, a part of India, and other territories with food resources on the basis of mutually beneficial trade cooperation.

How there is a development of food in the region? Whether there are real tendencies of his increase and especially entry into the world markets?

According to expert analytical center of agrobusiness, production of agricultural production in the actual prices in 2013–2016 constantly grows in the region (Tab. 2).

Table 2

Production of agricultural production in the region in the actual prices in 2013-2016 (billion rubles) [11]

Year	Production of agricultural production in the region in the actual prices (billion rubles)
2013	70, 2
2014	79, 2
2015	88,9
2016	93,3
2017	93,1 13,9 million rubles, or 96,0 % by 2016, including crop production – 87,7 %, livestock production – 102,6 %

The market of environmentally friendly products in the world for 2000-2014 has grown more than five times – from $18 billion in 2000 to about $100 billion in 2014 (according to the International federation of the ecological agricultural movement) thus it respectively will increase minimum up to 300 billion dollars [12].

Taking into account geographical proximity of an arrangement and transport availability deep specialization of Siberia and the Pacific East of Russia on production of environmentally friendly products and their delivery to the markets of fast-growing regions of Asia is possible.

Possibilities of production of environmentally friendly production in Russia and Siberia. One of resources of active development of production of environmentally friendly production in Russia and Siberia are brought out of an agricultural turn of the earth of agricultural purpose which were used till 1991, and then owing to various reasons have a rest, have received natural restoration and can be used for production of environmentally friendly production. Volumes of such lands huge. Only in Krasnoyarsk Krai there is such lands more than 1200 thousand hectares or 47 % of acreage used in agriculture in 1991. In Russia about 45 million hectares of the former acreage have a rest more than 20 years and have received full natural improvement [11].

Wild plants – berries, mushrooms, nuts, plants which are used in food and grow under natural conditions can become an initial resource in production of environmentally friendly production in Russia. Volumes of possible collecting and processing are huge.

Most successfully work with wild plants is put in the Tomsk region, the Irkutsk region, the Krasnoyarsk Krai has great opportunities. Actively develops preparations and production of wild plants in the Krasnoyarsk Krai where the area of forest fund is 164,0 million hectares. Here the average possible biological crop only of nut makes 1727 thousand tons, and possible collecting his 424 thousand tons. in a year. About 4-5 % of it are really prepared. The main deliveries up to 80 % of wild plants go to China [13].

It is important that for the long period of the neighbourhood with China and India production of the Siberian wild plants is known in the markets of these countries, and also has wide geography of sale in Israel, Canada, the USA, Germany, Japan. All production of wild plants of Siberia is in active demand and in Russia too.

Thus, development of environmentally friendly products in Russia has considerable prospects for rapid growth of production and occurrence on the new markets, especially in an Asian part of the planet.

We will consider need and resources for cooperation and network training for realization in the countries of the joint interfaced projects.

In Siberia and in the Far East of the Russian Federation there are 144 higher education institutions where more than 700 thousand students are studying.

Here research institutes of academy of Sciences are concentrated. In the countries where the "One Belt One Road" project, especially in the People's Republic of China is implemented, the higher education develops as a strategic resource. It allows participants of the Association of Sino-Russian Economic Universities to create the main approaches to develop network processes in education at least in such directions as managers, economists, businessmen, marketing specialists, experts in the field of international trade and the relations. These directions of preparation are are popular among students.

These experts will develop strategic plans and forms of their realization. Certainly, in the future it is desirable to include such directions in this network training of experts as technologists of coproductions, experts of railway, marine, air and pipeline transport, agrarian profile, specialists in processing of food and ecological products, according to consumer preferences of residents of the certain countries, etc.

It is also important to organize the joint centers of developments of separate projects, in that theoretical questions of modern economy and management. We are ready to become the center of studying of cooperation and network interactions, to accept on training in this profile of undergraduates and graduate students, to execute joint grants of the Russian Federal Property Fund and the Chinese structures.

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FINANCIAL DEVELOPMENT AND HOUSING PRICE CHANGES UNDER THE CONDITION OF FINANCIAL CONTROL: EVIDENCE FROM CHINA

According to the degree of financial control, China's national sample is divided into two regions: strong and weak. Under this framework, this paper studies the relationship between housing price changes and financial development level in different regions using the panel data of 1994-2014. The results show that first, in the long term, financial development contributes significantly to housing prices in both strong and weak financial control regions. And the impact is greater in strong financial control region. In the short term, the impact of financial development on housing prices is also positive, but the regional difference is small. Second, whether in long or short term, influence of residents' disposable income on housing prices in weak financial control area is stronger than that in strong financial control areas. Third, policy regulation to curb housing prices does not exert the expected price suppression effect, but instead boosted its rise.

***Keywords**: financial development, housing price, financial control, home purchase restrictions, tax transfer, panel error correction model.*

JEL Classification: C33, G12, G32

INTRODUCTION

From the perspective of an outsider, China's real estate development is complicated. Relative policies also experienced ups and downs. Attitude of policymakers changed from "do everything possible to increase housing supply" in 2013 to "resolve real estate inventory" in 2015. At the eleventh meeting of the central financial and economic leading group in November 2015, President Xi Jinping stressed that China needed to resolve the real estate inventory, in order to promote the sustainable development of the real estate industry. Why did the development of the real estate industry raise so much concern from the top leaders? The large real estate inventory has become an important reason for the weakness of economic growth. However, important position of the real estate industry in China's national economy is still steadfast. The continuing increase in housing supply has dampened the house prices. This may be so because of the mismatch between supply and demand which is restricting the development of China's real estate industry. According to the data released by the National Bureau of Statistics, the national commercial housing area for sale in 2015 increased by 50 % compared to that in 2013, while the commercial housing prices grew from 6,237 yuan per square meter in 2013 to 6,793 yuan per square meter in 2015, which was an increase of 8.9 %. Chinese housing prices frequently refresh historical records, and the growth logic behind this phenomenon is the focus of this paper.

In modern economic theory, the factors influencing the price of an asset, represented by real estate, have always been the most concerned area of researchers. The usual theoretical logic is that the development of real estate industry is closely related to the economic development level of a country or a region, and financial development is the most important source of economic growth. Therefore, there is a logical connection between the price of real estate and the level of financial development (Levine et al., 2000; Levine, 1997, 2005; Liang and Gao, 2007).

This inference seems to be confirmed from the practical observation of China. In 1998, the state adopted the notice of "State Council on further deepening reform of the housing system to speed up housing construction" (No. [1998] 23). It marked that the physical distribution system

of housing, continuing for many years, had been replaced by the new system of housing allocation monetization and housing supply commercialization. Since then, the potential consumer demand of housing has been released hugely. The state has afforded strong support on real estate as an important pillar industry. Corresponding to the rapid development in the real estate industry, the national average selling price of commercial housing continued to rise, from 2,063 yuan per square meter in 1998 to 6,323 yuan in 2014, an average annual increase of 12.9 %. The level of financial development was also very rapid during the same period. China's financial interrelations ratio (M21/GDP) was only 1.238 in 1998, and it rose to 1.93 in 2014 (Fig. 1).

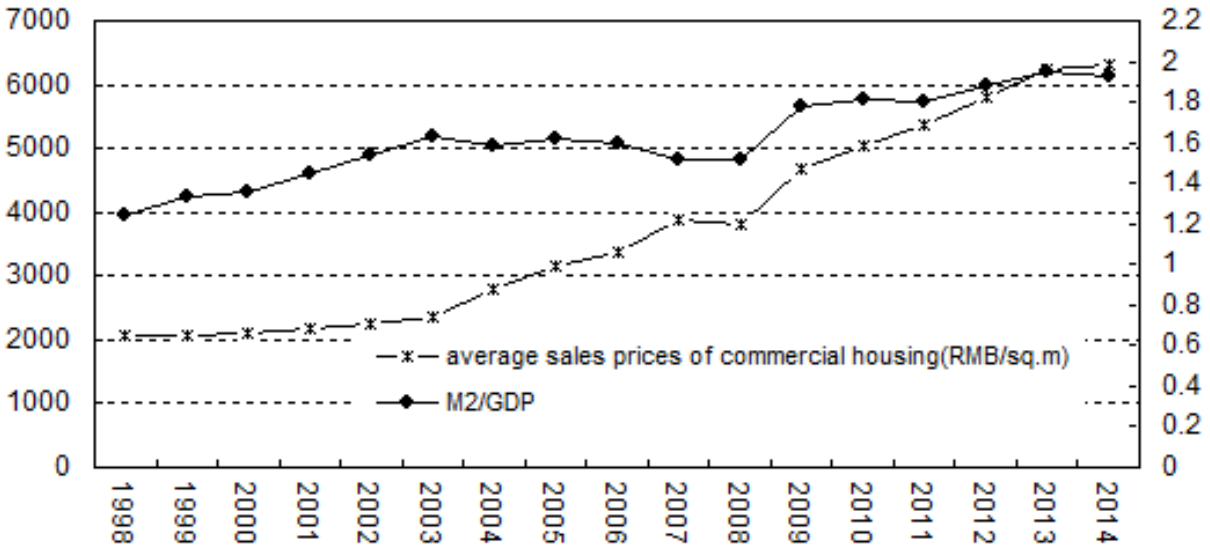

Fig. 1. Comparison of China's financial development level
and sales prices of commercial housing, 1998-2014

Source of data: raw data from China Economic Information Network database, rearranged by authors

From the direct comparison of the two groups of data, there has been obvious convergence in the trends of China's financial development and real estate prices. However, further empirical investigation is necessary on the intrinsic relationship, the long-term equilibrium relationship, and the short-term dynamic adjustment mechanism between the two. In our opinion, to study the relationship between financial development and real estate prices, it is necessary to consider both the different stages of economic development in various regions, and the different intensities of financial control as important influential factors. Our approach is as below. First from the regional perspective, we divide national sample into two groups: strong financial control and weak financial control. On this basis, we analyze the inherent relationship between regional financial development and real estate price fluctuations and obtain a more diversified conclusion.

1. LITERATURE REVIEW

In foreign academia, there have been a number of studies on the relationship between housing price volatility and financial development. The mainstream literature shows that a country's financial development can create favorable conditions for the normal operation of the real estate market, thus promoting the rise in real estate prices. However, the overheating financial development speed may lead to too many funds flowing into the real estate industry, forming excessive speculation environment in real estate. This could result in significant deviation of real estate prices from the real value, i.e., the real estate price bubble.

[1] M2 refers to the broad money, that is, the total amount of the total circulation of the currency and demand deposits and time deposits and savings deposits.

Reynaud (1995) believes that in the context of financial liberalization and financial deregulation, lending behavior will accelerate the cyclical fluctuations of the real estate industry, as well as the formation and collapse of the real estate price bubbles. By studying the effect of financial development on the real estate price, Ebrahim and Hussain (2010) discover that the increase of the financial system efficiency, caused by lower agency cost and cross-sectional risk sharing mechanism, contribute to the increase in real estate prices. Hott (2011) brings three kinds of non-rational expectations behavior into the benchmark model of real estate prices and mortgage loans. His research finds that through more adequate supply of funds by financial institutions to real estate buyers, the formation of the real estate price bubble is encouraged. Bubble burst will make financial institutions assume huge risk and losses.

In the empirical studies, Collyns and Senhadji (2002) conducts research on the real estate markets in Asian economies, including Thailand, South Korea, Singapore and Hong Kong. Results show that the growth in bank credit plays a significant role in promoting current real estate prices. Mora's analysis shows that the growth of bank loans can explain Japan's real estate investment boom in the 1980s to a large extent (Mora, 2008). With data from different countries, Hofmann (2003), Gerlach and Peng (2005), Oikarinen (2009), Gimeno and Mart, nez-Carrascal (2010) study the relationship between real estate price and financial development by different financial indicators. They come to the conclusion that financial development is an important driver of real estate prices.

In Chinese academic circles, some scholars also discuss reasons for the rapid rise in China's real estate prices in recent years and give theoretical interpretations from the relationship between financial development and real estate market. Yi (2005) believes that the rapid development of China's real estate market is only attributed to a release of "stock demand" since 1998, rather than the true conversion of potential demand into effective demand. This growth process is not entirely based on the corresponding growth of national income, but mainly on financial support provided by bank credit. Zhang et al. (2006) build a real estate mortgage loan model. Their analysis shows that there is a strong positive correlation between financial institutions and credit growth, prices rise in real estate industry. By constructing a stochastic optimal control model, Shi and Chen (2008) analyze the determinants of real estate prices under uncertainty environment. They point out that real estate price is affected by many factors, including mortgage interest rates, the loan amount of financial institutions, and resident income. Xiao (2008), Wang (2010) and He et al. (2011) also believe that the credit growth of financial institutions is an important reason for the rise in real estate prices. With regional sample data and panel error correction model, Liang (2007) and Gao (2007) discuss differences of regional fluctuations in real estate prices. Their results show that the impact of the credit scale on the East and West is much stronger than on the central region. By constructing a simultaneous equation model, Kong (2008) also applies cross-province panel data to study the relationship between financial support (mainly of bank credit) for the three areas (West, Middle and East China) and the price of real estate. They come to the same conclusion that there is a positive relationship between bank credit and rise of real estate prices. With co-integration test method, Chen and Lu (2012) explore the impact of financial development level on commercial housing prices. They think that financial development is the key factor driving the price of commercial housing up.

We draw on the theoretical logic and basic conclusions of the above research. But we contend that there are defects in the empirical analysis. Regional differences of financial control between different regions are not fully considered. And the relationship differences between financial development and real estate price caused by these differences also need to be analyzed. In China, the regional differences of financial control mainly manifest in poor fund flow resulting from local protectionism and regional division of financial institutions between regions. At present, China is still in the emerging and transitional period. Although the government has always been committed to promoting the formation of a unified national financial market, local protectionism and market segmentation still exists. There are different degrees of obstacles in the

flow of funds between different regions. Under the situation that GDP growth rate is the foremost performance evaluation index for local government, in order to grab financial resources and expand local economy, each region usually provides credit rationing to local industrial sectors through financial institutions controlled by the government. In addition, China's vast territory makes obvious regional differences in the level of financial development. These are all important variables we need to consider in analyzing the above issues.

2. EXISTENCE OF FINANCIAL CONTROL IN CHINA

It has been long since academic attention was paid on the phenomenon of financial control. In 1980, Feldsein and Horioka estimated a country's capital flow with correlation analysis of savings and investment, in order to verify the existence of financial control in financial market. And this is the so-called "FH hypothesis". The criteria of "FH hypothesis" about financial control phenomenon is as below. Within a country, free movements and free borrowing of funds between different regions imply that there is a low correlation between savings and investment within the area. On the other hand, if there is a significant correlation between the two in a long period, existence of financial control is indicated in this area.

Some scholars have studied the applicability of the "FH hypothesis" in China. Boyreau-Debray and Wei (2004), and Wang (2007) find that the direct use of the "FH hypothesis" to study financial control in China will lead to the problem of cyclical division deviation. This is because China's annual savings is much greater than investment. Under the effect of economic cycle, savings and investment always do not match. The use of the "FH hypothesis" is likely to result in the estimation bias. Boyreau-Debray and Wei (2004) note that capital flow within China is largely limited by human factors, such as credit rationing. Therefore, they use correlation between bank deposits and loans to measure regional segmentation under financial control policy in Chinese capital market, thus can solve the problem of saving and investment mismatch. This approach was also adopted by Wang (2007). He used a longer time series to confirm the existence of regional segmentation through financial control. To emphasize the differences caused by the financial control policy, he divided regions according to the control degree1.

The above research has enriched the applicability of the "FH hypothesis" in China. But we are concerned that their models only consider the state-owned banks, failing to include non-state-owned financial institutions2, which are growing rapidly under the background of financial reform, into the analysis framework. In fact, after thirty years of financial reform, the basic pattern of China's financial institutions has undergone significant changes. The proportion of external financing with non-state-owned financial institutions has increased year by year. For those large number of small and medium-sized enterprises and private enterprises, it is difficult to obtain loans from state-owned banks. They usually seek funds from non-state-owned financial institutions more actively. The development and growth of the non-state-owned financial institutions has weakened the state monopoly of financial resources to a certain extent and reflected the structural adjustment of China's financial system. In our opinion, to study the degree of financial control from regional perspective, the present situation of structural adjustment in financial system must be taken into consideration. It is more reasonable to include non-state-owned financial institutions loans into credit funds supply.

Based on the above considerations, we put forward an improved method to describe the degree of financial control in different regions of China:

First, we use the amount of deposits and loans of all financial institutions3 in various regions for quantitative analysis and estimate the correlation between the two; then we arrange the correlation coefficient from large to small, and finally measure the level of financial control in China. The specific econometric model to be estimated is as stated below,

[1] In this paper, we divide regions based on Wang. 2007.
[2] Such as city commercial banks, rural commercial banks and other non-state-owned joint-stock commercial banks.
[3] Including state-owned and non-state-owned financial institutions.

$$Loan_{i,t}=\gamma+\rho Deposit_{i,t-1}+\alpha X_{i,t-1}+\upsilon_{i,t} \quad (1)$$

In formula (1), $Loan_{i,t}$ represents the amount of loans of financial institutions in period t of province or region i. $Deposit_{i,t-1}$ represents the amount of deposits of financial institutions in period *t-1* of province or region i. To eliminate the interference of the special region factor, we use $X_{i,t-1}$ as control variables, which include fiscal policies Rfp and economic cycles Rbc in this region. Rfp indicates the ratio of fiscal expenditure to GDP, Rbc is the potential GDP in the regions excluding national average, and υ_{it} is the random disturbance term. In this paper, we use annual data of various provinces or regions in 1994-2014 (sourced from China Financial Yearbook and the China Economic Information network (CEInet) database). The larger the coefficient ρ estimated by formula (1), the stronger the degree of financial control.

In Fig. 2, different colors represent degrees of financial control. The stronger the financial control, the darker the red shading for the region; conversely, the more closed to the blue. We use brown for missing values, and divide China into east, central and west regions with purple lines. In West China, financial control level is the highest. Apart from Sichuan province (0.65), financial control degree in other western provinces are all above the level of 0.8. The financial control degree in the central region is the lowest. Color for most provinces is blue. Such distribution reflects significant differences in the extent of regional financial control in China. The credit funds allocation in the west are subject to strict deposit limit degree. It is closely related to the Great Western Development strategy, which is to speed up the construction of the western region. The financial resources required by many large water conservancy and transportation projects cannot do without national credit policy and resource tilt, which lead to highly centralized and illiquid financial funds. Situation in the eastern region is similar. The strategic deployment of "taking the lead in development" in the East enables coastal areas such as Yangtze River Delta, Pearl River Delta and Bohai economic circle lead economic development. Industrial upgrading and innovation ability improvement are attributed to the support of local financial resources. Therefore, the current distribution of financial control is closely related to the specific scientific development strategy in China.

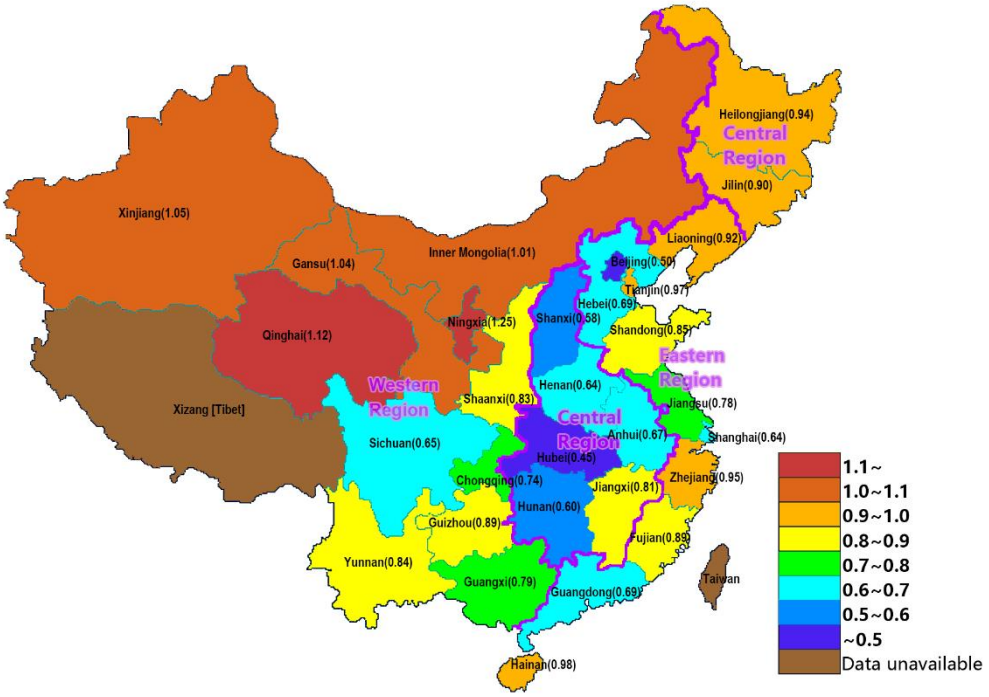

Fig. 2. Distribution of correlation coefficient between deposit and loan in West, Central and East China

Based on the size of the coefficient ρ, we divide the 31 provinces or regions in China into weak financial control areas (CW) and strong financial control areas (CS) (Tab. 1).

Table 1

Regional division of financial control in China

	Weak financial control areas (CW)				Strong financial control areas (CS)			
Provinces or regions	Tibet	Hubei	Beijing	Shanxi	Yunnan	Shandong	Fujian	Guizhou
	Henan	Hunan	Sichuan	Shanghai	Jilin	Liaoning	Heilongjiang	Inner Mongolia
	Anhui	Guangdong	Hebei	Chongqing	Zhejiang	Tianjin	Hainan	Gansu
	Jiangsu	Guangxi	Shaanxi	Jiangxi	Xinjiang	Qinghai	Ningxia	
Average ρ	0.6767				0.9743			

Note: for all regressions, $0.931 < \bar{R}^2 < 0.999$; T-tests of all ρ values are significant at the 95 % confidence level.

Based on the study of Boyreau-Debray and Wei (2004), we give a further explanation to the coefficient ρ. According to Tab. 2, coefficient value in the stage of 1978-1989 significantly increases from 0.435 to 0.58 in the stage of 1990-2001. Boyreau-Debray and Wei (2004) believe that overall financial control degree in China is strengthening. Comparing with situations in OECD countries, we found that with some external conditions controlled, the value of coefficient ρ decreases significantly, from 0.675 to 0.285. This indicates that financial control phenomenon is gradually weakened. In other related research, Bayoumi and Rose (1993) show that ρ value is 0.24 in Japan, and it is not significant; Sinn (1992) find that the ρ value for the US is -0.11, and not significant; Thomas (1993) studies the sample of the UK, and gets similar results with Sinn (1992). The conclusions of these studies indicate that the financial control of these countries is not obvious. Further, Iwamoto and Wincoop (2000) investigate the financial control of Japan and make comparison with OECD countries. They found that the phenomenon of financial control in Japan (coefficient of 0.31, significant) is much lower than that in OECD countries (coefficient of 0.56, and significant).

Table 2

Pvalue comparison between China and OECD countries

China		
ρ value	1978-1989	1990-2001
No conditional control	0.664	0.505
Domestic and regional factors controlled	0.435	0.58
OECD countries[1]		
ρ value	1978-1989	1990-2001
No conditional control	0.63	0.617
Global and domestic factors controlled	0.675	0.285

Sources: arranged based on Boyreau-Debray and Wei (2004)

All of these studies discuss the degree of financial control of a country as a whole. We try to use an improved method to reflect the characteristics of financial control in different regions of China, in order to study specific situation across China.

The division results in Tab. 1 show that: (1) there is a significant correlation between deposits and loans in financial institutions. In accordance with the definition of the "FH hypothesis", it indicates the existence of obvious financial control in financial development

[1] Boyreau-Debray and Wei (2004) compares financial control situation between China and OECD countries, the latter include 24 countries, namely, Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Italy, Japan, South Korea, Holland, New Zealand, Luxemburg, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United states.

process in China. By time periods, this feature did not change significantly after China joined WTO; (2) for provinces with strong financial control, their credit funds allocation is more limited by deposit. The flow of funds is also hindered more.

Therefore, in order to thoroughly analyze the real relationship between real estate prices and financial development, we must fully consider the basic characteristics of the formation and evolution of China's financial system. How will financial development affect the real estate price changes? What is the difference between long term trends and short-term fluctuations? In the framework of the financial control area division, we will establish panel co-integration and error correction model to test the relationship between the two.

3. DATA AND METHODOLOGY

3.1. Data

Data and their sources are as below.

(1) Housing prices (HSP). Liang and Gao (2007) describe the changes of housing prices in different regions with the average selling price index of commercial housing. The specific formula is: the average selling price of commercial housing = regional real estate sales / commercial housing area, marked with HSP.

(2) Regional financial interrelation ratio (RFIR). Although China's financial structure has improved significantly, its basic characteristic is still bank oriented. The allocation of funds mainly relies on indirect financing of the banking system and special rationing of national finance. The role of capital market is relatively small. Because the indicator of M2 is not counted by each region in China, this paper uses Arestis et al. (2001) approach. The regional financial interrelation ratio is defined as: RFIR=regional loan balance of all financial institutions / regional GDP. This variable can reflect the actual amount of funds that can be used in the economic development through financial intermediaries, which can describe the regional financial development approximately.

(3) Average disposable income of urban households (INC). The conclusions of extant literature show that the increased demand brought by rising income is also one of the important factors leading to the real estate price fluctuation (Holly and Jones, 1997; Case and Shiller, 2003; Hott and Monnin, 2008). Residents' income is an important factor affecting the real estate price and market demand. Rising household income will increase the consumption on housing, which will further lead to the continuous increase of the housing prices. In this paper, the average disposable income of urban households is used to measure the income of residents.

(4) Control variables. Many factors can affect the real estate price fluctuations. To examine the impact of financial development on the real estate price fluctuations under different degrees of financial control, this paper also introduces some other important control variables. They include real estate development investment (denoted as REI); the level of urbanization (denoted as Urban, and the formula is: Urban= urban populations of each region / total population of each region at the end of the year). In addition, many policies have been introduced in recent years by the government to regulate the real estate price. For example, since January 2010, the State Council has issued several notices on promoting the steady and healthy development of the real estate market. Policy control experienced five upgrades in a short term. In order to investigate the influence of financial regulation on the real estate prices in different areas, we introduce dummy variables1 (denoted as D2010), as of Tu and Zhang (2005), Shi and Chen (2008).

Data mainly come from the statistical yearbook of each province, China Financial Yearbook, and CEInet database. Considering requirements of data by panel analysis and data availability, the sample is selected as the annual data of 1994-2014. Because the data structure of Tibet area is not complete, it is eliminated from the empirical analysis. Tab. 3 presents descriptive statistics of main variables in different regions.

[1]Due to the characteristics of the sample data, we construct one dummy variable to study the policy effect of the government's real estate policy in 2010.

Table 3

Description and sources of variables

Variables	Description	Min	Mean	Max	Std. Dev	Observations	Sources
LNHSP	Natural logarithm of average sales price of commercial housing in each area	5.9815	7.7988	9.8434	0.6713	630	CEInet database
LNRFIR	Natural logarithm of regional loan balance of all financial institutions / regional GDP	-0.6214	0.0249	0.9496	0.2908	630	China Financial Yearbook
LNINC	Natural logarithm of average disposable income of urban households	7.8252	9.1624	10.7963	0.6597	630	Statistical yearbook of each province
LNREI	Natural logarithm of real estate development investment in each area	18.4207	24.0365	27.4375	1.7291	630	CEInet database
LNUrban	Natural logarithm of urban populations of each region / total population of each region at the end of the year	-2.0159	-0.9195	-0.1098	0.4144	630	Statistical yearbook of each province

3.2. SETTING OF CO-INTEGRATION EQUATION

Based on some authoritative real estate price decision model (Hofmann, 2003; Ahuja et al., 2010; Hua et al.,2012), we investigate the relationship between housing prices and financial development based on the basic co-integration equation below.

$$LnHSP_{k,it}=\alpha_{k0}+\alpha_{k1}LnRFIR_{k,it}+\alpha_{k2}LnINC_{k,it}+\gamma_{k}LnCV_{k,it}+\varepsilon_{k,it} \quad (2)$$

In equation (2), k=0, 1, 2, represents the whole country, weak financial control region, strong financial control region, respectively; i represents provinces in the specific region; t represents each period. $LnHSP_{k,it}$ stands for the housing price changes of province i in region k within period t. $LnRFIR_{k,it}$、$LnINC_{k,it}$ and $LnCV_{k,it}$ denote financial development, disposable income of urban residents and other control variables of province i in region k within period t. $\varepsilon_{k,it}$ is the random disturbance term. The main variables in the model are expressed in natural logarithmic form, and their coefficients indicate elasticity. According to the actual situation of China and the experience of previous studies, we refine the control variables and get the panel co-integration equation to be estimated:

$$\begin{aligned} LnHSP_{k,it}=&\alpha_{k0}+\alpha_{k1}LnRFIR_{k,it}+\alpha_{k2}LnINC_{k,it}+\alpha_{k3}LnREI_{k,it} \\ &+\alpha_{k4}LnUrban_{k,it}+\alpha_{k5}Dum_{k,it}+\varepsilon_{k,it} \end{aligned} \quad (3)$$

In equation (3), $LnREI_{k,it}$, $LnUrban_{k,it}$, and $Dum_{k,it}$ respectively represent real estate development investment, urbanization level and policy control variables, others are the same with those in equation (2). In this paper, the co-integration equation is established with Engle and Granger two-step method. In the empirical work, the stability of variables is first investigated with panel unit root test. If the integrated order of each variable is consistent, we can further test the co-integration relationship between variables and estimate equation (3). If there is no unit root in residuals, the co-integration equation is established implying that there is a long-term stable relationship between variables, and vice versa.

Based on the obtained co-integration equation, the residual term is used as the error correction term $\hat{\varepsilon}_{k,it}=ECM_{k,it}$, and the lag of the error correction term is regarded as the explanatory variable to construct panel error correction model (PECM)[1] :

[1] Policy control of the real estate industry is indicated with dummy variable, so it is not added into the panel error correction model.

$$\Delta LnHSP_{k,it} = \beta_{k0} + \beta_{k1}\Delta LnRFIR_{k,it} + \beta_{k2}\Delta LnINC_{k,it} + \beta_{k3}\Delta LnREI_{k,it} + \beta_{k4}\Delta LnUrban_{k,it} + \lambda_k ECM_{k,it-1} + \mu_{k,it} \quad (4)$$

In equation (4), $\mu_{k,it}$ is the random error term, and $\beta_{ki}(i=1,2,3,4)$ indicates the coefficient of each variable, which is short-term elasticity. Equation (3) and (4) constitute the economic model of the real estate price changes under the condition of financial control in China. The coefficients of the two models are respectively long-term and short-term elasticity of each variable on housing prices in different regions. Equation (3) reflects the long-term equilibrium relationship between housing price and financial development. Equation (4) indicates that the short-term fluctuations of housing price depends not only on fluctuations of financial development, but also by the effect of housing price deviation from the equilibrium level ($ECM_{k,it-1}$). λ_k, the error correction coefficient, reflects the regulating strength of long-term equilibrium relationship between financial development and housing prices on short-term fluctuations of housing price. In the statistics, if λ_k is negative, the establishment of panel co-integration equation is further supported. In the dynamic system, the difference variable reflects the fluctuation. For example, $\Delta LnHSP_{k,it}$ is the fluctuation of housing prices.

4. RESULTS

4.1. PANEL UNIT ROOT TEST

There exists spurious regression problem for panel data (Phillips and Moon, 1999). Therefore, we first conduct unit root rest for variables of different financial control regions before estimating the co-integration equation. According to whether there is the same unit root process in each panel data sequence, the panel unit root test methods can be divided into two categories: the first assumes that the panel sequence has the same unit root; the second relax the assumption of homogeneity, allowing each panel sequence with different unit root processes, which is more in line with the objective facts. IPS test, Fisher-ADF test, and Fisher-PP test are representatives of the second types of panel unit root test (Maddala and Wu, 1999; Choi, 2001). In this paper, these three methods are used to test the panel unit root of each variable.

Table 4

Results of unit root test in each region

Variable	CW		CS		CC[1]	
	ADF test value	P value	ADF test value	P value	ADF test value	P value
LnHSP	4.433	1.000	3.693	1.000	8.126	1.000
ΔLnHSP	206.152	0.000	200.448	0.000	406.600	0.000
LnRFIR	22.539	0.834	18.458	0.951	40.996	0.971
ΔLnRFIR	145.330	0.000	149.901	0.000	295.231	0.000
LnINC	1.403	1.000	3.516	1.000	4.919	1.000
ΔLnINC	149.935	0.000	136.913	0.000	286.848	0.000
LnREI	29.759	0.478	8.707	1.000	38.465	0.986
ΔLnREI	162.585	0.000	367.285	0.000	529.870	0.000
LnUrban	10.772	1.000	6.123	1.000	16.895	1.000
ΔLnUrban	172.114	0.000	161.615	0.000	333.729	0.000

ADF test results are shown in Tab. 4. There are unit roots in all variables in weak financial control region, strong financial control region, and nationwide. After the first order difference, there is no unit root at the 1 % significance level. Although not reported, the results are the same with IPS test, and PP test. Therefore, the co-integration test can be further carried out.

[1] CC represents nationalwide range.

Note: Δ represents first-order differential variable; the null hypothesis of ADF test is that there is unit root; Schwarz information criterion is used to determine the optimal time lags. In the unit root test process, we only select the intercept term. ***, **, and * indicate significance at 1, 5, and 10 % level, respectively.

4.2. PANEL CO-INTEGRATION TEST

Before co-integration test, Hausman test is conducted for model of different regions. Whether to select the fixed effect model or random effect model would be determined based on the test results. In the co-integration test, regression analysis is first carried out according to the above theoretical model. Then the residuals of regression are tested of the stationarity. If no unit root process for residual is detected then there is long-term stable relationship among variables, *i.e.* the co-integration relationship.

In the co-integration test results (Tab. 5), the regression residuals of all the models are stable, and there is no unit root at 1 % significance level. Therefore, there is long-term stable co-integration relationship among LnHSP, LnRFIR, LnINC, LnREI and LnUrban I (1) series. The adjusted R^2 of each model is above 0.9, which shows that the fitting degree of the equation is excellent. As a result, we can draw conclusions as below.

4.2.1. For weak financial control region

(1) The elastic coefficients of LnRFIR and LnINC are positive, and significant at 1 % level. This indicates that between 1994 and 2014, financial development and income of residents play a significant role in the growth of housing prices. Other conditions unchanged, an increase of one percent of financial development brings housing prices to rise by 0.116 percent; one percent increase of the disposable income of residents pushes housing prices to rise by 0.872 percent. This shows that in the weak financial control area, the long-term impact of income on housing prices changes is stronger than that of financial development.

Compared with the countrywide, the effect of financial development on promoting housing prices in weak financial control region is lower by 0.021 percent, while the effect of residents' income is higher by 0.145 percent. Among the control variables, LnREI has a negative impact on housing prices, but the coefficient is not significant, indicating that the increase in real estate investment has not pushed up the housing prices. But this effect is just the opposite in the strong financial control area.

(2) In the weak financial control area, the elastic coefficient of the urbanization level is positive, higher than that in the countrywide region. It is significant at the 1 % level, indicating that China's urbanization provides a space for housing demand. Housing demand caused by population agglomeration effect has led to rising real estate prices.

(3) The coefficient dummy variable, which is used to inspect the government policy effect, is positive, indicating that the government policy to curb real estate prices policy has taken effect. But this effect is contrary to the original intention of the policy makers. It not only failed to suppress the housing prices, but help them boost. The phenomenon could be attributed to the emergency measures such as purchase restriction, down payment increase in the second and third homes, collection of second-hand housing transaction tax. The down payment percentage has been increased above 30 percent in some cities. And the second hand housing transaction tax, committed by buyer and seller, includes deed tax, business tax and personal income tax. Its initial aim was to limit housing transaction and curb the overheated real estate industry in China.

4.2.2. For strong financial control region

(1) The elastic coefficient of financial development is significantly positive at 1 % significance level, showing that financial development has a long-term promoting effect on housing prices in strong financial control region. This positive effect is more obvious than that in weak financial control area. Possible reason is that in the strong financial control area, financial resources are more likely to be configured in the real estate industry, boosting the real estate prices. It may also be interpreted as evidnec in support of the proposition that liquidity constraints are binding in weak financial regions for home purchase.

(2) After controlling other factors, the elasticity coefficient of urban residents' disposable income is significantly positive, indicating that in strong financial control area, the disposable income has a positive impact on the long-term real estate prices, but this effect is significantly less than that in the weak financial control area. This once again can be interpreted as liquidity constraints are in play in the purchase of homes.

(3) The elasticity coefficient of investment in real estate development is significantly positive at 1 % significance level, suggesting that in the strong financial control area, real estate development investment promotes the housing prices more significantly than that in the countrywide scope. However, the coefficient of the urbanization level is not significant, suggesting that it does not produce price promotion effect in the strong control region. Alternatively, the above evidence can be read as supporting the view that supply in financially strong regions responds adequately to rising demand to the extent that it negates the contribution of urbanization to house prices.

(4) The coefficient of policy dummy variable is significantly positive, indicating that the policy regulation not only failed to inhibit the rise of real estate prices, but promote them instead. Although the promulgation of the policy restriction, increase in down payment, collection of second-hand housing transaction taxes and other emergency measures aimed to cool off overheated housing market, they are not problem-oriented strategies. The original intention of transaction taxes collection were to increase transaction costs, reduce investment, and control housing prices. However, rigidity in the market makes it difficult to realize the policy objectives. The burden is passed on to the buyer to further push up the housing prices. Moreover, the timing of the policy introduction is usually when the bullish mood has already existed in the market.This result is similar to that of the weak financial control region. The size of coefficients comparison shows that government policy control has greater impact in strong financial control area.

In addition, from the national scope of the regression results, coefficients of the five variables, LnRFIR, LnINC, LnREI, LnUrban and D2010, locate between the weak and strong financial control regions. This demonstrates that the results of this paper are reasonable.

Table 5

Regression results of co-integration equations

	Estimate	Std.error	t-Value	$Pr(>\|t\|)$
CW				
Constant	0.745	0.346	2.154	0.032**
LnRFIR	0.116	0.044	2.618	0.009***
LnINC	0.872	0.049	17.664	0.000***
LnREI	-0.033	0.022	-1.521	0.129
LnUrban	0.163	0.053	3.064	0.002***
D2010	0.081	0.026	3.102	0.002***
Adj.R2	0.939			
F-statistic	967.760	P-value	0.000	
obs	315			
Residual	ADF test	72.363	P-value	0.000
	PP test	77.851	P-value	0.000
CS				
Constant	1.019	0.300	3.395	0.001***
LnRFIR	0.216	0.052	4.198	0.000***
LnINC	0.521	0.053	9.770	0.000***
LnREI	0.084	0.023	3.685	0.000***
LnUrban	0.015	0.056	0.266	0.790
D2010	0.117	0.026	4.404	0.000***
Adj.R2	0.952			
F-statistic	328.341	P-value	0.000	
obs	315			
Residual	ADF test	49.032	P-value	0.016

	PP test	67.043	P-value	0.000
CC				
Constant	0.488	0.224	2.178	0.030**
LnRFIR	0.137	0.034	4.020	0.000***
LnINC	0.727	0.037	19.451	0.000***
LnREI	0.026	0.016	1.664	0.097*
LnUrban	0.009	0.038	0.224	0.823
D2010	0.099	0.018	5.628	0.000***
Adj.R2	0.963			
F-statistic	487.813	P-value	0.000	
obs	630			
Residual	ADF test	134.214	P-value	0.000
	PP test	141.645	P-value	0.000

Note: ***, **, and * respectively represent significant at 1, 5, and 10 % level; the corresponding p value of Hausman test, Chisq statistic in CW region is 1.000, so the random effect model is chosen; the corresponding p value of Hausman test, Chisq statistic in CS and CC regions is 0.000, so the fixed effect model is chosen.

4.3. PANEL ERROR CORRECTION MODEL

According to the estimation results of the co-integration equation, there is long-term stable equilibrium relationship between China's financial development level, urban residents' disposable income and housing prices. And the relationship differs in different financial control strength regions. From the Granger co-integration theorem, if variables deviate from the long-term equilibrium after a disturbance in the short term, the long-term equilibrium mechanism should have regulatory effect on short-term fluctuations of housing prices. And the panel error correction model can reveal the short-term dynamic adjustment effect. The degree of adjustment is determined by the coefficient size of the error correction term. Table 6 shows that in different financial control areas, the dynamic adjustment mechanism of short-term fluctuations in real estate prices is not the same.

In the panel error correction model of the three sets of variables, the error correction coefficient λ is significantly negative. This shows that the co-integration relationship between financial development, residents' income and housing prices has an inhibitory effect on the short-term fluctuations in housing prices. In addition, the error correction coefficients are different in each region (-0.322 in weak financial control area, -0.245 in strong financial control area). It exhibits that when housing prices deviate from equilibrium, financial development and income in weak financial control region has a more obvious inhibitory effect on the real estate price fluctuations in the short term. In other words, speed that housing prices return to equilibrium after short-term fluctuations is not the same in each region. It is faster in weak financial control region than in the strong financial control area. The possible reason is that in the strong financial control area, intervention of administrative power is larger on the flow of credit resources, resulting in poor liquidity of capital in the real estate market. In strong financial control region, the credit funds flow is prone to lag between industries or sectors, and the approval process for some industrial policy support may be complicated. Thus, housing price adjustment in weak financial control weak area is relatively more flexible, and this is another interesting finding of this paper.

So, the short-run adjustment ability on housing prices is lower than that in weak financial control area. At the same time, short-term impact of financial development level on the real estate price fluctuation is significantly positive in strong and weak control regions. It indicates that in the short term, the level of financial development also promotes the housing prices. The coefficient of disposable income of urban residents is significantly positive in the two regions, which indicates that the short-term growth of the residents' income can also affect the fluctuation of the real estate prices.

Table 6

Regression results of the regional panel error correction model: explained variables ΔLnHSP

	Estimate	Std. error	t-Value	Pr(>|t|)
CW				
Constant	0.010	0.014	0.705	0.481
$\Delta LnRFIR_t$	0.062	0.059	1.040	0.299
$\Delta LnINC_t$	0.863	0.119	7.270	0.000***
$\Delta LnREI_t$	-0.040	0.031	-1.298	0.196
$\Delta LnUrban_t$	-0.112	0.065	-1.726	0.085*
ECM_{t-1}	-0.322	0.042	-7.677	0.000***
Adj.R2	0.217			
F-statistic	5.349	P-value	0.000	
obs	300			
CS				
Constant	0.020	0.014	1.425	0.155
$\Delta LnRFIR_t$	0.141	0.056	2.527	0.012**
$\Delta LnINC_t$	0.375	0.113	3.321	0.001***
$\Delta LnREI_t$	0.091	0.026	3.522	0.001***
$\Delta LnUrban_t$	-0.068	0.062	-1.107	0.269
ECM_{t-1}	-0.245	0.038	-6.482	0.000***
Adj.R2	0.150			
F-statistic	3.778	P-value	0.000	
obs	300			
CC				
Constant	0.014	0.010	1.497	0.135
$\Delta LnRFIR_t$	0.091	0.040	2.303	0.022**
$\Delta LnINC_t$	0.598	0.081	7.393	0.000***
$\Delta LnREI_t$	0.040	0.020	2.044	0.041**
$\Delta LnUrban_t$	-0.108	0.045	-2.395	0.017**
ECM_{t-1}	-0.275	0.027	-10.254	0.000***
Adj.R2	0.182			
F-statistic	4.914	P-value	0.000	
obs	600			

Note: ***, **, and * respectively represent significant at 1, 5, and 10 % level; the corresponding p value of Hausman test, Chisq statistic in CW, CS and CC regions is 0.000, so the fixed effect model is chosen.

4.4. ROBUSTNESS TEST

In order to further improve the reliability of the conclusion, this section is to test the robustness of the previous results.

First is transformation of the main explanatory variables. Financial development indicator is the focus here. In the session of data, financial development is defined as the ratio of the loan balance in all financial institutions to regional GDP. Here the gross regional financial product to regional GDP is adopted to reflect financial development situation (FS). Data are from the CSMAR database. Unit root test is conducted on logarithm of variable. The results show that LnFS is I(1) sequence. Then we replace the original financial development indicator LnRFIR with LnFS to re-estimate the co-integration equation. The results show that the effect of financial development and residents' income on the housing prices are robust (Tab. 7). Specifically, after the adoption of the new financial development indicator, the elasticity coefficient sign does not change significantly, and it is significant at the 1% confidence level. Second is to adjust the sample period. We confine the sample time interval from 2005 to 2014. Its main aim is to examine the time period when a series of financial reforms have been proposed after 2005. The

results show that financial development and residents' income still exert a positive impact on real estate prices, and most other variables also show strong robustness.

Table 7

Results of robustness test

	Estimate	Std. error	t-Value	Pr(>|t|)
CC: adjusted period is 2005-2014				
Constant	0.655	0.499	1.313	0.190
LnRFIR	0.183	0.038	4.793	0.000***
LnINC	0.645	0.051	12.613	0.000***
LnREI	0.054	0.025	2.126	0.034**
LnUrban	0.055	0.120	0.459	0.646
D2010	0.086	0.013	6.271	0.000***
Adj.R2	0.982			
F-statistic	480.136	P-value	0.000	
obs	300			
Residual	ADF test	101.566	P-value	0.000
	PP test	130.219	P-value	0.000
CC: variable changed to LnFS				
Constant	0.433	0.226	1.919	0.055
LnFS	1.674	0.427	3.924	0.000***
LnINC	0.725	0.038	19.187	0.000***
LnREI	0.028	0.016	1.746	0.081*
LnUrban	0.040	0.036	1.121	0.263
D2010	0.087	0.019	4.622	0.000***
Adj.R2	0.964			
F-statistic	489.473	P-value	0.000	
obs	630			
Residual	ADF test	140.039	P-value	0.000
	PP test	138.709	P-value	0.000

Note: ***, **, * represent significant at 1, 5, and 10 % level.

CONCLUSIONS

The aim of this paper has been to investigate the contribution of financial development to changes in house prices in China. Our work has built on studies by Boyreau-Debray and Wei (2004) and Wang (2007), which divides China into strong and weak financial control regions according to the relationship between deposits and loans in all financial institutions. Based on this research framework, we discuss the inner connection between financial development and housing prices. Empirical results show that:

We use the heterogeneity in the level of financial development across the provinces to identify the contribution of financial development to changes in house prices using an econometric model. Data from 1994 to 2014 are used to estimate the long-run equilibrium relationship between house prices and the level of financial development, and the short run relationship between the above mentioned. Our results show that financial developments have a significant role in driving house prices notwithstanding the large role played by income. The quantitative estimates reveal the elasticity of financial development to house prices.

First, whether in the long-term trend or in short-term fluctuation, the level of financial development is positively related to housing prices. And it is more obvious in the strong financial control region.

Second, no matter in the long-term trend or short-term fluctuations, residents' income is positively connected to housing prices. And it is more obvious in the weak financial control region. In terms of the estimated coefficient, the effect of income on housing prices is significantly stronger than that of financial development and other control variables. It contributes the most to the real estate price increase. This shows that China's housing prices are

based on the growing wealth of residents. The development of the real estate market is more dependent on demand factors of regional economic development.

Third, the empirical results show that a series of policy measures carried out by Chinese government to curb real estate prices has not worked at best and has possibly been counterproductive. Our estimates suggest that the policies may have boosted the rise in housing prices. While the reasons for the above are still under investigation, we hazard that this may be due to expectations. That is, each policy intervention.

Our research does not consider the effects of land finance mortgage interest rates and policy expectation. In future research, we will comprehensively include the impact of these factors to reveal the relationship between the level of financial development and housing prices.

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THE RUSSIAN ECCLESIASTICAL MISSION IN BEIJING AND THE CHINA-RUSSIA TRADE RELATIONS

The creation of the Russian ecclesiastical mission in Beijing was due to the internal and external interests of the Russian Empire. In the absence of diplomatic relations between Russia and China, the Mission was the non-official representative of the Russian government in Beijing [1]. It laid the foundations for scientific study of China, which contributed to the development of Russian-Chinese trade relations as well.

The history of the Russian ecclesiastical mission in Beijing can be divided into two stages. The first one can be noted from 1715 until Beijing Treaty between Russia and the Qing Empire was signed in 1860. During those years, the Mission was entrusted with diplomatic and commercial missions, which were determined by the Treaty of Kyakhta, signed in 1727. After Beijing Treaty was signed in 1860, the diplomatic and trade missions were assigned to the Russian Embassy in Beijing. The Russian ecclesiastical mission passed into the jurisdiction of the College of Foreign Affairs of the Holy Synod [2]. The second stage can be noted from the 1860s to 1917. The purpose of the paper is to find out what historical impact the existence of Mission had on the relations between Russia and China.

The early years of the Russian ecclesiastical Mission were purely of a missionary character. However, Russia's attempts to establish diplomatic relations with China, as well as a significant reduction in Russian-Chinese trade relations in the 60s of 18th century, led to the decision to use the Mission as Russia's official representative in China. As a result, The Russian ecclesiastical mission became the only permanent and the most reliable source of information about China [3].

The collection of political, trade-economic and military information was charged to all members of the mission: persons with spiritual ranks, students, doctors and artists.

At the beginning of the XIX century, the Russian government began to pay more attention to the Russian ecclesiastical Mission in Beijing. In 1807, the Ministry of Foreign Affairs of the Russian Empire appointed the first official police officer to the Mission [4, p. 195]. Thus, the ecclesiastical Mission turned to an agency with diplomatic functions of the Russian Empire. There was also a reorganization of the Russian ecclesiastical Mission in Beijing, if it was previously subordinated to the Irkutsk Governor, then from the beginning of the XIX century it began to obey the Collegium of Foreign Affairs of the Empire. By this action, the Collegium paid some special interest to the missionary activity.

In 1818, by order of the Russian government, the main activity of the Mission was not religious, but the research one. The main research areas were economics, culture. Special attention was paid to the periodical reports on important events in the political and economic life of China [5].

In 1819 the head of the Kyakhta customs P. F. Golyakhovsky, asked the Mission to send him one or two times a year some information on the following issues: "1. Prices for fur and all other Russian goods in different cities of China. It was important to emphasize the prices set by Chinese dealers as well. 2. What product was especially needed? It was necessary to evaluate what goods the Chinese needed particularly. 3. The cost of different varieties of tea (tea, shopping (the worse quality), floral tea, green tea (higher class), brick tea (pressed tea crumbs). 4. Every year, the ratio of gold to silver and copper to silver as well by using the weight unit "liang" to

measure the ratio of gold to silver, silver to copper coin which was called in Chinese “qian” or in Manchurian and Mongolian “zoso” [6].

Regarding China’s plans to regain control of the Amur, the Russian Ministry of Foreign Affairs instructed the chief of the eleventh Mission (1830-1841), Archimandrite Benjamin (Morachevich) – “to pay all attention to the below subject: to collect accurate data on the course of the Amur river, on the water depth, riversides and population situation” [7]. Relating to the large influx of cheap goods from England to China, the twelfth mission (1840-1849) was entrusted to clarify the economic situation in the Chinese market and provide the Russian government with maximum information on its implications for Russian trade with China.

The twelfth chief of the mission Archimandrite Polikarp (Tugarinov) in 1844, “reported the Asian department on trade and the possibility of competition in the Chinese market with the British” [1]. The mission was supposed to buy the samples of English products from local manufacturers and sent them to Russia.

Thanks to the activities of The Russian Ecclesiastical Mission, the Russian government received some important information about the economic condition of China, including the main trade routes, the methods of goods’ delivery, customs and tax duties, trade centers, the structure of Chinese exports and imports. This information was thoroughly analyzed, discussed and used in the commercial interests of Russia.

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GLOBALIZATION OF SOLUTIONS TO THE PROBLEMS OF REDUCING UNEMPLOYMENT IN THE LABOR MARKET AS A BASIS FOR IMPROVING THE QUALITY OF LIFE FOR THE POPULATION OF RUSSIA AND CHINA

An urgent task in the context of globalization is to solve the problems of using the positive aspects of globalization for the development of an efficient labor market while neutralizing its negative consequences.

Unemployment is a macroeconomic problem, which has the most direct and strong impact on every person. Loss of work for most people means a decrease in the standard of living and causes serious psychological trauma.

The absence of a system of labor markets that provide the movement of labor and its effective use leads to spontaneous internal migration of the population and even immigration to which the states bordering China are confronted, therefore it is more objectively impossible or rather problematic to determine the level of unemployment and the need for creating new jobs.

The main reason for the obstacles to the establishment of a single labor market between the Russian and Chinese labor markets are the differences in the quality of social and labor standards in the field of education, vocational training, wages, conditions, health insurance for workers and their families, pensions, etc.

Therefore, it is necessary to consider the peculiarities of national labor markets in Russia and in China. Rapid population growth in China causes the excess of supply over demand in the labor market. The employment dynamics in the Russian regions have opposite trends in the inflow and outflow of labor resources. If the migration increase in the country in the period of 2011-2016 was 240 thousand people on average, then there is an acute shortage of labor in the sparsely populated areas of Siberia and the Far East.

Consequently, there is a need for employment state regulation in the labor market, both in Russia and in China, as a part of the coordination of migration policy. To do this, we should use social partnership, the introduction of information technologies in the field of employment, and the development of practice-oriented targeted education. State employment programs should be aimed at reducing the imbalance in social and economic development between regions, as well as the introduction of an effective and integrated system to ensure timely and high-quality information for job seekers and employers in order to increase the availability of employment services.

The quality of life of the population, as a categorical concept, reflects the existing measure of satisfaction with the life of the population. As a statistical expression, the quality of life characterizes the material and financial possibilities of the population of a certain group.

To compare the standard of living of the population of the Russian Federation and China, it is possible to use the gross national income per capita in 2016 (Table).

Table

Country	Population, mln.	Gross National Income, USD	National Poverty Line, %	Unemployment Rate, %
Russia	146,8	8477	11,2	5,3
PRC	1 374, 22	7963	30,6	18,1

As of the end of 2016, 43.35 million people living below the poverty line were registered in China. To achieve its goal, China needs to reduce poverty by 10 million people a year, which means about a million people a month, or 20 people per minute.

Russia is a country with a higher income, compared to China, what attracts workforce from China. Therefore, to resolve the movement of the workforce in the Russian labor market, bilateral agreements that will reduce illegal labor migration and organize migration control are needed.

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THE STATE OF FOREIGN TRADE COOPERATION BETWEEN RUSSIA AND CHINA IN THE CONTEXT OF ECONOMIC GLOBALIZATION

The growing importance of the Russian Federation in international trade determines the importance of the foreign economic sphere for the development of the Russian economy. With significant energy resources, highly skilled workforce is available at a relatively low cost of labor. Russia is a huge market of goods, services and capital. However, the degree of realization of this potential in the foreign economic sphere is currently insufficient. Geopolitical risks determine the difficulties in both Russian exports and imports. But despite the emerging difficulties, Russia's trade with other countries is growing, which indicates the development and strengthening of trade and economic relations (Fig. 1–3).

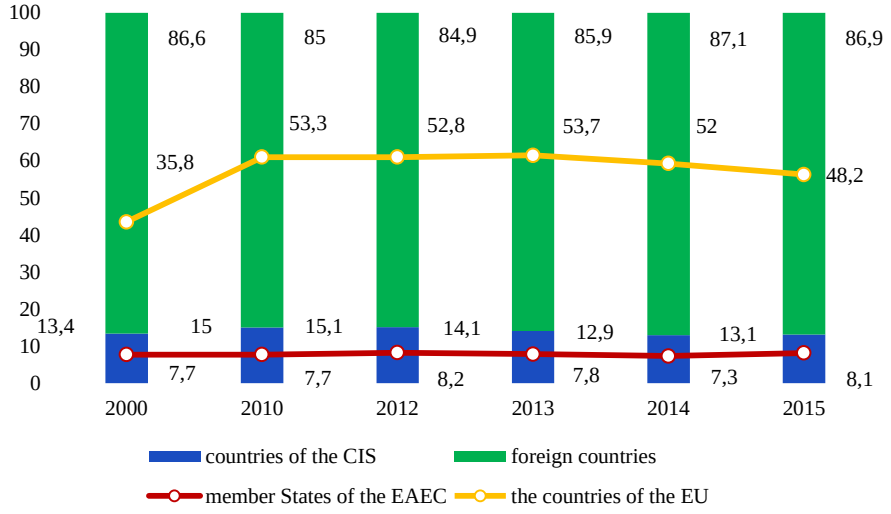

Fig. 1. Export Structure of the Russian Federation for 2000-2015, %

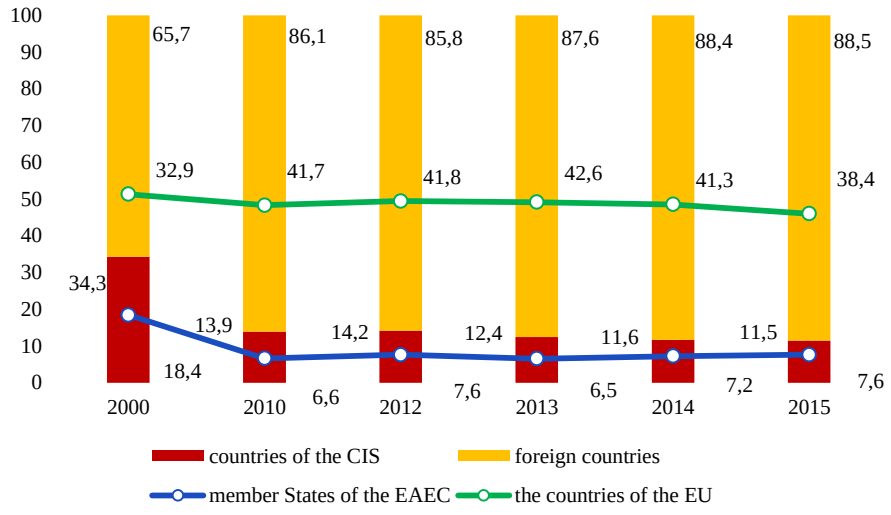

Fig. 2. Structure of imports of the Russian Federation for 2000-2015, %

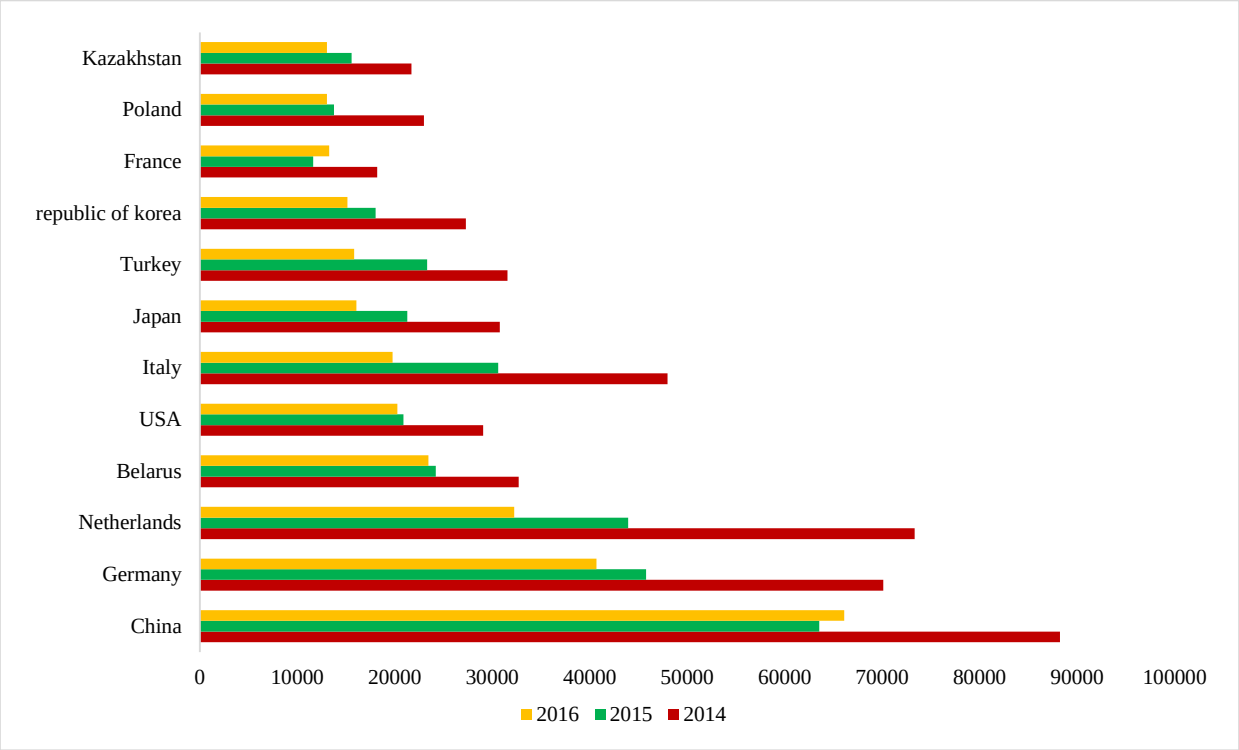

Fig. 3. Foreign trade turnover of the Russian Federation
with the largest trading partners in 2014-2016, mln. USD

The commodity structure of exports continues to be dominated by mineral raw materials (68 %), the second most important group of exports are chemical products (about 6 %), the share of other product groups is insignificant. Imports are dominated by machinery, equipment and vehicles (44 %), chemical products, food products and agricultural raw materials (16 % each).

China is a member of 56 different international and regional associations and organizations. Including the world trade organization, APEC, Shanghai Cooperation Organization, etc.

The main objectives of China's membership in the WTO were identified as: the integration of China's economy into the world economy, improving the competitiveness of Chinese goods in world markets, attracting direct investment in various sectors of the Chinese economy to create a modern production base, infrastructure, trade and services of international level. The application of the rules and regulations of the WTO to resolve international trade disputes on the domestic market of the PRC and protection of Chinese exports to third countries. China continues to cooperate actively with a number of international financial and banking organizations. The dynamics of trade between Russia and China is shown in Fig. 4.

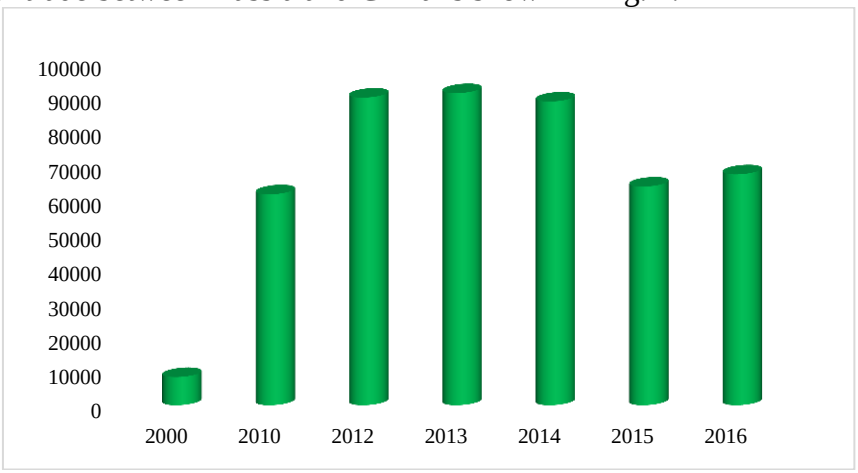

Fig. 4. Foreign trade turnover of the Russian Federation and China 2000-2016, mln. USD

The geographical proximity of Russia and China led to the emergence and development of mutual contacts since the 17th century. A special period in the development of bilateral relations was the twentieth century, when the Soviet Union and the People's Republic of China established trade, scientific and technical relations, laying the Foundation for further economic cooperation. On February 14, 1950, the Treaty of Friendship, Alliance and Mutual Assistance between the Union of Socialist Republics and China was signed in Moscow. This period of Russian-Chinese relations is considered a "Golden Time". Cooperation was characterized by the dynamism of scale and depth of relations. Currently, trade and economic relations between Russia and China have acquired the character of strategic cooperation and stable partnership. The basis of Russian-Chinese foreign economic cooperation is mutual foreign trade turnover. According to the Rosstat of Russia at the end of 2016, its turnover amounted to about 65 billion us dollars, which put China in first place among Russia's foreign trade partners. China's share in Russia's foreign trade turnover is about 12 %.

In the commodity structure of Russian exports to China, the following groups occupy a leading place: mineral products (mainly fuel and energy complex) – about 50 %, wood and pulp and paper products – 15 %, chemical products – 13 %, metals and products from them – 9 %, food products – 5 %. The share of machinery, equipment and vehicles was about 8 %.

The commodity structure of Russian imports from China is dominated by goods of the following groups: machinery, equipment and vehicles – about 50 %, textiles and footwear – 19 %, chemical products – 8 %, metals and products from them – 7 %, food products – 5 %.

The peculiarity of foreign trade relations between Russia and China is the noticeable scale of cross-border trade: the value of the turnover of trade operations of this type is 10-12 billion USD. The main partner of the Russian Far Eastern regions in this type of trade is the Chinese province of Heilongjiang. The share of Russia in the total cross-border trade of China is about 25 %.

In 2016, the bilateral trade turnover approached 65 billion dollars. China came in first place in Russia's foreign trade. The task was to increase the turnover to 100 billion (in the next 3-5 years).

Russian-Chinese investment cooperation has developed. According to Rosstat, the total amount of accumulated Chinese investments in the Russian economy at the end of 2016 amounted to 11.5 billion dollars. This includes US$900 million direct investment, and 10.5 billion USD of other investments.

The energy cooperation between Russia and China has three main aspects: political, economic and financial. For China, the economic aspect is in the first place. For Russia, the political aspect is in the first place. And in terms of the liberal model of development of Russia and the basic market it is financial aspect.

Therefore, the strategic partnership and cooperation between Russia and China for Russia is a political counterbalance to its relations with the United States and NATO countries. And the increase in oil and gas exports to China is a lever of pressure on prices and sales of energy to Europe.

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ASSESSING THE RISKS OF TRADING ACTIVITIES WITH CHINA FOR THE ENTREPRENEURS FROM THE KRASNOYARSK KRAI

Current trends of the world economy globalization, the territorial proximity of the Krasnoyarsk Krai and China, the established long-term business ties between these regions predetermine promising areas for the development of trade activities with a possible sustainable turnover growth of both retail and wholesale trade. At the same time, the current environmental conditions stipulate the existence of a multitude of trade risks, which makes it necessary to identify and evaluate them in order to develop a set of measures for their prevention or minimalization.

Each organization faces the need to assess risks to reduce the number of dangerous events and achieve their goals, as they affect the formation of profitability of the enterprise.

Risk can be assessed for the whole organization, its subdivision and individual activities when dangerous events occur. The degree of depth and detail of the assessment depends on the specific situation, the reliability of the data and the needs of the organization. Risk assessment can be carried out at different stages of the life cycle. At the same time, each stage requires its own methods of risk assessment.

The study of foreign economic literature has revealed a variety of scientific approaches to the assessment and analysis of the enterprise risks.

Our researches assume that the most effective approach to risk assessment is the integrated approach. On the one hand, this approach allows obtaining a more complete picture of the possible results of the enterprise's operations, i.e. about all possible positive and negative surprises and, on the other hand, makes the wide application of methods for the risks analysis and assessment possible. This approach will allow the enterprise to manage risk factors most effectively, which will invariably accompany its activities.

The risks assessment of trading activities of entrepreneurs from the Krasnoyarsk Krai with China was carried out in the context of the following areas of research:

- identification of the main types of risks in the context of environmental factors;
- the ranging of identified risks by an expert method;
- risk assessment by an expert method with the definition of single, private and integral evaluation indicators;
- building a risk matrix and determining their acceptable level;
- selection of the most effective methods of risk management.

All the variety of trading activities risks of the Krasnoyarsk Krai entrepreneurs with China were classified into the following groups:

1. Commercial risks:

1.1. Risks from suppliers:

- risk of non-fulfillment of contractual obligations by suppliers and contractors;
- risk associated with non-receipt of products, goods, works, services from suppliers and contractors on time;
- the risk of supplying products, goods of inadequate quality.

1.2. Risks from customers:

- the risk associated with the lack of goods or services regarding the satisfaction of the interests, desires and needs of customers;

- the risk connected with change of needs and demand of consumers;
- the risk of lack of demand or a significant reduction in demand.

1.3. Risks from intermediaries:

- risks in concluding mediation agreements;
- settlement risks in intermediary contracts;
- the risks of working with different principals.

2. Economic risks:

- the risk of rising prices for goods and services, leading to a decrease in purchases and customer activity, as well as an increase in the cost of services;
- the risk of rising unemployment, leading to a decrease in the individual and, as a consequence, the aggregate demand of buyers;
- the risk of reducing the income of consumers, leading to a decrease in purchasing power and revenue.

3. Political risks:

- the risk of prohibition of sale, or the requirement of a license for a certain type of products, services from the authorities;
- discrimination of a high degree of bureaucracy in relations with state bodies, including in obtaining licenses for carrying out activities;
- risk of non-receipt of the necessary volume of goods of products, services for implementation as a result of imposing sanctions;
- the risk of regional import of equipment due to non-acquisition of spare parts as a result of sanctions;
- the risk of a significant increase in the prices of imported products due to imposed sanctions and other measures to limit imports.

4. Insurance risks:

- risk of loss of the insured amount of money, as a result of refusal of insurance payments or reduction of their sum for objective reasons;
- the risk of loss of the insured amount of money due to the breakdown of the insured equipment, caused by non-compliance with the technique.

5. Information risks:

- risks of getting unreliable, untimely information;
- risks of theft and modification of information;
- risks of irreversible changes and loss of information.

6. Other risks:

- tax risks;
- risks of civil law character;
- risks of pricing, etc.

In the course of an expert survey of Krasnoyarsk and the Krasnoyarsk Krai entrepreneurs engaged in trading with Chinese entrepreneurs, the above risks were ranked in terms of their significance, which allowed them to be grouped into three blocks: high, medium and low risk, and a score of each risk was scored on a ten-point scale with the subsequent calculation of integral indicators of risk assessment.

The above researches make it possible to build a matrix of risks of carrying out trade activities by the entrepreneurs from the Krasnoyarsk Krai with China and to determine the most effective methods for managing identified risks on this basis.

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INTEGRATION OF SOUTHERN SIBERIA INTO THE SYSTEM OF INTERNATIONAL COOPERATION AS A RESULT OF THE PROJECT "THE SILK ROAD ECONOMIC ZONE"

International economic integration of individual economies is an objective process, which is the most important characteristic of the modern world economy. In the current situation of a sharp cooling of relations with the countries of the European Union, the United States and its allies, threatening national security, the highest leadership of Russia has declared a course on the reversal of a significant part of international economic relations in the Eastern direction, primarily to the countries of the Asia-Pacific region.

A result of this process was the "Silk Road Economic Zone" project proposed by China. According to this project, a common Eurasian trade and economic space and a trans-continental transport corridor are being formed. According to the published data, the project is based, among other things, on the construction of three railway corridors (North, Central and South). All of them will connect the Eastern provinces of China with the countries of Western Europe. At the same time, the prospects for transit traffic through Russia and the development of its Eastern regions largely depend on the choice of a specific route.

Thus, within the framework of this article, the aim is to consider the importance of this project for the development of Russia as a whole, as well as its individual regions, and southern Siberia in particular.

The implementation of the plans to create Eurasian transit transport corridors will allow neighboring regions to solve the priority tasks of development. There are following advantages for Southern Siberia:

- inclusion of the continental territory into the system of international relations on more competitive terms [1];
- formation of the region's transport infrastructure meeting modern requirements, first of all [1];
- overall economic and social development of the region;
- development of industrial farms site [2];
- participation in the intensified processes of development of international cooperation in the Eastern direction [2].

Summing up, these corridors should become zones for closer economic consolidation and economic development of adjacent continental areas, work on the economic and political integration of the vast Eurasian space. The situation of Russia, China, Kazakhstan and other Eurasian countries in the world community, the efficiency of their economy and strategic security will largely depend on the timely implementation of these transport mega-projects on the basis of fundamentally new technical solutions.

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STUDY ON THE CONSTRUCTION AND COUNTERMEASURE OF CROSS-BORDER E-COMMERCE RULES

1. BACKGROUND AND SIGNIFICANCE OF RESEARCH

Since 2011, China's average annual growth rate of traditional foreign trade is less than 10 %, while China's cross-border e-commerce transaction size (including retail +B2B) maintains an average annual growth rate of 28.6 %. The booming cross-border e-business has become the new engine of foreign trade growth. The new business mode of cross-border electronic commerce puts forward new challenges to the traditional trade rules. But the rules and systems of cross-border electronic commerce still lags far behind the booming development of cross-border e-commerce. Such issues as trade facilitation and security, border management and behind the border management, coordination of supply chain stakeholders, dispute settlement mechanisms and capacity-building need to be addressed. This paper combines the evolution of cross-border e-commerce rules and gives a review on it, then analyzes the difficulties which China has to face with and puts forwards related policy suggestions.

2. CURRENT STATUS AND TRENDS OF RESEARCH

There are currently 1392 papers on the research of cross-border electronic commerce. According to the relevant literature, the research mainly starts from the following aspects: (1) Research on the influence of cross-border electronic commerce on traditional trade. (2) Analysis on the current situation of cross-border electronic commerce. (3) Research on supporting policies and rules of cross-border electronic commerce. Through the analysis of the above literature, we know that scholars pay more attention to practice and policy compared to theory and rules. In the study of rules, the paper mainly focuses on the research on the content and evolution of the rules of cross-border electronic commerce. However, the research on text analysis, rule revision and system establishment based on the terms of representative trade agreement is very scarce.

3. EVOLUTION AND REVIEW OF CROSS-BORDER ELECTRONIC COMMERCE RULES

Since 1998, the WTO has included e-commerce in the negotiation, covering the definition of e-commerce, attribute classification, tariff, intellectual property, market access and other contents. But so far, no substantive progress has been made in the issues of e-commerce in the WTO negotiations. At the Bali conference in 2013 and the Nairobi Conference in 2015, the WTO decided to extend the moratorium on e-commerce and extended the resolution on exemption of electronic transmission products to 2017.

In the new generation of regional trade agreements led by the United States and Europe, such as TPP and TISA, the international rules of e-commerce show new demands for the development of e-commerce in the 21st century, and the issues such as high standards and high-level intellectual property protection, free flow of cross-border data and protection of personal information have become the focus of the negotiations. TPP sets up a separate chapter for e-commerce, which standard is much higher than that of existing regional trade agreements. TISA is expected to undertake e-commerce rules under the TPP framework and achieve new breakthroughs.

The following table shows the evolution process of e-commerce rules:

Agreement	Date	Rules
Declaration on Global Electronic Commerce	1998	The electronic transmission is exempt from customs duties at the first time.
United States-Jordan Preferential Trade Agreement	2001	First appeared in the form of "electronic commerce" chapter, forming the embryonic form of digital trade trading rules.
TPP	2015	The relevant rules are perfected and refined.
TISA	Has not yet reached	

4. The difficulties which China have faced with

In terms of rule-making, there is still a big gap between China's and developed countries' cross-border electronic commerce rules, which challenges China's acceptance of existing rules. However, in terms of single clause analysis, China's acceptance range is different, the following table gives specific details:

Difficulty or facility of acceptance	Rules
More difficult to accept	Open Networks, Network Access and Use, Source Code, Personal Information Protection, Unsolicited Commercial Electronic Messages, Location of Computing Facilities
Less difficult to accept	Cross-Border Information Flows, Electronic Authentication and Electronic Signatures, International Cooperation
Basically acceptable	Customs Duties on Electronic Transmissions, Online Consumer Protection

For political and security reasons, China has blocked many foreign websites, such as Google, Twitter, YouTube, Facebook and so on, so the "Open Networks, Internet Access and Use" clause is more difficult to accept in China. The "source code" clause requires the participating countries not to force foreign business software providers to hand over the source code, while China enacted a regulation in January 2015 that requires the company to hand over the source code of the software and to embed a "backdoor" program in the software and hardware. "Personal information Protection, Unsolicited Commercial Electronic Messages" belongs to the network privacy protection clause, in terms of personal information protection, China is far behind international requirements and difficult to accept the rules.

The electronic signature law of the People's Republic of China, adopted in 2004, establishes the legal effect of electronic signature, regulates the behavior of electronic signature, and clarifies the legal status and certification procedure of the certification body, but the law still takes the security of transaction as the most important consideration and there is a certain gap with the UNCITRAL Model law on Electronic Commerce. Therefore, the "Electronic Authentication and Electronic Signatures" clauses are less difficult to accept in China.

China has actively launched international cooperation in certain Internet-related areas, the new version of the Consumer Rights Protection Act adds a special provision for online consumer protection based on the comprehensive safeguarding of consumer rights and interests. Therefore, it is not difficult for China to accept the above clauses.

5. CHINA'S COUNTERMEASURES UNDER THE NEW RULES OF CROSS-BORDER ELECTRONIC COMMERCE

Facing the new changes of international rules of cross-border e-commerce, this paper proposes a cross-border e-commerce policy which conforms to Chinese conditions.

1. China should actively participate in and lead the construction of cross-border e-commerce rules. China's e-commerce has developed rapidly and is in the world's leading position. In the process of development, we have encountered many unprecedented problems, which have posed challenges to the traditional international trade model and formed a realistic source of constructing and improving cross-border e-commerce rules. Therefore, it is an important test and an opportunity for China to participate in the construction of international trade rules.

2. Opening up to the outside world, such as network access and use area, releasing the vitality of e-commerce trade. However, we should pay attention to the balance of benefits and security in the process of openness.

3. Strengthening the construction of post-border rules, as cross-border e-commerce has a high demand for post-border rules, such as taxation, intellectual property, information technology and other aspects. To meet the challenge of new rules for cross-border e-commerce, China must strengthen the construction of post-border rules.

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THE PROBLEMS OF INCREASING AWARENESS ABOUT THE ADVANTAGES OF RUSSIAN GOODS TO CHINESE CONSUMERS UNDER CONDITIONS OF PUBLIC AND ECONOMIC PROCESSES DIGITALIZATION

The process of bringing the product to the international level often encounters the problem of the difference in perception of a brand by people who live in different traditions and share different values. All nations are different, each of them has its own system of values, which was formed by many generations. In this regard, it is not possible to change it to a commercial enterprise or a whole foreign state without prejudice to the welfare of the whole nation.

The identification of cross-cultural differences allows to overcome consumer resistance of a foreign state to a brand they were unfamiliar with before, gradually deserving their loyalty. Without taking into account these differences (for example, communication in the prevailing sociocultural conditions), any strategy for bringing a product to the international market is doomed to failure. Undoubtedly, the problem of monotony of brand perception by people who differ from each other by traditions, mentality, language, habits, culture is extremely difficult at all levels, from corporate to national. Entering branded goods to the international market, many companies seek to reduce their transaction costs associated with organizational, material and intellectual expenses, and minimize the change in the brand for a new market characterized by a different socio-cultural space.

For the successful enter of the trademark to the national market, this principle loses its relevance. The influence of globalization, and with it the need to take into account cross-cultural differences in the promotion of trade marks, led to the emergence of specific forms of communication and their glocalization.

The term "glocalization" is a vivid example of an oxymoron. It is formed from two words "globalization" and "localization". The Russian scientist G. Bagiev defines glocalization as "ensuring the competitive advantage of a global company through the dialectical unity of localization and globalization, where the former is provided by the adaptation of the seller's marketing mix to national markets, and the second by the creation of global target markets by integrating / modifying other national markets" [1].

The glocal approach is reflected both on the trade mark itself, in which the complex of marketing (goods, price, promotion, sale) is not simply adapted to the requirements of the national market. The trade mark under the glocal approach is made especially for the needs of the national market, taking into account all intercultural and other differences of the target audience.

The glocal approach is also reflected in the tools that help raise the awareness about the product in foreign markets [2]. Glocal marketing is a technology of the international business functioning in conditions of glocalization and confessing the philosophy of global marketing.

In this case, of course, this approach has both positive and negative sides. The main advantages of glocal advertising include reducing the risk of errors associated with ignoring the pecularities of local culture, and less laborious development of an advertising campaign when using local branches of transnational companies. The main disadvantage in this case is a significant increase in costs for the development and implementation of adapted advertising campaigns, connected, first of all, with conducting additional marketing research [2].

Glocalization also has a significant impact on the digitalization of business tasks related to the need to raise the awareness about the benefits of trademarks in national markets. Digitalization means the fullest possible use of the potential of digital technologies, entrepreneurial practices, successful businesses, saturated with information flows and changing under their influence, both process and structurally.

It is digitalization that allows to optimize transaction costs by changing the way of interaction with target national markets by developing new (and not adapted) ways of positioning and promoting a brand there.

Using the approach of glocal digitalization makes it attractive in terms of the possibility of reducing transaction costs and necessary in terms of applying an effective approach to working up the Chinese market. China is the largest player in the market both in terms of revenue and in quantity of buyers who prefer to make purchases on the Internet.

Obviously, under the conditions of highly competitive markets in China, only using the approach of glocal digitalization will provide companies with a steady effect from programs for the enter and promotion of brands in the market and, accordingly, high sales volumes of their products.

Nevertheless, everything is not so simple. Global digitalization, in fact, is a new method of doing business. There have not been established clear rules of international law.

In addition, the growing popularity of mobile devices and the growing number of Internet users every year provides a significant increase in buyers in the e-commerce market, making it even more attractive and, at first glance, easy to penetrate because of the absence of visible market boundaries.

In September 2015, the Ministry of Industry and Trade of Russia jointly with the international trading platform AliExpress presented the project “Fashion. Made in Russia”. Within the project, more than 100 domestic brands were represented [3]. According to the newspaper Kommersant, during several months of the separate section on AliExpress, where clothes, footwear and accessories of Russian companies were put up for sale, the buyers made 24 orders and put 552 goods in My Wish. At the same time, more than 130 thousand people visited the project [4].

The reasons for the low level of sales are a high mark-up on the retail cost of goods, the availability of analogs, including from Europe and America, a low level of benefits awareness of Russian goods [5].

As it turned out, another Russian mentality became another problem of development of the Chinese market by Russian companies. A large share of Russian companies still does not own the technology of working in retail e-commerce markets (marketplace).

Thus, the problem of raising awareness about Russian goods on Chinese markets is not only related to Chinese consumers' unwillingness to buy Russian goods that are unfamiliar to them.

Many Russian manufacturers are entering the Chinese market to the standard way and are trying to promote their trademarks to the Russian market by saving advertising budgets in the global networks that are familiar to the Russian market. However, in the Chinese market these methods are useless according to the standards of the Chinese market, the advertising budget of Russian companies simply dissolves in the digital space of China’s electronic trading platforms and does not lead to any result.

Of course, talking about raising awareness is impossible if Russian trademarks are not in the minds of the Chinese consumer. The way out can be found in integrating the efforts of several companies and entering the Chinese market under a single umbrella brand, as European companies do successfully.

Another problem for Russian companies is that the Chinese adhere to extremely conservative views. In business, in order to gain the trust and disposition of the Chinese partners, it is necessary to constantly maintain personal contact with them. It takes a lot of time and personal meetings to build trust relationships. Chinese businessmen, as a rule, do not consider business

projects with strangers. To start business cooperation with Chinese partners under such conditions, Russian companies should always obtain recommendations. For example, if the Russian state participates in the project, this will help to make a positive decision and more favorable terms of cooperation.

China is a country in which long-term partnerships are particularly valued (both formal and non-formal). In this connection, the organization of business negotiations to reach an agreement at the first meeting is an initially doomed to failure task. The mentality of many Russian companies is aimed at quickly achieving the goal, not allowing them to overcome this invisible market boundary with China.

Thus, in order to raise awareness of the advantages of Russian goods in the Chinese market in the digitalization environment, one should not forget about the need to maintain long-term personal communications with Chinese partners. This factor is one of the keys to a successful and continued work in the Chinese market.

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BUILDING ENERGY SECURITY CHAIN BETWEEN CHINA AND RUSSIA IN THE CONTEXT OF MULTIPLE COMPETITION IN GLOBAL ENERGY SUPPLY AND DEMAND

In the past two years, OPEC has cut production frequently. Under the Trump administration, the United States has withdrawn from the "Paris Agreement" and the rapid expansion of energy production. A series of "uncertain" events have seriously affected the stability of the global energy market, and international energy prices have plummeted. As the world's most important energy consumer and producer, China and Russia are facing profound changes in global energy supply and demand, and relying on the national "One Belt and One Road" important development opportunities, we need to design a safe chain path for future energy cooperation and ensure common energy and economic security. This article examines China-Russia energy security issues, quantifies the indicators, and measures the degree of energy security in China and Russia from a variety of factors such as politics, economy, resources, technology, systems, transportation, military, and policy, and in the context of multiple global energy supply and demand competitions. On this basis, it measures and assesses the impact of Sino-Russian energy cooperation on the economic development of the two countries. Finally, it considers the energy security cooperation between China and Russia based on the perspective of global value chain, from energy extraction and processing, energy transportation, energy consumption and energy. In the areas of governance, etc., a chain of energy security will be built and suggestions on the future of energy cooperation between China and Russia will be made.

1. ANALYSIS OF THE SITUATION OF MULTIPLE COMPETITION IN GLOBAL ENERGY SUPPLY AND DEMAND

A series of "uncertain" events that have seriously affected the stability of the global energy market have been staged frequently, oil and gas prices have plummeted, and the complex pattern of multiple supply and demand competitions across the world has gradually emerged. As the world's largest energy consumer, China's "gas shortage" caused by environmental governance, energy reforms, etc., has been concentrated in the winter of 2017, and the issue of energy security has again caused concern. Overall, the current global energy landscape presents two characteristics: first, profound changes in the supply-demand relationship and pricing mechanism lead to sharp fluctuations in energy prices; second, demand-driven changes in the global energy structure fundamentally change, and the U.S. The "supply eastward move" of rock oil "supply to the west" and emerging market countries such as China and India are the dominant route for today's global energy. In the face of the world energy situation, it presents the complicated and multi-polar situation in which supply sources and demand sources are simultaneously "multipolar" and "diversified". This section summarizes the global background of the current diversified competition of energy supply and demand, and combines the current energy consumption and supply of energy in the world. The main practices in the energy industry field summarize the current international energy cooperation situation.

2. HISTORICAL PROGRESS AND STATUS QUO OF SINO-RUSSIAN ENERGY COOPERATION

This section sorts out the history of Sino-Russian energy cooperation, applies content analysis, and analyzes the contents of the energy-level strategic cooperation agreement signed

between China and Russia from 1992 to 2017, revealing the laws and characteristics of Sino-Russian energy cooperation. This study, combined with historical analysis, believes that the key factor in determining the energy cooperation between China and Russia is the economic benefits and national security benefits obtained through cooperation. The comprehensive effects of these two factors have affected the process of energy cooperation between China and Russia.

3. EVALUATION OF ENERGY SECURITY LEVELS OF CHINA AND RUSSIA

China and Russia are both big producers of energy. The difference is that China is currently the world's largest energy consumer and the second largest net oil importer, while Russia is the world's major net exporter of natural gas and oil. The focus of energy security on China is safeguarding supply, while for Russia it is on the other hand, guaranteeing stability in exports and prices. In recent years, the economic crisis in the United States, the development and utilization of shale gas, and the increase in the self-sufficiency rate, together with the multiple sanctions imposed by Europe and the United States on Russia, have brought a great impact on the Russian economy, which mainly relies on energy exports. But at the same time, it also provided opportunities for diversification of Russian energy exports and Sino-Russian energy cooperation. This section examines China-Russia energy security issues from a variety of factors including politics, economy, resources, technology, systems, transportation, military affairs, and policies. It quantifies these factors into 12 indicators and measures the state of China-Russia energy security from 2000 to 2016. The calculation results are shown in the following table. As a large energy supply and energy reserve country, Russia's energy security level has been high since 2000, and its volatility is not significant. As an energy consumer country, China's energy security has become increasingly important, since 2000. The level of energy security has increased significantly.

Table

Indicators Results of China and Russia Energy Security in Selected Years

Index System	2000		2010		2016	
External Dependence on Energy	0,3177	0,1143	0,2471	0,1254	0,2874	0,1133
Energy Trade Concentration Risk	0,0432	0,1087	0,0732	0,1081	0,0975	0,1244
Energy Consumption Intensity	0,0486	0,1455	0,1286	0,1572	0,1563	0,1599
Fossil Energy Consumption	0,0194	0,0204	0,0284	0,0293	0,03862	0,0264
Energy Storage and Production Ratio	1,1767	1,1421	0,9744	1,0342	1,2432	1,1573
Energy Price Volatility	0,2421	0,2420	0,2576	0,3011	0,2766	0,3276
Strategic Petroleum Reserve	0,2859	2,4236	0,7833	2,5491	1,0743	2,8655
Oil Consumption Growth	1,1144	1,0943	0,9749	1,1354	1,0855	1,1564
Transport Channel Reliability	0,0859	0,6844	0,2577	0,7764	0,3076	0,7255
Energy Processing Conversion Efficiency	0,0535	0,1280	0,0809	0,0912	0,1043	0,1183
Total Score	4,0633	7,8434	5,8755	7,8843	6,2431	7,7501

4. ASSESSMENT OF THE LEVEL AND EFFECT OF ENERGY COOPERATION BETWEEN CHINA AND RUSSIA

This section examines the economic effects of China-Russia energy industry cooperation, especially the cooperation of fossil energy industry. Based on the existing literature, the energy industry cooperation index was constructed, and the relationship between energy cooperation and GDP and trade between the two countries was explored using a vector autoregressive model (VAR) to further demonstrate the importance of China-Russia energy industry cooperation. The

China and Russia Energy Cooperation Evaluation Index (ECI) and the GDP of China and Russia are taken as endogenous variables, and two sets of vector autoregressive models are constructed. The Brent crude oil price was introduced in the model as an exogenous variable to reflect the world energy price. The results of the model show that the Sino-Russian cooperation index for energy industry cooperation can significantly explain the fluctuation of GDP between the two countries. The overall effect of the impulse response of the Sino-Russian energy industry cooperation on the regression model of economic growth between the two countries is positive, indicating that the bilateral energy industry cooperation between China and Russia has a significant role in promoting economic growth between the two countries.

5. CONSTRUCTION AND COUNTERMEASURES OF CHINA-RUSSIA ENERGY SECURITY CHAIN

Under the complex background of multiple global energy supply and demand competition, energy security is no longer a stand-alone problem that a single country can to solve from the perspective of the roles involved in integration. It is a resource-supplying country and resource consumption that requires energy supply and demand. The coordination of many roles in the energy industry chain, such as countries, related energy governance countries, and energy companies that participate in particular, is no longer a simple issue in the import and export of energy products, but also needs the participation of a country. The systematic project of coordinated management and control of many sectors such as energy production enterprises, government management, environmental protection, financial security, and logistics transportation. Therefore, the energy security chain means that under the condition that the global energy competition pattern is deepening, international energy cooperation among countries needs to build an energy safety chain coordinated and managed by the multinational, multisectoral, and multi-linkages of relevant countries and enterprises. For China, the construction of the Sino-Russian energy security chain has become a systemic task that needs to be solved urgently to safeguard both the economic development and energy security of the two sides. Through the construction of the energy security chain, the problem of unstable price fluctuations in the current global energy market can be balanced to a certain extent. The energy transportation stability mechanism contained in the energy security chain can better address various risks caused by transnational long-distance transport of international energy. The protection of energy supply and demand among countries that have established cooperative relations can also give maximum support to the system.

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DIGITALIZATION OF EDUCATION: REVOLUTION OR FASHIONABLE TREND?

Smartboards, multimedia technologies and internet access have made an inseparable part of a modern classroom. Teachers and students daily use virtual space for interaction and distant learning. The analysis of research papers in the field, as well as interviews with students provided opportunities to identify essential benefits and potential risks of making classrooms "wired". The author makes a conclusion on complex interrelations of the level of digitalization in training and studies in virtual environment with the quality of education. It is impossible to redesign students to fit into the system, but we can re-design the system for students. This can be the difference between success or failure for our students that need the promise of higher education the most.

***Keywords**: higher education, national education, technology plan.*

INTRODUCTION

Currently students live in a world where the classroom is closely linked to the outside, so traditional learning and instruction methods do not work now. Digitization means the true revolution in education when students can learn at their own speed and build their own learning route both within and outside the classroom. At the same time, mentorship, support and direction of their teachers can benefit their learning results [1].

The report of the RF Center for Strategic Developments called "12 Solutions for New Education" which is regarded a draft project for educational reform in Russia in the framework of the RF Strategy for Social and Economic Development up to 2024 defines the notion of "new literacy". It includes basic skills in typical life situations in ever changing world, specifically, financial, legal, medical, ecological and technological literacy alongside with inter-disciplinary skills, independency and self-motivation [2].

Modern trends in Russian higher education coincide with the global trends of mass education supported by distant learning, introduction of new technologies, artificial intelligence, etc.

Higher education has become more specialized, with students trained based on the labor market current and forecasted demands and exposed to a variety of learning routes, with one's own personalized trajectory. While teachers enhance student motivation by providing support in search of the information sources and making use of them [3].

But, is digitalization just a new attractive trend, or it has benefits that can lead to better education outcomes?

The benefits of digitalization in education are enormous and indisputable for many researchers and managers in education. One of the most frequently mentioned is shortening the distance between a student and his/her goals and dreams by quick adaptation of learning and teaching to learner and employer's demands [1].

Online education as a type of distance learning with no needs to attend the college or university in person; e-learning or computer-based training includes all forms of electronically supported learning and teaching. For example, free video sites, such as YouTube and Vimeo are helping to make these videos easy to access.

These sites allow students to view the lectures at a convenient time and place. Students can control the pace of these lectures and watch them repeatedly. Thus, on-line and blended learning provide opportunity to integrate student education easily with other aspects of their lives.

Another valuable benefit is the opportunity and trained ability to manage big data and share them in order to make most rigorous decisions in everyday life: digital libraries and digital university campuses have made information sources easily accessible almost to anyone.

Moreover, technology has made education stress-free for students. A fundamental change in the way that learners can gain knowledge, skills and competencies with technology is going to be useful for their future employment in our increasingly digital world. For this reason, universities are gradually introducing digital teaching solutions meeting technological abilities of a generation of learners familiar with iPads and trying to make the classroom atmosphere more participatory. In this case, subject knowledge and skills are trained alongside with developing both a learner and a trainer of digital skills, thus multiplying the benefits.

Finally, a digital technology has led to the fundamental change in the way that learners are able to interact with other individuals, both their peers and educators, from all around the world. This enhances cultural awareness and globalization.

As for educators, they can benefit from the use of information and communication technology, as it facilitates student understanding, who, being technically savvy, are in the best situation to absorb what comes up in the classroom.

From the teaching perspective, digital technology is enabling teachers to create more interactive, engaging and flexible learning materials in a variety of digital and multimedia formats and make them available to students online.

Educators are also able to teach in a variety of different ways in the classroom, through the use of in-class technologies, online materials and students' own mobile devices and blended learning. These changes are enabling educators to have a more diverse set of pedagogical approaches to support their learners, which means that they can be more inclusive in their teaching methods.

But digitalization bares a number of challenges to all interested parties that do not allow making a direct link between the scale of digitalization and higher education achievements.

The main challenge on the university side include the need to adapt to the digital era by restructuring the system of teacher training and retraining as well as large scale technological adjustment to changes which are not quite certain and can lead to cheating [4]. In this case, not only finance becomes an obstacle (implementing and then maintaining technology is costly particularly as systems can quickly become out of date), but the system readiness for radical changes with a danger of 'digital divide' – the divide between those who have access to digital technology and the internet, and those that do not.

Another challenge for the university is due to global nature of digitalization and means staying competitive and keeping own authenticity and unique advantages which demands developing rigorous model of development in training and research [5].

As for educators, real revolution is coming in methods of teaching and instruction. A lot of time and resources are to be invested into technologies and applications that have yet to be proven to be effective or efficient when compared to more traditional classroom learning contexts. Teachers and schools need to think carefully about when, why and how to use technologies as well as evaluating their efficiency and effectiveness. The example is keeping interest and motivation without too much entertainment and distraction from serious problem solution [6].

The assessment system is to be adapted to a variety of learning paths with an individual set of tasks for each student. Evidence suggests that now the potential of digital technologies in the classroom is not quite clear.

Moreover, there may be problems with the existing infrastructure, for example, internet connections may be inconsistent and/or slow.

Safety for students and teachers is a key challenge in terms of prevention of cyber-bullying, the hacking of personal information, access to illegal or banned materials and distractions from learning (such as social networking and mobile phone use).

Not less essential is a health concern, as some uses of technologies can be harmful. For example, poor posture and eyestrain are common problems when working at desktop computers for prolonged periods. Also, Repetitive Strain Injury (RSI) is a risk that occurs from the repeated actions necessary to control mobile devices.

The concerns on student side are also essential. As American researchers have found, the biggest barrier to digital learning for teachers is gaining student access to technology. Then comes a lack of time during the school day.

Education technology company Schoology, producer of a free web-based learning management system with tools for creating content, designing lessons and assessing student learning, conducted a survey with Responses having come from 2,846 education professionals worldwide, a high volume being from the United States.

Almost everybody said digital learning had a positive impact on student achievement (95 percent) and teaching effectiveness (92 percent). However, most of the time, the resources they said they use tend to be "static" – PDFs and Word documents (cited by 90 percent of respondents) and videos (cited by 70 percent). This suggests, the report noted, that institutions "may be digitizing traditional learning instead of enhancing it". Online games came in third, referenced by 42 percent of participants, and publisher content and open educational resources ranked lower (39 percent and 37 percent, respectively).

Teachers and administrators specify their major barriers to integrating technology into teaching and learning. They are presented in Fig. 1 below [7].

AMONG OTHER RESULTS

A quarter of respondents run 1-to-1 programs where students can't take devices home; a similar number have 1-to-1s where they can take them home.

- Not quite half of participating schools (46 percent) have an A learning management system **(**LMS) in place; 20 percent don't; Among those with LMSes, 39 percent of education entities with 50,000 or more students required LMS use.
- The survey found that frequency of LMS use also corresponded to level of student engagement. The highest proportion of "very engaged" students were found in schools where the LMS was used daily.

The survey also examined instructional approaches that integrate technology.

The ones used most by respondents were differentiated instruction ((75 percent), blended learning (54 percent), and individualized learning (45 percent). Individualized learning, or individualized instruction, is a method of teaching in which content, instructional technology, and pace of learning are based upon the abilities and interest of each learner.

CONCLUSION

The RF, China, European countries and the USA regard digital education not as a fashionable trend, but an inseparable part of social economic development focusing on five main areas – learning, teaching, leadership, assessment, and infrastructure. The results of digitalization of higher education includes a variety of MOOCs offered last year by 500 universities all over the world, meaning annual double number of trainees and five-fold consolidated return on the MOOC, market thus leading to have tremendous changes in the educational landscape globally.

There is no single answer to the question if integrating digital technologies has a direct impact on achieving best results in education. Many variables are to be considered, primarily, the opinion of final users – learners and employers. As the report on digital technologies from the charity Nesta in the UK notes, "What is clear is that no technology has an impact on learning in its own right; rather, its impact depends upon the way in which it is used [5].

At the same time, as digitalization has already become a reality, both strategically and tactical measures are to be taken on the university level.

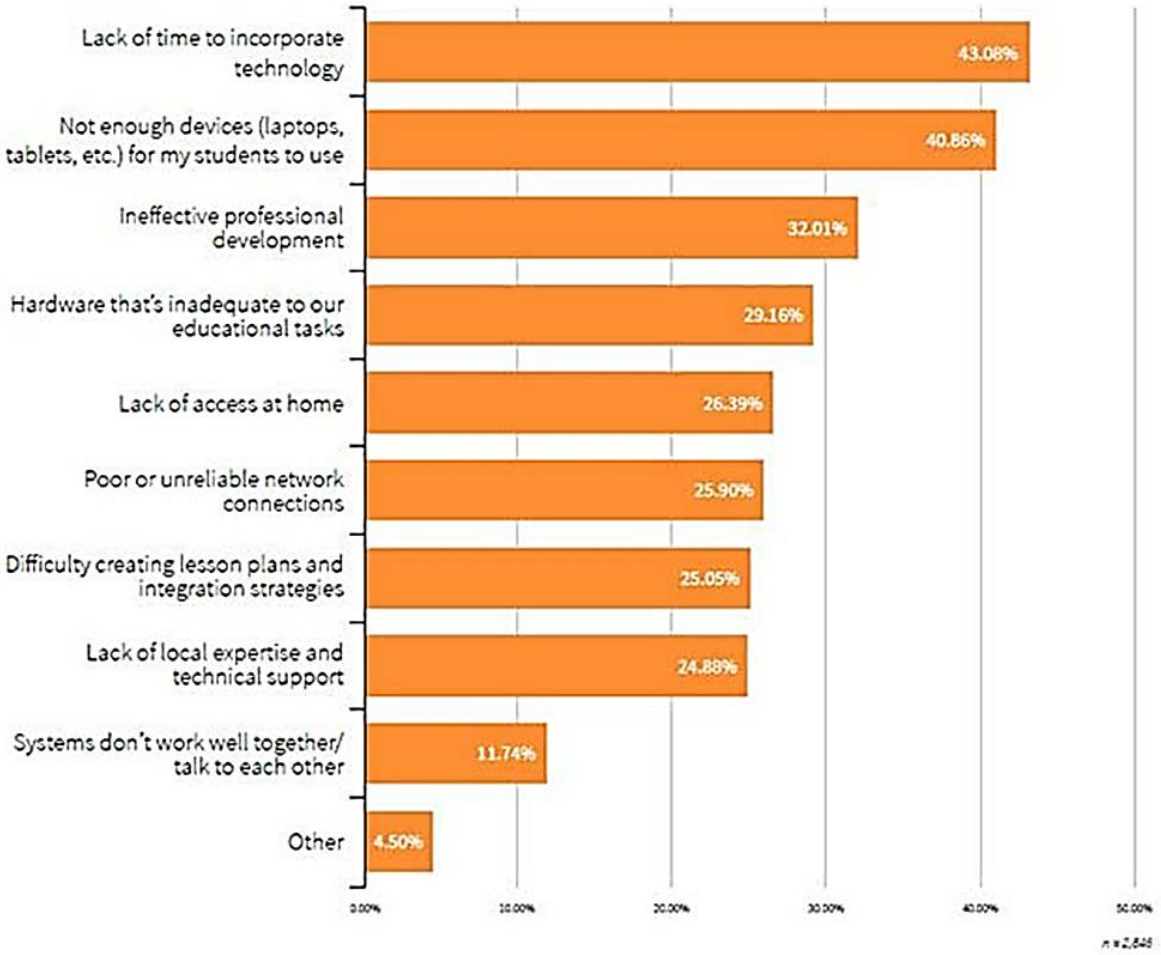

Figure. Major obstacles to integrating technology into teaching and learning
Source: "The Global State of Digital Learning in K-12 Education" [7]

The strategy of the university on digital transformation is to be initiated by the University authorities and supported on the department level with every teacher involved in the measures realization understands how and why their activities make an integral part of the whole university strategy.

The IT specialists are to be properly trained and by introducing new IT approaches and solutions and in close cooperation with educators and learners [4]. Supportive measures can include:

- Training and retraining of faculty and students in digital skills;
- Supporting and motivating those educators integrating digital technologies in teaching and instruction;
- Motivating both IT and teaching staff to join integration educational platforms into everyday teaching.

The vital point is regular feedback and cooperation of all interested parties – students, teachers, researchers, IT specialists, employers, graduates and potential students.

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SUPRAGLACIAL SILK ROAD: OPPORTUNITIES, CHALLENGES

As one of the Blue Economic Channels, Supraglacial Silk Road has been fitted into the overall layout of the Belt and Road Initiative. As the shortest shipping line, Supraglacial Silk Road connects Europe, Asia and North America, therefore it is also known as a new lifeblood of international shipping route. Currently, two strategic pivot points are involved to Supraglacial Silk Road: Northeast Passage and the Arctic development, which will promote all-round cooperation between Arctic and near-Arctic countries such as maritime transport, polar development and Arctic governance to achieve mutual benefits.

***Keywords**: Supraglacial Silk Road, 21st century Maritime Silk Road, Supraglacial Economic Corridor, Blue Economic Channel, Northeast Passage.*

On November 1, 2017, when President Xi met with Russian Prime Minister Dmitry Medvedev, he pointed out that "We should assure that the construction of 'Belt and Road'[1] will link up with the Eurasian Economic Union and strive to accomplish projects such as the Binhai International Transportation Corridor. And we must jointly develop and utilize the Arctic waterways to build the Supraglacial Silk Road". On the same day, during the 22nd regular meeting of the Chinese and Russian Prime Ministers, they once again exchanged views about the build of the Supraglacial Silk Road and reached a new consensus.

THE HISTORIC OPPORTUNITY OF "SUPRAGLACIAL SILK ROAD"

The smooth beginning and commercial operation of the Silk Road benefited from the melt of the Arctic ice. In recent years, the Arctic tundra releases more carbon dioxide due to the human carbon emissions and ElNino phenomenon, which directly leads to the Arctic temperature warming. Russian scientist Oleg Annisimo who is a Nobel Peace Prize laureate, also pointed out in 2015 that Arctic sea ice could disappear completely within 40 years as global warming intensifies[2]. Mark Seretse, director of the national ice and snow data center, predicted it is possible that Arctic sea ice could disappear completely in the summer of 2030[3]. As a major coastal country of the Arctic Ocean and a northeast channel country, Russia is aiming at the new opportunity brought by the melt of the Arctic ice, has launched a series of Arctic development plans and encouraged China to participate which provides a rare opportunity for China-Russian cooperation to build the Supraglacial Silk Road.

China-Russian cooperation will speed up the construction of port infrastructure in the Arctic Ocean zone and will jointly construct another major freight transport channel which is parallel to the "Economic Belt of Silk Road". This cooperation will stimulate the development of the remote areas of Chukchi and Magatan in the Russian far East and the construction of coastal infrastructure. In return, it also brings investment and manufacturing job opportunity. The "Ice Silk Road" will open a new line from a port north of Shanghai to ports of western Europe, the North Sea, the Baltic Sea and others. The line will be reduced to 7900 miles and cutting mileage by 5100 miles compared with the traditional line from the Strait of Malacca to the Suez Canal. And if going east along the sea route to the east coast of North America, that will be 2000 to 3500 nautical miles shorter than the traditional Panama Canal line. At the same time, the Supraglacial

[1] Xi Jinping meets with Russian Prime Minister Dmitry Medvedev [N] // People's Daily. 2017. № 11-2 (1).
[2] Climate experts warn that Arctic sea ice may disappear completely by 2050 // Science and technology daily. 2015. № 04-03 (7).
[3] The Arctic area of sea ice shrank to the lowest level since 1972 [EB/OL] // China Weather website.

Silk Road can avoid the safety problem troubles ship navigation which brought by Monsoon, and to some extent ease the pressure that military deployment of United States, India and other countries in the Malacca region. It can avoid the increasingly frequent harassment of Somali pirates as well.

In 2017, China ocean shipping group dispatched five ships in all from Lianyungang, Tianjin Xingang to Norway and Denmark from August to September, during the Arctic Ocean navigation window. And only the first ship of the ships, the Lotus Pine, hired an icebreaker to guide, while the others sailed independently. This saves about $800000 on the icebreaker cost. According to the company's calculations, what the five ships saved via the North Pole rather than the Strait of Malacca is about 25313 nautical miles and 80.6 days and 2018 tons of fuel. And at least cutting 5 ten-thousand dollars cost on the Suez Canal as well.[1] The line fully shows the commercial merit of the Supraglacial Silk Road. Russia thinks highly of the route's absolute predominance and seeks to position it as an alternative route to the Suez Canal.

The "Ice Economic Belt" is actually the promotion and expansion of economic cooperation between China and Russia in years. The Yamal natural gas project which is located in the Russian Arctic Circle, has become an important fulcrum in the "Ice Economic Belt". In 2013 the Russian government and the Tektronix Inc. invited the China Petroleum and Natural Gas Group to join the Yamal project. The first production line of this project was formally put into operation on December 8, 2017. The second and the third production lines are planned to be put into operation in 2018 and 2019 respectively. When all the three projects are into operation, the annual output of liquefied natural gas is 16 million 500 thousand tons and the condensate oil is 1 million tons. The shareholders of the Amazon project are Russian Novatek France Total, Petro China and the Fund of Silk Road, and the proportion of the project is 50.1 percent, 20 percent, 20 percent, 9.9 percent respectively. The total investment of the project is 27 billion dollars, and the Chinese company actually owns 29.9 percent of the Yamal project. China is already a buyer in the second batch of liquefied natural gas in Yamal. Except the Yamal LNG project, there are two more LNG projects in Russia's northern coast. The Arctic-2 LNG project is located in the north of Jidan which is Russia's largest peninsula and it is proved that reserves are about 235 billion cubic meters of natural gas and 9 million tons of liquid hydrocarbons.

Two important Russian ports along the Supraglacial Silk Road – Murmansk and Vladivostok are known as ice free port where ships can sail all seasons because of the warm currents though their latitude is high. If China and Russia reach an agreement to construct a free trade zone in Vladivostok, while the port could become a transfer station for goods in Northeast Asia due to its perfect location. The goods from China go to the sea by the port in the Tumen River or the railway built from Harbin to Vladivostok, then go west to Murmansk through the Supraglacial Silk Road, supplied by the ports along the way. Murmansk could also be a commodity hub in northern Eastern Europe, then affecting the whole of Europe.

Challenges the Supraglacial Silk Road faced

The existence of the Arctic Council and the Arctic policy adopted by the Arctic countries are both opportunities and challenges for non-Arctic countries to participate in the Arctic affairs. Although China is a permanent observer state of the Arctic Council, an important condition for becoming a permanent observer is the need to "respect the sovereignty and jurisdiction of the Arctic states in the Arctic", which is actually an indirect recognition of the special benefits of the Arctic countries in the region. China's choice to build "the road of ice on the ice" with Russia, the largest country with the territory of the Arctic Ocean, is undoubtedly a precursor to the economic and trade cooperation between the Arctic and non-Arctic countries, and the cooperation between the two countries will inevitably meet the challenges from the great powers of the Arctic. Secondly.the Supraglacial Silk Road also faces the challenge of US and Russian military competition and the change of the Northeast Asia situation.

[1] Cosco seaborne special transport of 5 ships through the Arctic Northeast Passage. Cosco Marine Special Transportation Co., Ltd. Website [EB/OL], 2017-09-21. URL: http://www.nykcos.com/News/Detail.aspx?ID=11417.

The situation in Northeast Asia will also affect the expansion of the Supraglacial Silk Road. One of the purposes that Russia conceived of Supraglacial Silk Road is to take its Far East port – Vladivostok as an important port to connect China, Japan, South Korea and other economic powers in Northeast Asia. So, Russia can promote the economic development of its Far East region. As for China, it would prefer to extend the Supraglacial Silk Road from Vladivostok to the ports along China's eastern coast and then connect with "21st Century Maritime Silk Road" which includes the China Oceania South Pacific Blue Economic Channel and the China-Indian Ocean Africa Mediterranean Blue Economic Passage.That will form a trend around the Eurasian continent. In the process of China-Russian jointly construction of the Supraglacial Silk Road, it must establish an alert mechanism and a plan about the security situation in Northeast Asia.

The traditional trade routes between China and Europe mean that most goods that China imports or exports (especially crude oil from the Middle East and North Africa) must be transported through the Straits of Malacca and the Suez Canal, which is not only a long way but there are also many traditional and non-traditional security problems, such as military bases, pirate attacks and others. And that also reflects China's energy security problems. Nowadays, China's energy dependence is 16.5 % in 2015, with crude oil's dependence is 65.5 % in 2016, probably more than 80 % in 2030. The external dependence of natural gas is 34 % in 2016 and will be more than 40 % by 2030. By 2020, the energy consumption and imports of China will be first in the world. The diversification of energy and transportation channels has undoubtedly become a very urgent strategic choice.

Liquefied natural gas and oil from Russia will account for a large proportion in the prediction about future freights of the Supraglacial Silk Road. The Supraglacial Silk Road as the blue economic corridor planned by One Belt and One Road will challenge the traditional routes with shorter voyages and lower costs, thus changes the focus of China's energy trade and then changes the current shipping trade pattern to some extent.

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INNOVATIVE DEVELOPMENT OF SIBERIAN REGIONS IN THE CONTEXT OF GLOBAL INTERACTION BETWEEN RUSSIA AND CHINA

The article discusses the possibilities of innovative development of the regions of Siberia as adjacent territories of the Russian Federation and the People's Republic of China. According to the results of empirical research of the current situation, the possible directions of building effective models in the context of global interaction of countries are highlighted. Necessary conditions for the development of the initial model are formulated.

Innovative direction of economic development in modern conditions is considering as a priority in the world practice. In this vein, it seems important to consider the possibilities of obtaining the maximum synergy effect from the interaction and cooperation of neighboring countries, which include Russia and China.

Appeal to the analytical materials [1], which characterize the innovation sphere, indicates the presence of positive dynamics (Tab. 1) of these countries.

Table 1

Countries – leaders in innovation activities as of January 1, 2018 [1]

Position	Country	Mark	Place of the country in comparison with the previous year	Position	Country	Mark	Place of the country in comparison with the previous year
1	The Republic of Korea	89,28	0	14	Belgium	77,12	-1
2	Sweden	84,70	0	15	Norway	76,76	-1
3	Singapore	83,05	+3	16	Netherlands	75,09	-1
4	Germany	82,53	-1	17	Great Britain	74,54	0
5	Switzerland	82,34	-1	18	Australia	74,35	0
6	Japan	81,91	+1	19	China	73,36	+2
7	Finland	81,46	-2	20	Italy	68,88	+4
8	Denmark	81,28	0	21	Poland	68,74	+1
9	France	80,75	+2	22	Canada	67,98	-2
10	Israel	80,64	0	23	New Zealand	67,40	-4
11	USA	80,42	-2	24	Iceland	67,11	+1
12	Austria	79,12	0	25	Russia	66,61	+1
13	Ireland	77,87	+3	26	Malaysia	64,79	-3

The priority of the innovation economy in China was formulated at the beginning of 2006. The innovation course was announced as a new national strategy. At the All-China Conference on Science and Technology, the fundamentals of the country's development plan in the field of science and technology for the medium and long term (by 2020) were announced, the main purpose of which is to increase the capacity of independent innovative development of the country and build an innovative economy. Priorities were named:

1) Reduction to 30 % of the level of the country's dependence on foreign technologies;

2) Increase to 2.5 % of GDP in R&D costs;

3) An increase to the level of more than 60 % of the contribution of knowledge-intensive industries to economic development [2].

Optimization of structures and the concentration of forces and means in the most promising scientific areas are those tasks that given considerable attention in China. In 1998, the reorganization of the Academy of Sciences began. According to the plan, by 2020, of the 129 academic institutions, 30 of the strongest and most recognized in the world should remain. A new procedure for determining scientific priorities and funding introduced to eliminate the dispersion of funds. Cooperation with business is developing rapidly: universities attract 36 % of private investment in research and development [3].

In the Russian Federation, the innovation vector of development was defined in the early 2000s. In a number of developed program documents (the Concept of long-term socio-economic development of the Russian Federation for the period up to 2020, the Strategy of innovative development of the Russian Federation for the period up to 2020, etc.), target indicators of economic growth are defined. In particular, an increase in the share of industrial enterprises engaged in technological innovations in the total number of industrial enterprises to 40–50 % by 2020 (9.4 % in 2009); an increase in Russia's share in the global markets for high-tech goods and services (nuclear power, aircraft, space technology and services, special shipbuilding, etc.) to 5–10 % in 5–7 or more sectors of the economy by 2020; an increase in the share of exports of Russian high-tech goods in the total world volume of exports of high-tech goods to 2 percent by 2020 (0.25 % in 2008); an increase in the gross value added of the innovation sector in the gross domestic product to 17–20 % by 2020 (12.7 % in 2009); an increase in the share of innovative products in the total industrial output to 25–35 % (in 2010 – 4.9 %); an increase in domestic expenditures on research and development to 2.5–3 % of the gross domestic (1.3 % in 2010), of which more than half is due to the private sector; an increase in the share of publications by Russian researchers in the total number of publications in world scientific journals to 3 percent by 2020 (2.08 percent in 2010), etc. [4]

At the same time, statistical indicators of economic and innovative development indicate a significant lag behind the planned levels.

A retrospective slice of the initiation of the innovation vector and an appeal to the results of the 15-year period of its implementation makes it possible to carry out a comparison of the parameters of the innovative development of Russia and China (Tab. 2).

Table 2

Comparison of the parameters of the innovative development of Russia and China

Name of the indicator	Russia	China
Strategic direction of economic development	Transfer by 2020 of the Russian economy to innovative way of development (ensuring economic growth, competitiveness of the country in the world market, solving social problems, ensuring economic security)	Preservation in state property of strategically important sectors of the economy that affect pricing; technology development
Tools of science and technology policy	State target programs	National programs to solve major scientific and technical problems
Structure of R & D financing	Own funds – 13.7 %, funds of budgets of all levels – 55.4 %, foreign sources - 2.7 %, other – the rest	Funds of enterprises (75 %), approximately 22 % of budget funds, the rest – foreign and other sources
R & D financing instruments	Competitive financing, participation in venture financing, state guarantees, subsidizing of projects and interest rates on loans, cooperative agreements and government contracts, grant financing and government programs tools	
The scale of knowledge generation, their quality and impact on the development of the global knowledge base	The share of publications from the world is currently equal to 2.12 %	The proportion of articles published by Chinese authors (or with their participation) exceeds 11 %

Compiled by [5–7; https://viafuture.ru/mirovye-praktiki/kitaj/innovatsionnaya-politika-kitaya].

Systematization of the main characteristics illustrates the diversity of the formation and implementation of the innovation course. In this vein, the question of the potential of global interaction between Russia and China is logical.

Table 3

External and internal threats to the innovative development of Russia and China

China	Russia
Direct Yuan's dependence on the dollar	
Low competitiveness of financial institutions compared to global	Lack of leadership and strong positions in global knowledge and technology markets
Less impact compared to the United States and the European Union countries in the global financial market	
Outflow of specialists abroad	
Low intellectual property protection	
Hourly labor productivity (in terms of GDP, taking into account PPP) of workers employed in the economy, in China is less than 20 % of the average level in EU countries.	
Low level of health care and environmental quality.	The discrepancy between the rate of change of the environment and the infrastructure of the growth of technological markets
A serious problem remains the weak involvement of the western regions of the country in the innovation process.	Insufficient demand for innovations associated with the structure of the regional economy

According to the authors, the changing paradigm of world interaction of states, the formation of key trends in the technological development of the global economy, as well as the specificity of regional economies of the adjacent territories of Russia and China and the level of their development make it possible to highlight the following areas of implementation of mutually interesting cooperation projects:

- The formation and development of industries with high added value, especially in the processing sectors;
- improvement of the transport infrastructure through the creation of transit trunk transport corridors "Countries of the Asia-Pacific Region – the Far East – Siberia – European Part of Russia";
- Institutional cooperation in the formation of the financial infrastructure;
- Joint activities in the timber industry complex;
- The creation of a modern highly productive agriculture.

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COMPARATIVE ANALYSIS OF STRUCTURAL CHANGES IN THE ECONOMY OF RUSSIA AND CHINA

The review of the essence of structural shifts and economic growth, their interrelationship and interdependence, as well as the main factors of structural shifts, problems of ensuring their quality and efficiency is relevant for the economy of Russia and China. From an analytical point of view, the modern economy of Russia and China is of great interest, since recent years have been characterized by significant structural changes due to the active continuation of the development of market relations, the strengthening of the influence of global processes combined with emerging trends in the post-industrial economy.

2014 marks the beginning of a new stage in the development of the country's economy, which is associated with the entry into the Russian Federation of the Republic of Crimea and the introduction of economic sanctions, requiring additional understanding of the impact of new factors on the trends in economic dynamics.

Based on Tab. 1 data, since 2014 there has been a slowdown in GDP growth, in 2015 and 2016 there is a negative dynamics (-2,5 % and -0,2 %, respectively), in 2017 the growth amounted to 1,5 % (Tab. 1).

Table 1

Dynamics of growth rates and real GDP growth in the Russian economy

Indicators	2013	2014	2015	2016	2017
Real GDP growth, %	101,8	100,7	97,5	99,8	101,5
GDP growthrate, %	1,8	0,7	-2,5	-0,2	1,5

According to Rosstat, in the period of 2013-2017 the share of exports in GDP of Russia varied from 25.8 to 29.8 %. The share of imports declined in 2014 to 19.7 % and in 2015 to 15.2 % influenced by economic sanctions and Russia's response measures. There was an increase in share of imports to 20.6 % in 2016 and to 23.7 % in 2017 [1].

The index of gross capital formation rapidly fell in 2014 as compared to 2013 and only in 2016-2017 had positive values with the downward momentum in 2017. The downward trend of savings continues, creating limitations for investments in the future.

From 2013 to 2014 the final consumption expenditure index showed leap down into the negative value area, continuing to remain in this zone in 2014, and only in 2016 and 2017 years had positive values with the decline in 2017 (Fig. 1).

The basis for increasing the aggregate demand – the traditional factor of economic growth in Russia is lost as a result of this dynamics.

In the period from 2012 to 2016, there was the deterioration of the quality of structural shifts in the economy of Russia. The decline in the quality of structural shifts was due to the negative dynamics of the following indicators: labour productivity, capital, innovation, overdue debt.

The dynamics of aggregate index of the quality of structural shifts from 2012 to 2016 is presented in Fig. 2.

Graphic analysis of aggregated index shows falling quality of structural change in the Russian economy from 2012 to 2015 with some quality recovery in 2016, but the indicator remained in the area of negative values [2; 3].

China's economy as well as the Russian economy shows slowdown in GDP and the share of investment in GDP (Tab. 3).

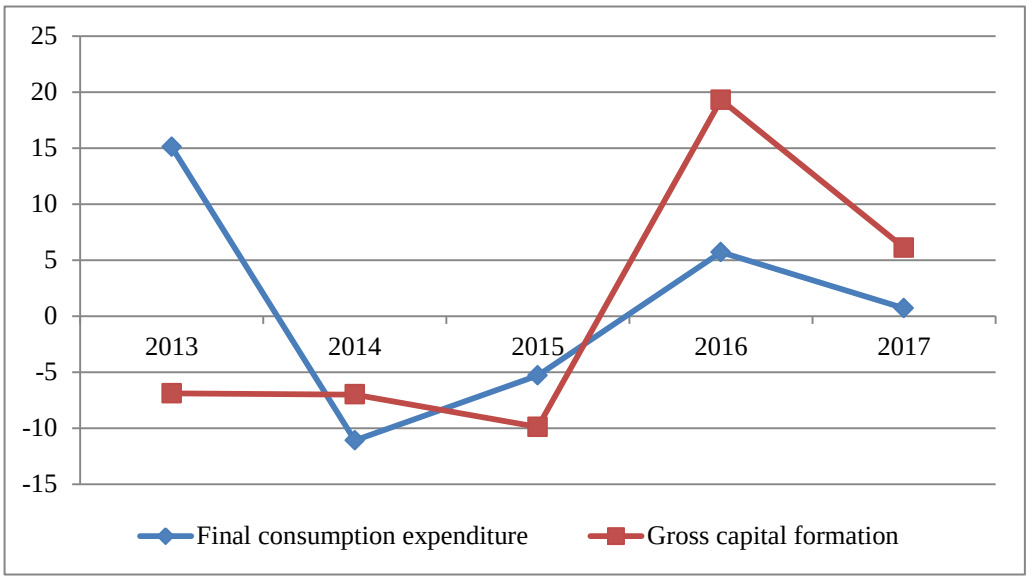

Fig. 1. Dynamics of indices of final consumption expenditure and gross capital formation in the Russian economy in 2013–2017, %

Table 2

Growth indicators (indices), characterizing structural changes in the Russian economy during the period 2012–2016

Key indicator	Sign indicator	2012	2013	2014	2015	2016
Labour indicators:						
the number of employed	+	0,010	-0,002	+0,002	+0,011	+0,001
the number of unemployed	-	0,161	+0,002	-0,06	+0.096	-0,005
labour productivity	+	0,031	-0,011	-0,015	-0,059	+0,02
wages per employee	+	0,074	+0,119	+0,091	-0,894	0,079
Capital indicators:						
asset profitability	+	-0,082	-0,032	+0,003	-0,038	-
Indicators of natural resources:						
energy intensity	-	0,046				
Indicators of scientific and technical progress:						
the cost of technological innovation	+	0,127	+0,229	+0,089	-0,007	-0,998
the amount of innovative goods, works, services	+	0,211	+0,221	+0,021	+0,074	+0,136
innovation activity	+	-0,010	-0,019	-0,02	-0,06	-0,097
Indicators of investment:						
investment in fixed assets	+	0,066	+0,014	-0,033	-0,044	+0,125
Financial performance:						
the share of loss making organizations	-	0,030	+0,065	+0,065	-0,012	-
profitability of sold goods (works, services)	+	-0,104	-0,186	+0,043	+0,11	-
overdue accounts payable organizations	-	0,016	+0,237	+0,28	+0,291	+0,093
Aggregate AIq quality index		**+0,044**	**+0,003**	**-0,033**	**-0,107**	**-0,091**

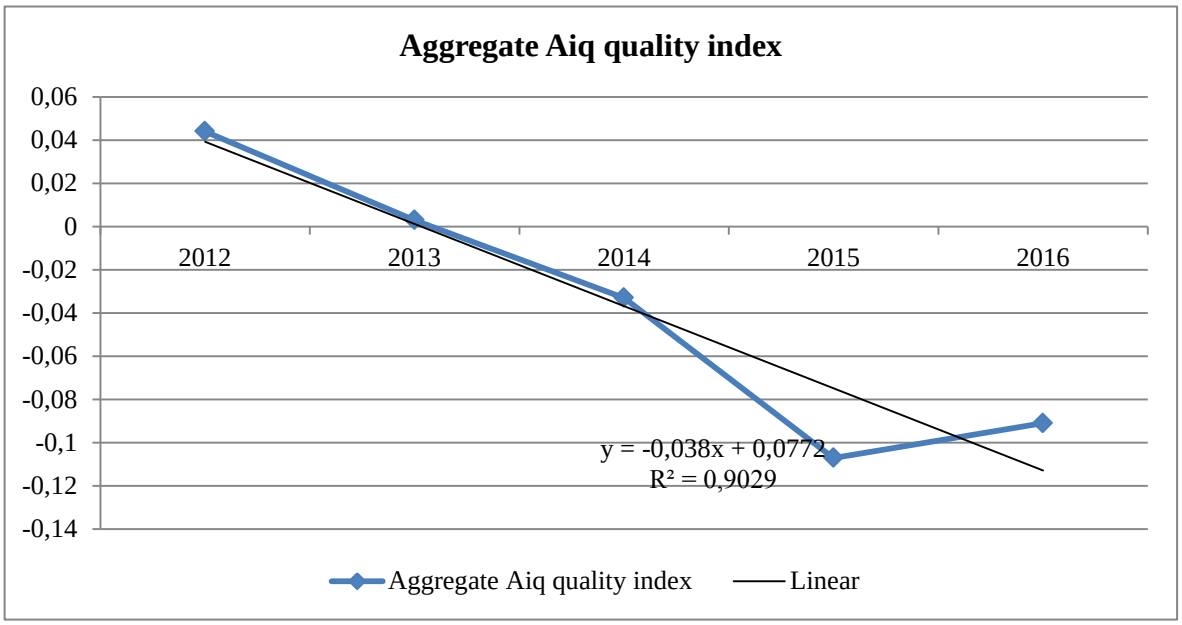

Fig. 2. The dynamics of aggregate index of the quality of structural changes in the Russian economy

Table 3

The growth rate of GDP and the share of investment in GDP

	2010	2011	2012	2013	2014	2015	2016
GDP growth, %	10,6	9,5	7.9	7,8	7,3	6,9	6,6
Total investment, % of GDP	47,9	48,0	47,2	47,3	46,7	45,0	43,7

The China's GDP growth slowed gradually to 7.8 % in 2013 and 7.3 % in 2014, in 2015 and 2016 there was a feather decline in the growth rate of GDP [4].

The situation with the dynamics of the share of investments in China's GDP is similar, there is a tendency to decrease of the share of investments in China's GDP. Investment is the main driver of GDP growth.

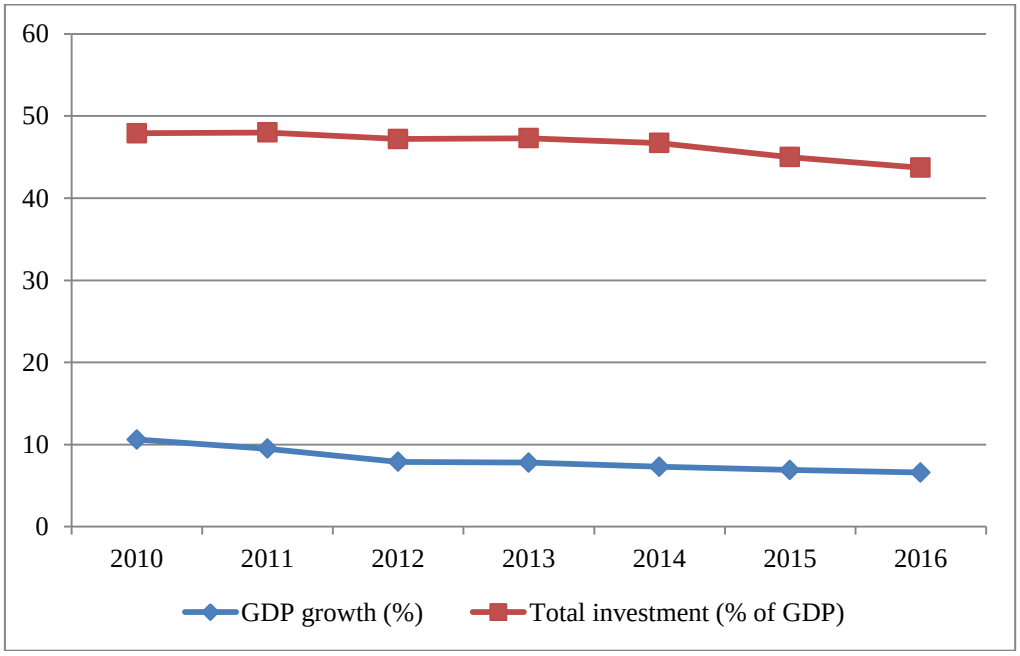

Fig. 3. Dynamics of GDP growth and share of investments in GDP

China demonstrates a model of economic growth associated with the development of energy- and resource-intensive production. Export-oriented production has led to imbalances in the economic, environmental and social spheres, which have only worsened over time. The solution of the problem is related to the structural adjustment of the economy, it is necessary to develop the services sector, to shift from exports to the domestic economy.

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ASSESSMENT OF THE PROSPECTS FOR INTEGRATION INTERACTION OF SMALL BUSINESS INTO THE AGRO-INDUSTRIAL SECTOR OF THE SOUTHERN REGIONS OF THE KRAI

***Keywords**: agro-industrial sector, small business, integration interaction, the concept of mutual relations, efficiency of mutual relations.*

The aim of the analysis of the models for integration interaction and formation of potential for mutual relations in agro-industrial sector with allocation of managing subjects is given.

On the basis of the analysis of theoretical positions, two opposing approaches to the formation of systems of partner relationships are identified:

- evolutionary, based on the assumption of lower transaction costs arising in the process of market exchange, and revenue growth through effective management;
- portfolio, based on the establishment and development of only those relationships that meet the established criteria

The evolutionary approach focuses on developing relationships with all partners, which is not economically viable. The portfolio approach involves analyzing partners based on established criteria with the aim of developing those relationships that bring a large added value to the chain control chain, but do not allow to assess these relationships in dynamics due to the mobility of participants.

The basis of this study is the concept of relationship marketing [Mc Garry, 1950, 1953; Alderson, 1965], introduced into the scientific work of L. Berry [1983], and led to the emergence of new concepts, such as network structure and network dynamics, the positions of partners in the network [Hakansson, Snehota, 1989]. Similar issues are being considered by Russian researchers. In the works of A. Sterlina, A. Ardishvili, V. Katkalo, O. Tretyak, O. Yuldasheva, M. Rumyantseva, S. Kushcha [1–3] is the result of a general analysis of network forms of intercompany cooperation, mechanisms for managing relationships with using different tools.

Based on the peculiarities of partner networks of Russian companies, namely those initiated and managed by industries that are “survival networks” or “entrepreneurial networks”, with different market positions and dependence on suppliers, factors affecting their effectiveness and degree of mutual influence are revealed.

The goal of forming relationships in partner networks in the form of access to information, control over value added, implementation of a joint strategy is defined. The assumption is made that the specification of goals increases the degree of interdependence of partners, and high interdependence is aimed at long-term cooperation.

It is suggested to measure the effectiveness of mutual relations in the form of an indicator of economic rent based on added value and created step by step in the process of its formation. Additional conditions contributing to the growth of efficiency are determined: the level of trust, the propensity to integrate and the degree of interdependence. Partners should be involved in the process of defining strategic development priorities, creating internal coordination mechanisms that affect market orientation and involvement in innovative processes.

The assessment of the prospects for integration of partners was carried out according to the indicators of the agro-industrial complex with the identification of tendencies to involve partners

who have the prospects of technological renewal of agricultural production and transfer them to the rails of the digital economy and deep processing of raw materials. The stakeholders are identified and classified, the intensity of their involvement in the processes is determined, taking into account the established barriers to entry.

The order of formation and distribution of the added cost on the basic directions of an agricultural production is defined: animal industries and plant growing. The results allow us to highlight problems for further study of this issue and to confirm the correctness of using the proposed approach to intensifying the integration of small business in the agro-industrial complex with the definition of value chains and its distribution in accordance with established criteria for all participants in the partner network.

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WAYS TO IMPROVE THE COMPETITIVENESS OF STUDENTS: THE EXPERIENCE OF RUSSIAN AND CHINESE UNIVERSITIES

Education is the largest social institution, a translator of basic values and goals of social development. One of the main principles of the transformation of modern society is the outstripping development of human capital. To ensure the implementation of this process, a special role is assigned to universities. Currently, the most important areas of transformation on the higher education market are the creation of competitive universities, the integration of universities into the global educational space, the attraction of talented students and highly qualified teachers. This trend is today's characteristic not only for national educational systems, but also for the global education market.

In the modern university education system, the priority position is the formation of a competitive person, capable of operating beyond professional boundaries, creating new technological and social reality. The orientations of such education are: the maximum realization of the person's own opportunities on the basis of commitment to universal human values; formation of the need for self-development in research activities within the acquired profession; the formation of skills, concepts and values in the field of professional activity, the formulation of systemic (critical) and problem-centered thinking [1].

Modern world socio-economic trends, as well as constantly increasing demands of employers for potential employees, actualize the problem of development of personal competitiveness of students in the process of their education in the university.

Competitiveness, as a rule, is associated with the success of a person in both professional and personal spheres. The authors of S.D. Reznik and A.A. Sochilova define the competitiveness of the student as an integral characteristic of the personality, expressed in achieving the motives for success; knowledge of how to act to achieve competitiveness; the ability to build a comfortable living space [2].

Nowadays China and Russia are actively involved in the process of competition in the global education market. This process is accompanied by the transformation of all operations of modern universities. The introduction of innovative educational technologies in higher education is aimed at training a competitive specialist during the education process. The process of developing and implementing new educational practices is aimed to extent the personality of students, to increase the level of creativity of their thinking, to develop skills of elaboration individual trajectories, as well as strategies for finding educational and practical tasks solving solutions and predicting the results of the decisions made. In modern conditions the nature of the teaching work is changing, it becomes "consultative and creative", aimed at forming a competitive personality [3].

Competitiveness, as a complex ability, allows the person to find inner confidence, harmony with oneself and the world and determines the adequate individual behavior [4].

Formation of personal competitiveness in the conditions of the university presupposes a sufficiently high internal tension of the student, his ability to mobilize his personal potential, being inclined towards constant struggle with himself and with other students for resources, leadership and success. Problems of higher educational institution student's personal competitiveness formation are the research subject of Russian and Chinese scientists in various scientific fields: pedagogy, psychology, economics and management.

In the Russian practice, various approaches to the formation of students' competitiveness are used in the process of their education in higher educational institutions. The analysis of scientific literature made it possible to reveal successful practices in this area in the Russian universities. Successful examples of the formation of personal competitiveness of students in the educational process at a university are:

1) Introduction in the educational process such courses as "Intensive introduction to the profession: orientation of students and management of a personal career", "Personal Management", "Career Management". During education process students develop the "Plan of life and career of the student" and use the tool "Student Weekly". They also receive practical skills during business practices "Introduction to the profession" and real experience in the university firms [5]. S.D. Reznik and his colleagues formed a model and mechanisms for managing competitiveness within the framework of an innovative educational program to enhance the social stability of Russian students on the basis of special educational technologies. A number of projects have been implemented: "Intensive introduction to the future profession: technologies for managing personal careers and personal competitiveness", etc.

2) An individual development plan is a tool that contains a certain list of actions or activities that allow achieving personal goals. The individual development plan is a part of the individual educational program and includes it includes: subjects of choice within the curriculum of the university; workshops and informal organizations and associations inside and outside the educational institution with the indication of individual total weekly load. A qualitatively drawn up development plan becomes a kind of card for a person who wants to organize his life [6].

3) Many Russian authors have noted the positive experience of applying SWOT-analysis in socio-economic management. Authors M.L. Romanova, R.V. Teryukha, I.Yu. Glukhen'kii suggest using the method of SWOT-analysis to investigate the tolerance as an important element in system of personal and professional qualities of the student [7]. Associate Professor of the Strategic Management and Marketing Department, Tomsk State University, I.V. Krakovetskaya has been using the SWOT-analysis of personality in the author's course "Business Communications" for 5 years and notes the effectiveness of using this method in the educational process. Using this method allows: to build an individual profile, which helps to form a student's personal brand; form a strategic map and personal strategy for the development of students' competitiveness.

4) At the present stage of the development of higher education, road maps have been actively used by universities to develop competitive strategies. D.A. Konoplyansky suggests using road maps as a method of strategic planning of the pedagogical process that stimulates the activity of all participants due to a better understanding of the prospects and allows to specify future goals, as well as possible ways of their implementation. In the work "Features of the use of the roadmap method in forming the competitiveness of the graduate of the university", the author emphasizes that the development of the road map and its subsequent implementation should include a wide range of stakeholders. Noting the role of students as active road map participants D.A. Konoplyansky highlights: compliance with the requirements of educational and professional standards; active participation in extracurricular activities; self-development, self-improvement, self-determination in the educational and professional space of the university [8]. Joint designing of road maps allows creating a collective intention and increasing the effectiveness of students' interaction with all stakeholders. The advantages of the "road map" method for forming the students' personal competitiveness include: the development of system (critical) and problem-centered thinking, the acquisition of skills in constructing a future career, understanding the variability of ways and scenarios for personal and professional development.

Most modern Russian researchers agree on the need for an integrated approach. This allows to create during university learning not only highly skilled professionals, but also a developed individual, capable of continuous constructive transformation in a rapidly changing environment.

The main feature of this approach is the work with the life goals and meanings of future graduates.

China has undergone global changes in education over the past decades. The successes of China's modern education system are determined by the factor of literate restructuring of its education system as the main factor of the country's successful development in the future. Successful reform of China's national education system was also facilitated by the factor of taking into account the national characteristics of the Chinese people mentality. Successful and accelerated development of education is also facilitated by nationwide psychological and personal characteristics of the character and mentality of the Chinese: diligence, responsibility, perseverance, high ambitions in work and education.

An important feature of the Chinese education system is the fact that, during its five-thousand-year history, it owes a special relationship between society and government to knowledge, learning and the Teacher. That is why the youth of China has a very strong motivation and desire to receive higher education, as well as an understanding of the fact that a person with higher education will receive a higher status and material security in society [9].

China's universities take on important functions of inheriting civilization, cultivating talents, innovations in science and technology and providing social services in the process of implementing the national strategy of "China's prosperity through science and education" and "a powerful country through talents" [10].

Students form their unique and sustainable competitive advantages by integrating their own resources and social resources during long-term learning and practice.

The successful practice of forming the personal competitiveness of Chinese students in the process of studying in a university includes:

1. Introduction into bachelor program such courses as "Necessary professional and personal skills of the students" and "Career planning". To build a career education for each student, universities should focus on the process of shaping and promoting their personal competitiveness. Individual career education can be carried out with the help of various instruments, such as professional career lectures, professional career guidance, career of outstanding graduates, etc. All these instruments will contribute to the professional self-determination of students and the conscious building of an individual educational trajectory.

2. Harnessing the opportunities of social practice, which provides opportunities for additional acquisition of practical skills in extracurricular activities, enhancing social insight and developing social responsibility [11].

3. Formation of "campus culture" in universities as a special mechanism for supporting talents, developing the competitiveness of future graduates. "Campus culture" stimulates the creative abilities of students, energizes, helps to choose their life and professional path.

The analysis of methods and best practices for the formation of personal competitiveness of students used by Russian and Chinese universities allows us to draw the following conclusions:

- Only the harmonious development during the learning process at the university intellectual (IQ), mental (MQ), physical (PHQ), emotional (EQ) and spiritual (SQ) intelligence that combines the values and principles of the individual will form a competitive personality.
- The toolkit used in the system of forming students' personal competitiveness requires taking into account the specifics of the educational programs of all faculties and institutes. The organization of all processes should be oriented toward working with life's meanings, reflection, self-esteem, and student self-analysis.
- Particular attention should be given to the formation and development the university ecosystem for the reconstruction of the platform for trial actions of students and the acquisition of experience. This will enable future graduates more effectively realize their competitive potential in the process of learning.

Getting the first skills of possible ways of life trajectory management in the process of training raises future graduates to a qualitatively new level and allows them to significantly strengthen their competitive positions in the labor market.

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INTERACTION IN THE FRAME OF ONE BELT AND ONE ROAD INITIATIVE AS AN ECONOMIC AND POLITICAL PROCESS[1]

One Belt and One Road initiative is positioned as an international economic project that focuses on the formation of the integration interaction of its member countries, especially in such areas as investment in infrastructure, education, construction materials, automotive and steel industry. At the same time, the critics of the initiative draw attention to its political aspect emphasizing that it is designed to guarantee China's political dominance by turning it into the center of global trading network.

From our point of view, both estimates of this project, economic and political ones, are mostly normative, while the focus of normative assessments is almost polar. It is obvious that any integration association has economic and political aspects. A positive analysis of this initiative is needed for a detailed description of the relationship between these aspects and the overall orientation of the project. In this case, it is about to consider this project from a positive economic science point of view, which involves building a model that connects the causes, implementation processes and possible outcomes of the presented integration project. This fact requires the search for adequate methodological approaches to solve the problem.

From our point of view, the methodological basis of such a positive approach is to consider any integration interaction as an economic-political process. From this fact, any integration association is an international political market (power market) [1, p. 92–94]. The characteristics of possible integration association and prospects for its development are congruent with the types of power markets that have evolved in different countries.

The power market has the following discrete structural alternatives to its organization: political market, administrative market and hybrid political-administrative (bureaucratic) market. Voters, politicians and professional bureaucrats ("rational bureaucrats") are the subjects of the classical political "bargaining" [2; 3]. As a result, there is a system of organization of society built on the autonomy of economic and political markets as well as on a clear separation and interaction of the private and public property regimes. Open and competitive political markets are the most important element of the mechanism of control over the State ensuring its orientation on maintaining the regime of protected exclusive rights of the private owners. At the same time, the public sector as a system for the production of public goods including State services for the specification and protection of property rights functions within the framework of the State ownership regime.

Administrative market arises within the framework of a centralized economy of the Soviet type. Conceptual analysis of this type of power market was carried out by such authors as S. Kordonskiy, V. Naishul, P. Aven, V. Shironin and other authors [4–6]. Various groups of party-political and economic nomenclature were the subjects of status "bargaining" on this market. Administrative market is as a system built on the fusion of political, bureaucratic and economic transactions with the decisive role of power resource trade and the predominance of status competition. The most important goal of all participants is the competition to strengthen their status positions, which expands the real possibilities to softening budget constraints.

Economic and social development along the way of the administrative market with the inherent mechanisms of status competition meant the formation of a special property rights mode characterized by the "inverted" relations of the principle-agent on the formal and real levels

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of this system. The State was the principal and the representatives of the party-economic nomenklatura of various levels were its agents at the level of formal property rights. However, the overflow of economic power to the economic nomenclature of enterprises and departments as well as to the leaders of local party and State structures meant that managers became principals controlling the largest amount of ownership for resources but formally remaining agents. Under this mode of property rights groups of special interests formed within the party-state hierarchy were focused on the accumulation of their political resource. At the same time, the narrow composition of these special interest groups and the orientation of their participants in realizing private benefits through opportunistic behavior towards the formal principal, the State, gives them the character of distributive coalitions. These coalitions reduce the effectiveness of the economy performance by their actions (the characteristic of their activity as a manifestation of "red sclerosis" was given by M. Olson [7] is indicative.

Political-administrative market has hybrid nature because it combines elements of status (administrative) and classical political transactions. It is based on a network of contracts between the "ruler" (the ruling group) and other economic and political actors who have individual political resource.

Typical features of the political-administrative market are the following:

- real fusion of political, bureaucratic and economic "bargaining" with formal separation;
- counter bureaucratization of political and economic transactions and politicization of bureaucratic and economic "bargaining".

Bureaucratization consists in the fact that the competitiveness of actors in politics and business is determined by the status in the hierarchy of power. However, "bureaucrats" and "entrepreneurs" position themselves as "politicians" and are oriented toward increasing their political (power) resource. This means that public politicians acting as agents of voters are absent or are almost completely superseded in the frame of this system, as well as "rational bureaucrats" focused on the effective performance of administrative functions. Politicized bureaucrats and politicized entrepreneurs are the main actors of the hybrid political-administrative market. This means that both groups of actors combine economic and political functions. Representatives of business act as carriers of political interests, and representatives of authorities promote directly business interests.

European Union can be indicated as the most successful integration association among the others around the world. This integration association is based on the classical political markets both at the national and supranational levels. The problems that arise in these markets lead to the crisis phenomena of the development of the European Union, despite the established economic interrelations and the serious mutual benefits of the participants. The problem that arises is due to the fact that access of various interest groups to a political resource is carried out collectively through political lobbying. The emerging structure of supranational political markets in the EU creates serious advantages for multinationals and supranational bureaucracy, and limits access to political resource for interest groups operating predominantly within the national framework. This serves as a base for political forces advocating the restoration of national sovereignty and limiting the positions of supranational structures. The most vivid example is Brexit that launched the process of the United Kingdom withdrawal from the European Union contrary to the positions of leading economic and political actors in the United Kingdom.

An alternative version of the integration association was realized within the framework of the Council for Mutual Economic Assistance (COMECON). Actually, this integration association was based on the administrative markets, the limitation of which was manifested in the predominance of rent-seeking motivation over productive one [8]. Active administrative bargaining was in the frame of COMECON and the interest groups were formed, which were transformed into distribution coalitions like at the national level. Their actions limited the productive activity within the framework of the COMECON's international economic cooperation.

The main countries participating in the integration project "One Belt, One Road" (China, Russia and countries of Central Asia) have institutional systems based on the different versions of the hybrid political-administrative market. It is necessary to form a supranational political-administrative market within the framework of integration association to ensure the balance between economic and political interests of politicized bureaucrats and politicized entrepreneurs representing the main participating countries.

The problem of the interests balance between the economic and political actors of China and Russia acquires special importance within the framework of the emerging integration association. The leader in this association is the People's Republic of China, which is interested in strengthening its political influence in the post-Soviet space and in promoting its business interests, which consist in access to sources of raw materials and transport infrastructure. Political and economic actors of Russia are interested in preserving their political position in the post-Soviet space and the status of a great power. Russia is strongly interested in political and economic interaction with the PRC in current complicated geopolitical situation.

At the same time, this integration project creates certain opportunities and generates serious risks for economic interests of Russia. The opportunities are related to the implementation of the export growth by the fuel and energy complex companies (oil, natural gas, coal, timberland exports) and the use of transport infrastructure (Trans-Siberian Railway, Baikal-Amur Mainline, etc.) for transit transportation. On the other hand, threats are related to the following circumstances:

Firstly, transport corridors that bypass Russia and are directly competing with the Russian projects for the development of transport infrastructure are formed within the framework of this project. Secondly, the problem lies in the fact that both the plans of Chinese business and the Government of China are focused mainly on using Russia as a supplier of raw materials and a market for Chinese products with higher added value. At the same time, non-resource business and political actors have a need to develop cooperative ties with China in the non-resource sector and attract Chinese capital for the development of industries with high added value.

In our opinion, the choice of options for Russia's participation in this integration project will be determined by the overall configuration of economic and political actors in the Russian political-administrative market and the forms of their interaction with similar actors from China. It is a matter of choosing between two discrete structural alternatives [9] to the development of the Russian economy and society: "enclave dual economy" and "integrated economy" [10]. "Enclave dual economy" means that the export-resource sector does not create incentives for the development of the rest of the economy. It does not form long and ramified added value chains in the national economy. "Integrated economy" means that the export and resource sector serves as a locomotive for development of other industries, stimulates the diversification and modernization of the entire economy, creates long horizontal added value chains that cover manufacturing industry and innovation sector.

Summarizing some results, the following normative recommendations can be made. It is necessary to use the opening opportunities for the development of integrated economy in the country as well as build long added value chains, and at the same time block threats leading to the "locking" of enclave dual economy trajectory when choosing the forms of Russia's participation in the integration association.

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RESEARCH ON COOPERATION IN TOURISM AND AGRICULTURE DEVELOPMENT BETWEEN XINJIANG, NORTH EAST PART OF CHINA AND FAR EAST PART OF RUSSIA UNDER THE CONTEXTUAL BACKGROUND OF "ONE ROAD, ONE BELT" STRATEGY

In recent years, countries and regions have used geopolitical advantages to strengthen mutual cooperation, and the production layout has gradually shifted to the border areas. The "One Belt, One Road" national strategy is advancing and brings opportunities for the border areas. This paper mainly studies the northeastern China and Xinjiang regions bordering Russia, the research objects are agriculture and tourism, the development status, opportunities and challenges of which are analyzed and the due recommendations are proposed in the final part of the study.

***Keywords**: Northeast China and Xinjiang, Russia's Far East, agriculture and tourism, status and opportunities, challenges and recommendations.*

INTRODUCTION

The concept of "One Belt, One Road" not only inherits the spirit of the ancient Silk Road, but also brings opportunities for the development of border areas. The border between Northeast China and the Russian Far East border, and Xinjiang is the core area of the "Belt and Road", which have the inherent advantages of economic cooperation along the border. Russia is paying more and more attention to cooperation with China [Wishnick Elizabeth, 2017]. Under the "Belt and Road", agricultural economic development plays a vital role in the prosperity and strength of China and Russia. Tourism is an important support for the "Belt and Road" initiative. The Northeast and Xinjiang should firmly grasp the platform of "One Belt, One Road" and use their own advantages to promote excellent culture, increase culture exchange [Liu Zhengjiang, 2016].

1. STATUS QUO OF COOPERATION IN NORTHEAST CHINA, XINJIANG AND RUSSIA IN AGRICULTURE AND TOURISM

Both the northeast of China and the Far East of Russia belong to the economically backward regions of the two countries. The revitalization of the northeast and the prosperity of the Far East depend on the cooperation of agriculture and tourism between two regions [GangyanXu, 2014]. Nowadays, the area developed is increased in the northeast of China and the Far East region of Russia. The types of crops planted have also become more diversified, which has driven the output of equipment, labor, and technology in Northeast China. The tourism industry of China and Russia have also actively cooperated in developing tourism products and developed a number of cross-border tourism routes. In recent years, Russian tourists and travel agencies have gradually noticed China's rich tourism resources, and people in northeastern China are no longer limited to Moscow and St. Petersburg, and they also visited the banks of Lake Baikal. In summary, the tourism cooperation between Northeast China and Far East part of Russia has further deepening and gradually extended to inland areas.

For many years, China has been one of the main destinations for Russians to travel. On February 16, 2016, the China-Kazakhstan multilateral transit routes of transport were opened, and

Xinjiang trucks can go directly to Russia, which facilitates bilateral freight and personnel exchanges. The overall attitude of the Russian toward China is that Chinese are friendly and they consider us as their close partners and allies. A solid public foundation will promote further cooperation between Xinjiang and Far East part of Russia in agriculture and tourism.

2. OPPORTUNITIES AND CHALLENGES OF SINO-RUSSIAN COOPERATION

2.1. OPPORTUNITIES FOR SINO-RUSSIA COOPERATION

China and Russia are each other's largest neighbors, with more than 4,300 kilometers of borders. The long border between China and Russia makes the two countries have a unique geographical advantage in the development of regional cooperation. Secondly, the "One Belt and One Road" initiative has brought great opportunities for Sino-Russia cooperation. In addition, resources in tourism and agriculture have complementary advantages for Sino-Russian cooperation.

2.2. CHALLENGES FOR SINO-RUSSIAN COOPERATION

Although Sino-Russian cooperation has good opportunities, it also faces certain challenges. On the one hand, from the 1990s to the present, the mass media and many experts have been plucking the argument that "the reality and counterfeiting threats from China on the Far East boundary of the Russian Federation" and vigorously promoted the excessive "China threat theory". Although the relations between the two countries are now closely developed, this concept still exists. On the other hand, Sino-Russian cooperation is constrained by trade barriers and trade service systems. After Russia's accession to the WTO, it basically followed the WTO's trade rules, but some of the long-term uncertainties still exist. The development of the legal norms and service systems for bilateral trade between China and Russia in the Far East is still not perfect, which is undoubtedly a challenge for Sino-Russian cooperation.

3. STRENGTHEN THE CONSTRUCTION OF TRANSPORTATION INFRASTRUCTURE IN THE BORDER REGIONS BETWEEN CHINA AND RUSSIA

The modernization of the Russian Far East region's transportation infrastructure is relatively poor, which not only greatly restricts the region's resource development and economic development, but also limits the further expansion of Sino-Russian cooperation in the Far East region [Jingyu Li, Hua Xu, 2010]. Strengthening the transportation infrastructure construction in the border areas between China and Russia is of great significance to the cooperation between the two countries in agriculture and tourism.

3.1. INNOVATE THE COOPERATION MODE

The northeast and Xinjiang part in China and the Russian Far East region can complement each other in agriculture and tourism through cooperation, but the cooperation mode should be innovated. In the "One Belt and One Road" initiative, a new type of cooperation mode as "food buyback arrangements" was adopted in Sino-Russian cooperation in the field of agricultural resources. Innovate modes like this will not only help the depressed Russian agricultural industry find a new way of development, but also supplement food supply for China.

3.2. PROMOTE THE MECHANISM ARRANGEMENTS OF COOPERATION

The existing "China threat theory" is not conducive to the friendly exchanges between the peoples of the two countries. In this regard, the two countries have made corresponding efforts to increase mutual understanding between the two peoples and resolve their contradictions and misunderstandings. For instance, China and Russia have held some cultural exchange activities for many years, such as the National Year, Language Year, Year of Tourism, Youth Friendly Exchange Year, and Media Exchange Year, which have greatly enhanced mutual understanding and trust between the two peoples. In order to establish a good image of China in the Russian Far East, China must strengthen the sense of social responsibility of China's "going global" enterprises and vigorously promote civil and cultural exchanges.

CONCLUSION

Northeast China, Xinjiang, and the Russian Far East are rich in natural resources and unique in landscapes, suitable for areas that develop agriculture and tourism. The “Belt and Road” policy proposes new opportunities for its development. At the same time, the escalation of trade protectionism and the long-standing “China threat theory” have also brought challenges to bilateral trade cooperation. Therefore, we should give certain support to the national policy in the new era, strengthen infrastructure construction, innovate cooperation models, and conduct humanities and cultural exchanges.

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PRODUCTION PRACTICE OF STUDENTS AS ONE OF THE METHODS OF THE GLOBAL INTERACTION MODEL OF RUSSIA AND CHINA

The hotel business is usually seen as an integral part of the tourism business. Tourism is an additional source of attracting funds to the budget system of the Krasnoyarsk Territory, a means of increasing employment and the quality of life of the population, the basis for the development of the socio-cultural environment and the upbringing of patriotism, a powerful tool for education and the formation of a cultural and moral platform for the development of society. The development of the industry is supported by public investments, as well as the development and implementation of state policy in the field of tourism and hospitality. Tourist business should be considered as a full-fledged branch of the economy of the Krasnoyarsk Territory and Krasnoyarsk, which dictates the need to determine the possibility of its support and development. The Krasnoyarsk Territory and Krasnoyarsk have a significant tourist potential, the state of which is determined by the resource potential and image that allows to develop all kinds of active, nature-oriented and cultural-cognitive recreation, to form its own tourist product and to present it both for consumers of the domestic market and for foreign tourists [1].

In 2013, the government of the Krasnoyarsk Territory approved the Krasnoyarsk Territory State Program "Development of Culture and Tourism" [2].

Our Territory is characterized by a significant variety of natural and climatic conditions, landscapes, historical and cultural resources. In the region there are such unique tourist objects as the monument of nature of the regional importance "Geographical Center of the Russian Federation" (Evenki District), the historical center of the city of Yeniseisk, the Putoran Plateau (a UNESCO World Heritage site), the Mammoth Museum (Khatanga settlement), the Historical Ethnographic Museum "Shushenskoye", etc. There are a lot of events in the region that have Russian and international fame. In the short term, the 400th anniversary of Yeniseysk in 2019 and the 29th World Winter Universiade 2019 are significant factors that stimulate the development of inbound tourism.

Recently tourism is actively developing in the Krasnoyarsk Territory, the flow of foreign visitors, including the growing number of tourists from China is also increasing. According to TurStat "in 2017 689 thousand tourists visited our region, which is 7 % more than in 2016. There were 26.5 thousand foreigners among them" [3].

It should be noted that our tourists and business representatives are also visiting China, so the Chinese part is interested in opening Russian restaurants.

One of the important factors determining the quality of dwelling of foreign tourists in our country is the catering at the hotels and other accommodation facilities.

The cuisine of different nations differs significantly, as they reflect the cultural traditions and national characteristics of individual nationalities. It is very important that people coming to Russia from other countries have the opportunity to organize their meals according to their preferences. In the global and national practice there is a similar experience in organizing meals for foreign tourists. In the restaurants of the hotels separate rooms and lines of distribution of national cuisines are organized. In accordance with the above, there arises the problem of training

staff for the restaurant business, with knowledge of the characteristics of various national cuisines. Undoubtedly, it is better to study the peculiarities of national traditions in cooking directly in the country – the bearer of these traditions.

One way to solve this problem is to organize the practice of students in a particular country.

The practice of students is an obligatory part of the process of training specialists in higher educational institutions and is conducted on properly equipped bases of higher education institutions, as well as in modern enterprises and organizations of various sectors of the economy, education, health, culture, trade and public administration. According to the curricula of higher education institutions, the terms of professional practice make up 20-25 % of the total academic time.

The main goal of vocational education is the preparation of a qualified worker, competitive, responsible, competent, fluent in his profession, ready for constant professional growth. To implement this goal, a developed professional self-awareness is a necessary condition for the specialist [4].

Practice is the first experience of the future specialist's entry into professional activity. Specificity of this process consists of several important points: the socio-cultural background of the institution where the practice takes place; personal traits of the trainee; position of the university in relation to practice as part of the educational program in the specialty. The position of the university can be different, and it is based, as a rule, on the notions of the essence of practice. In the most general form, the practice of students is an integral part of the learning process and aims to consolidate and deepen the knowledge gained by students in the process of training, acquiring the necessary skills of practical work in the specialty.

The organization of training and production practices at all stages should be aimed at ensuring the continuity and consistency of students' mastery of professional activity in accordance with the requirements for the level of graduate training.

Educational and production practice, provided for by state educational standards of higher professional education, is carried out on the basis of agreements between higher educational institutions and enterprises, institutions and organizations, in accordance with which these enterprises, institutions and organizations, regardless of their organizational and legal forms, are required to provide places for passage practice of students of higher education institutions with state accreditation, and is financed by funds of the corresponding budget. The organization of practical training of students is regulated by the Regulations on the Practice of Students of Higher Educational Institutions.

The objectives of organizing and conducting the practice are: to minimize the timeframe for the formation of specialists who have the level of theoretical knowledge and practical work experience necessary for effective work; consolidation and expansion of theoretical and practical knowledge gained during training; study of the organizational structure of the enterprise and the management system operating on it; acquaintance with the content of the main works and studies carried out at the enterprise or in the organization at the place of passing the practice; acquisition of practical skills in future professional activities or in its individual sections.

To effectively achieve the above goals, students of the Siberian Federal University Institute of Economics and Trade (SFU ITE), who are on practice, must carry out the following tasks: to understand the essence and social significance of their future profession and the main problems of the disciplines that determine the field of professional activity, to see their interrelationship in an integral system of knowledge; to have an orientation on professional skills and creative development of the profession and the person in it; to understand the determining role of methodological and philosophical views in the activities of a professional; be able to use the methods of scientific and technical creativity to solve problems related to professional activity.

The peculiarity of the integrated training system is that the organization of the production practice is aimed at ensuring the continuity and consistency of students' mastery of professional activity in accordance with the level of the graduate's training

IET SFU has a fairly rich experience since 2003 in organizing the practice of students in China. And for several years students of the Chair of Technology and Catering Organization have successfully practiced in several restaurants in Daqing City, Heiludzyan Province: Russian Style, Great Wall, Desheng Trepang. These restaurants are oriented both to Russian cuisine and to Chinese cuisine.

Particularly interesting is the experience of students in the restaurant "Russian Style" in 2003. The administration of Daqing City set a goal to open a restaurant of Russian cuisine. To implement this idea, not experienced experts from Russia were invited, but graduate students under the guidance of a lecturer at the Chair of Technology and Catering.

The future specialists of the restaurant business successfully coped with the task. The guys took part in the development of the menu, the processing of dishes, participated in the design of professional clothing. After the opening of the restaurant, students continued their practice in the position of cooks and waiters at the restaurant "Russian Style".

China is one of the oldest states in the world with its rich traditions and customs, deeply rooted in history. The traditions of China are an important component and an integral part of Chinese culture in general.

It was China where the necessary branches of science began their development. Among them: nuclear and space industry, petrochemistry and electronics. Improving the outdated achievements, this wise people almost every day comes up with something new. Over the past two decades, the GDP of this state has increased almost sixfold. And recently the tendency to economic recovery continues. Accordingly, the living standard of the local population also rises. Also, China is developing rapidly and culturally. But, despite of the fact that this country has already achieved so much, it is not going to stop at all. In the plans of the government of the country: by 2050, China must fully achieve the level of development equal to the industrial development of the European countries and build a medium-prosperous society of the future.

In Chinese culture, and in the life of every Chinese person food plays a very important role, it is almost the main theme of any conversation. Cookery in China since ancient times was considered as one of the most revered. Cooks in China often combined their skills with the skills of healers, because food in China is considered as a medicine.

During the practice in China the students got acquainted with the peculiarities, customs, traditions and the way of life of the Chinese nation, acquired invaluable professional skills, realized the social importance of their future profession, and discovered the deep interrelation between the culture of the nation and the culture of nutrition. In their reports on practice, students unanimously noted the need for such international cooperation in the organization of industrial practice as an instrument for increasing professionalism and increasing competitiveness in the labor market of future nutrition specialists.

Practice, held in Daqing City, showed a real opportunity for cooperation between our two countries in the context of professional practices of students in higher education.

In May 2018 a meeting of the representatives of the Siberian Federal University and the Harbin University of Commerce was held. It was decided to continue cooperation between the two universities.

One of the important issues of cooperation is the strengthening of the mobility of students and lecturers of higher educational institutions. The development of tourism business in the Krasnoyarsk Territory, the holding of international events such as the Universiade 2019, cooperation between individual universities – all these events involve a huge flow of foreign visitors, including people from the People's Republic of China. An important point is the organization of a comfortable dwelling of our friends, including a competent food service, which requires an appropriate professional approach.

Thus, the organization of students' practice in China is an important link in the formation of nutrition specialists who have knowledge not only in the field of Chinese cooking, but also are

well versed in the national characteristics and traditions of Chinese culture, which contributes to strengthening cooperation between the two countries.

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ASSESSMENT OF RISKS FOR IMPLEMENTING TRADE ACTIVITY BY THE BUSINESSPEOPLE OF KRASNOYARSK KRAI WITH CHINA

In modern conditions of management any object and subject of economic activities are exposed to the systemic impact of various risks: political, social, economic, financial, industrial, commercial, etc. In this regard, the problem of analysis, assessment and management of risks in the course of enterprises' activities is one of the main problems in the economy today. In this article the technique of carrying out a qualitative assessment of the risks arising in the course of activity of the organizations in the sphere of trade is considered. Based on the activities of enterprises of the Krasnoyarsk Krai with entrepreneurs of China, a general assessment of the risks arising in the work of these enterprises, as well as the results of the study of a generalizing, integral indicator indicating the magnitude of the risk of trading activities of entrepreneurs of the city of Krasnoyarsk and Krasnoyarsk Krai with entrepreneurs of China are given.

***Keywords**: risk, commercial activities, methodology, approaches to assessment, survey, integrated indicator.*

Current trends of globalization of world economy, proximity of Krasnoyarsk Krai and China, the developed long-term business contacts between these regions cause the perspective directions of development of trade activity with the possible steady growth of a turnover of both retail and wholesale trade.

According to the published report of the head customs office of the People's Republic of China the trade turnover between Russia and China following the results of 2017 has increased by 20,8 % a year and made $84,07 billion.

At the same time, for 2017 export volume from China to Russia increased by 14,8 % and was $42,88 billion, and the volume of import of the Russian goods to the People's Republic of China for the same time has grown by 27,7 % to $41,2 billion. According to the Russian President, commodity turnover of Russia and China for the first half of the year 2018 has increased by 50 % and by the end of the year it is planned "of $100 billion" [6].

Despite the specified positive tendencies, the operating environmental conditions assume existence of a set of risks of implementation of trade activity that causes need of their identification and assessment for their prevention or minimization.

The risk can be estimated for all organization, its division, separate projects, activity or concrete dangerous events. The degree of depth and specification of assessment depends on a concrete situation, reliability of data and requirements of the organization. The assessment of risk can be carried out at various stages of life cycle, at the same time each stage requires use of the methods of assessment of risk.

Studying and the critical analysis of domestic and foreign economic literature has revealed a variety of scientific approaches to assessment and risk analysis of activity of the organization. In the researches conducted by us, it is supposed that the most effective is synthesis of the main scientific methodological approaches to assessment of risks: complex, system, dynamic, differentiated, integrated.

An integrated approach of a research, on the one hand, allows to gain a better understanding about possibility of risks in activity of the organization, and on the other hand, does possible broad application of various methods for the analysis and assessment of risks. Such approach allows the organization to operate risk factors most effectively, which will accompany its activity steadily.

Being a subsystem of larger system of indicators, the system approach, on the one hand, allows to estimate risks as the complete system of indicators (for example, indicators of assessment of external and internal environment), and on the other hand as the subsystems of indicators of risks which are mutually influencing at each other (commercial, economic, political risks, etc.).

The dynamic approach, on the one hand, allows to consider dynamic development of indicators of assessment of risks, and on the other hand, to make researches taking into account reason investigative communications and hierarchy of indicators of assessment of risks.

The differentiated approach allows to carry out the division of the general system of indicators of assessment of risks, originally uniform or consisting of identical elements, on more or less isolated parts, elements, indicators (various determinants of assessment of risks and single, private indicators of assessment characterizing them).

The integrated approach provides the integration of single, private indicators of assessment of risks into the generalizing, integrated indicators that in turn allows to submit the generalizing characteristic of degree of risk for separate groups of determinants and in general for the organization.

Generalization and the critical analysis of the approaches to a research and assessment of risks of the activity of the organizations presented in foreign and domestic economic literature and own researches of authors allow to offer the following sequence of carrying out quality standard of the risks arising in the course of activity of the organizations (Fig. 1).

At the first stage of the technique offered by us the most significant factors arising in the course of implementation of trade activity by businessmen of the Krasnoyarsk Krai with trade businessmen of China (block 1) have been studied, revealed and classified:

1. The commercial risks uniting in themselves the following groups of risks:

1.1. Risks from suppliers:

- the risk of failure to follow contractual obligations by suppliers and contractors;
- the risk connected with non-receipt in time of production, goods, works, services from suppliers and contractors;
- the risk of delivery of production, goods of inadequate quality.

1.2. Risks from buyers:

- the risk connected with lack of goods or services concerning satisfaction of interests, desires and needs of buyers;
- the risk connected with change of requirements and demand of consumers;
- the risk of lack of demand or essential decrease in demand.

2. Economic risks:

- the risk of increase in prices, tariffs for goods and services leading to decrease in purchases and activity of buyers and also to growth of expenses on rendering services;
- the risk of growth of exchange rate, leading to increase in prices, tariffs and expenses on rendering services;
- the risk of reduction of income of consumers leading to decrease in purchasing power and total revenue.

3. Political risks:

- risk of the ban on import-export of goods, or the requirement of the license for a certain type of production, service from authorities;
- risk of high degree of bureaucracy in the relations with public authorities, including in obtaining licenses for activity implementation;
- risk of non-receipt of necessary volume of goods of production, services for realization as a result of imposition of sanctions and other restrictions;
- risk of impossibility of regional import of the equipment owing to not acquisition of spare parts as a result of sanctions and other restrictions;
- risk of essential increase in the prices of import production owing to the imposed sanctions and other measures for import restriction.

4. The other risks uniting in themselves the following groups of risks:

4.1. Insurance risks:

- risk of loss of the insured sum of money, as a result of refusal of insurance payments or reduction of their sum for the objective reasons;
- risk of loss of the insured sum of money because of breakage of the insured equipment, the caused non-compliance with the equipment.;
- risk of reduction of the insured sum of money for the different objective reasons.

4.2. Information risks:

- risks of obtaining unreliable, untimely information;
- risks of theft, modification of information;
- risks of irreversible changes and loss of information.

4.3. Risks of the taxation and pricing:

- risks of change of the taxation of activity of the businessmen who are carrying out trade activity;
- risks of increase in the customs duties, tariffs and other tax payments;
- risks of increase in the prices for various objective reasons leading to decline in demand of consumers.

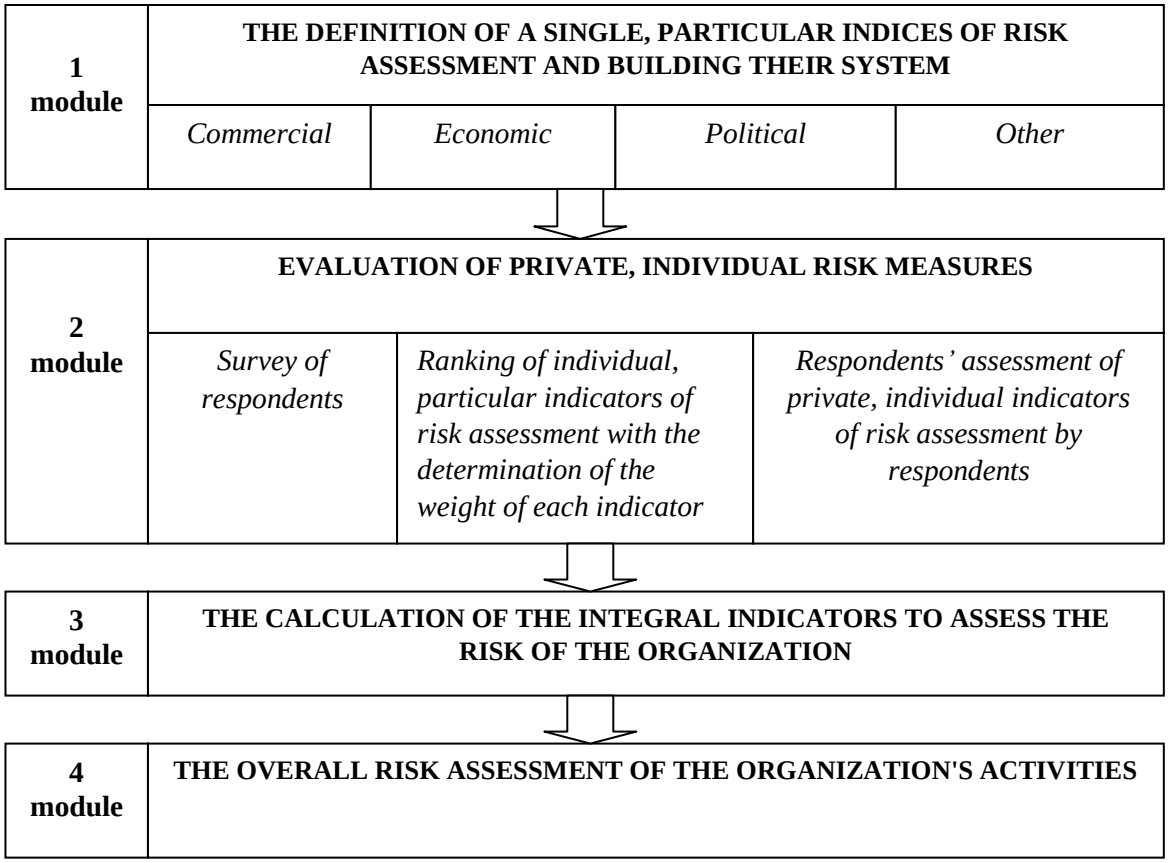

Figure. Flowchart of evaluating risks of activity of the organization

At the second stage of the research (block 2) the assessment of single, private indicators of assessment of risks by carrying out questioning of the businessmen who are carrying out trade activity with businessmen of China under the questionnaire which is specially developed for these purposes with determination of the importance of each certain indicator of assessment during ranging and the ball assessment of the degree of risk on each private indicator on a 10-ball scale has been carried out.

During implementation of the third direction of the research the integrated assessment of risks of trade activity. The calculation and the analysis of integrated indicators will allow the

organizations to receive average indicators by types of risks and separate objects and divisions of the enterprise and also to reveal statistical regularities of development of indicators.

In this regard, at the third stage of the technique of assessment of risks offered by us calculation and the analysis of integrated indicators for each group of indicators of risks (commercial, economic, political and other risks) on the following formula defined during the researches is provided originally:

$$И_{о.р.i.} = \frac{К1*З1+К2*З2+\cdots+Кn*Зn}{\sum Зn},$$

$И_{о.р.i.}$- an integrated indicator of assessment of risks on i-group of risks; K1, K2, etc. – ball assessment by respondents of each type of risk, %; Z1, Z2, etc. – the importance of a single, private indicator of assessment of risk, %.

After definition of integrated indicators on each group of risks expediently, according to us, to perfrom calculation of the generalizing, integrated indicator of assessment for the following formula:

$$И_{об.} = \sqrt[4]{Ик.р.* Иэ.р.* Ип.р.* Ипр.р.}$$

where $И_{об.}$ – the generalizing, integrated indicator of assessment of risks of trade activity, %; Ик.р.– an integrated indicator of assessment of commercial risks, %; Иэ.р – an integrated indicator of assessment of economic risks, %; Ип.р – an integrated indicator of assessment of political risks, %; Ипр.р – an integrated indicator of assessment of other risks (insurance, information, etc.), %.

At the fourth investigation phase during who conducted expert the survey of businessmen the considered risks have been ranged on importance degree that has allowed to group them in three blocks: and to present to high, average and low degree of risks as a result the general assessment of risks.The researches (table) conducted by us allow to draw the following conclusions and generalizations.

Table

Integrated indicators of assessing the risks of trade activity with businesspeople from China in a section of separate groups of determinants (by results of questioning of businesspeople from the city of Krasnoyarsk and the Krasnoyarsk Krai)

Name indicator	The method of calculating the indicator	Integral meaning indicator, %
Integral indicator of commercial risks	$Ик.р. = \frac{К_1 \times З_1 + К_2 \times З_2 + ... + Кп \times Зп}{\Sigma Зп}$, where K1, K2, etc. – the share of respondents who assessed a single, private indicator of commercial risk assessment as high, %; 31, 32, etc. – the importance of a single, private indicator of commercial risk assessment, %	56,2
Integral indicator of economic risks	$Иэ.р. = \frac{Э_1 \times З_1 + Э_2 \times З_2 + ... + Эп \times Зп}{\Sigma Зп}$, where Э1, Э2, etc. – the share of respondents who assessed a single, private indicator of economic risks as high %; 31, 32, etc. – the importance of a single, private indicator of economic risk assessment ,%	65,9
Integral indicator of political risks	$Ип.р. = \frac{П_1 \times З_1 + П_2 \times З_2 + ... + Пп \times Зп}{\Sigma Зп}$, where П1, П2, etc. – the share of respondents who assessed a single, private indicator of political risks as high %; 31, 32, etc. – the importance of a single, private indicator of political risk assessment, %	52,3
Integral indicator of other risks	$Ипр.р. = \frac{Пр_1 \times З_1 + Пр_2 \times З_2 + ... + Прп \times Зп}{\Sigma Зп}$, where Пр1, Пр2, etc. – the share of respondents who assessed a single, private indicator of other risks as high, %; 31, 32, etc. – the importance of a single, private indicator of other risks assessment, %	38,5

The results of the conducted research (Table) generally demonstrate the average level of risk of implementing trade activity by businesspeople of the city of Krasnoyarsk and the Krasnoyarsk Krai with businesspeople from China.

The greatest value of an integrated indicator of assessment of risk is the share of group of economic risks (65,9 %), including the following main risks:

- the risk of growth of exchange rate, leading to increase in prices, tariffs and expenses on rendering services – 69,4 % of respondents have estimated this risk as rather high;
- the risk of reduction of income of consumers leading to decrease in purchasing power and total revenue – 61,5 % of respondents recognized also high level of this type of risk;
- the risk of increase in prices, tariffs for goods and services leading to decrease in number of purchases and activity of buyers and also to growth of expenses on rendering services – 67,1 % of respondents have noted the high level of this risk.

The second-large value of an integrated indicator of assessment of risks is the share of group of political risks (52,3 %). Including, the interviewed businessmen have noted the highest level by such types of risk as risk of the ban on import-export of goods, or the requirement of the license for a certain type of production, service from authorities (60,2 % of respondents), risk of essential increase in the prices of import production owing to the imposed sanctions and other measures for import restriction (54,7 % of respondents) and risk of non receipt of necessary volume of goods of production, services for realization as a result of imposition of sanctions and other restrictions (52,1 %).

Smaller level of political risks is the share, according to respondents, of such types as risk of high degree of bureaucracy in the relations with public authorities, including in obtaining licenses for activity implementation (49,8 %) and risk of impossibility of regional import of the equipment owing to not acquisition of spare parts as a result of sanctions and other restrictions (32,6 %).

Also, according to results of poll of respondents, rather high value has also an integrated indicator of assessment of commercial risks – 56,2 %.

At the same time, the interviewed businessmen have noted the highest values of levels of such commercial risks as:

- the risk of delivery of production, goods of inadequate quality (59,3 % of respondents);
- the risk of failure to follow contractual obligations by suppliers and contractors (57,2 % of respondents);
- lack of demand or essential decrease in demand of consumers (55,7 % of respondents).

Respondents have estimated other types of commercial risks within 45-51 % as moderately average.

The smallest value of an integrated indicator of assessment of risks of implementation of trade activity by businessmen of the city of Krasnoyarsk and Krasnoyarsk Region with businessmen of China among the revealed and classified risks is the share of the group of other risks uniting in itself insurance, information risks, risks of the taxation and pricing (38,5 %).

In this group of risks the interviewed businessmen have noted the highest level by such types of risk as risk of increase in the customs duties, tariffs and other tax payments (45,5 % of respondents), risk of increase in the prices for various objective reasons leading to decline in demand of consumers (60,6 % of respondents), risk of obtaining unreliable, untimely information (48,9 % of respondents). Respondents have estimated other types of other risks below average (less than 35-40 %). After the research of integrated indicators on each revealed group of risks the indicator of the generalizing integrated assessment of the risks arising in trade activity of businessmen of the city of Krasnoyarsk and Krasnoyarsk Region with businessmen of China on the following formula has been calculated:

$$\text{Иоб.} = \sqrt[4]{56{,}2 * 65{,}9 * 52{,}3 * 38{,}5.} = 52{,}26\ \%$$

Thus, the calculated generalizing, integrated indicator (52,26 %) demonstrates the average level of risk of conducting trade activity by businessmen of the city of Krasnoyarsk and Krasnoyarsk Region with businessmen of China.

At the same time, the levels of different types of risks revealed during the conducted research demand their careful studying and the analysis for the purpose of justification of the actions directed to decrease the degree of possible risks of conducting commercial activity and development on this basis of effective administrative decisions.

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PROSPECTS OF SINO-RUSSIAN HIGH SPEED RAIL COOPERATION UNDER THE "ONE BELT, ONE ROAD" INITIATIVE: THE CASE OF VLADIVOSTOK-MUDANJIANG RAILWAY

Consisting of wide range of activities, "One Belt, One Road" initiative (OBOR) is one of the biggest and most discussed infrastructure megaprojects of modern world. High-speed rail (HSR) construction is considered an important part of OBOR.

China holds a leading position in HSR length: Chinese HSR network is comprised of 26 869 km of train lines having speeds in excess of 250 km/h in June 2018 [1]. It is also hard to compete on price against China. According to the World Bank 2013 paper titled "High-Speed Railways in China: A Look at Construction Costs", the cost of HSR construction in China is one third lower than in other countries [2].

Russia is also interested in HSR network creation. However, HSR is a relatively new type of transport in Russia, and international cooperation seems to be a logical choice for its development.

There are three Sino-Russian HSR construction projects, currently discussed in press: Moscow-Kazan, Ekaterinburg-Chelyabinsk and Vladivostok-Mudanjiang.

As HSR is usually associated with developed countries, a danger of excessive politization of HSR construction decision-making process appears. We must take into consideration economic aspects of HSR building (including the development of neighboring areas by chain-effect), specific features of neighboring territories and characteristics of HSR as a transport mode. Thus, we will avoid a situation in which a potential of HSR line is underused or used improperly.

The main characteristics of modern HSR include:

- HSR lines is traditionally used for passenger transport.
- High passenger flow is necessary to make an HSR project profitable. Excluding indirect effects, the expected first year demand, compensating for construction, maintenance and rolling stock costs, and making project beneficial, is at least 8-10 mln passengers for the line of 500 km [3].
- Shorter passenger dedicated HSR lines (up to 800 km) are more profitable [4]. For longer HSR lines passenger flow and profitability drop dramatically, as more passengers choose air transport instead, while maintenance costs increase [5].
- The majority of HSR lines are built within the borders of countries. Trans-border HSR lines are rare; as their construction requires international cooperation, investment risks (financial and political risks) rise, project management becomes more complicated. If there is a difference in standards in participating countries (for example, different gauges or rolling stock requirements), additional negotiations and efforts become necessary.

We compared main characteristics of Moscow-Kazan, Ekaterinburg-Chelyabinsk and Vladivostok-Mudanjiang HSR projects (Table).

A brief comparative analysis shows that passenger flow is not big enough to ensure an adequate payback. The conclusion is the same for any HSR project in Russia: it is nearly impossible to provide the necessary number of passengers due to Russian demographic situation. It makes the analysis of possible development gains for the economy of neighboring areas particularly important. In this context Vladivostok-Mudanjiang HSR project can deliver short-

term and long-term benefits that are more tangible. Positive effects achievable in the short-term period include tourism development and merchandise trade growth, positive effects, which are expected to gradually increase for a longer period of time, involve investment and technological cooperation.

Table

Comparison of Moscow-Kazan, Ekaterinburg-Chelyabinsk and Vladivostok-Mudanjiang HSR [6–15]

Criteria	Moscow-Kazan	Ekaterinburg-Chelyabinsk	Vladivostok-Mudanjiang
Project price, bln rubles	1288	360	816
Length, km	790	218	380
Price per 1 km, bln rubles	1,6	1,6	2,1
Speed, km/h	360	300	200
Population of neighboring areas, mln people	17,9	7,8	1,9 (Russia); 37,9 (China)
Planned passenger flow, mln people/ year	16,3	3	5
Planned freight flow, mln t /year	-	-	5
Challenges	– Choice of financing model; – Technical complexity (1/3 of the line is bridges, viaducts and road overpasses; ballastless tracks)) – Ecological aspect	– Choice of financing model; – Technical complexity of some parts of the route	– Choice of financing model; – Technical complexity (70 % of the line is bridges and tunnels) – Difference of standards (Russian gauge – 1,520 mm; Chinese gauge – 1435 mm)

■ Tourism promotion. Traditionally tourism is among the most vigorous areas of cooperation between Primosky Krai and Chinese provinces. 334 thousand of Chinese citizens have visited Primosky Krai for the first 9 months of 2018 [16]. Taking into consideration the plans of Russian government related to tourist cluster we believe that there are great perspectives for the increase in tourist inflow including the one from China to Primorsky Krai. Regional authorities do their best in transforming Krai into the center of event and cultural tourism [17]. Special attention should be drawn to the project of gambling zone "Primorye". Only one casino is in operation currently: Tigre de Cristal. For the first two years of existence (2015-17) it has attracted 600 thousand visitors including 38 % of foreigners [18]. For the first 10 days of 2018 this casino had 3,5 thousand of guests from different countries [19]. Two other sets "casino-hotel" are under construction. Aquapark establishment is planned as well [20]. In august of 2018 it was announced that South Korean company K International Inc. is ready to invest 18 bln. of rubles into construction of 12 hotels for 6 thousand places, restaurants and casinos which will result in employment of 20 thousand people [6]. The construction of HSR will promote regional accessibility, namely, decrease travelling time in comparison with automobile (6-7 hours), and increase travelling comfort. The line Vladivostok-Mudanjiang will provide connection with a developed net of Chinese high-speed railways and attract visitors not only from Heilongjiang province but from the whole North-East China.

■ The new drive for trade in goods. Vladivostok-Mudanjiang project suggests for cargo transportation establishment, which can help the existing customs checkpoints. The potential of abovementioned HSR matches the trade structure of Primorsky Krai – China. HSR lines are suitable for the transportation of perishable food and urgent deliveries. In 2017 export volume from Primorye to China reached $1146,5 mln, including 46 % for fish and seafoods. Import was $2137 mln, including 7 % for fruits and vegetables, 32 % for automobiles and equipment

(including electronic equipment) [21]. Therefore, HSR line may be utilized for the transportation of perishable animal, fish, and aquaculture products, and mechanisms delivery (to diminish risks of damaging).

- Investment and technological interaction development. Due to the increase of regional transport accessibility HSR may raise the positive effects of previously planned projects in the area of investment and technological interaction.

China is the largest investor for the Russian Far East and Primorye. In February 2018 there were registered about 600 organizations using Chinese investments in Primorye [22]. Chinese investors are attracted by the wide variety of industries: agriculture and aquaculture, living and commercial property, energy sector, transport and logistics, automobile industry, tire recycling and utilization, wood processing [23–25]. Chinese investments volume in the Russian Far East grows steadily, in 2017 it increased by third [25]. We expect the increase of positive tendency of getting Chinese investments due to several reasons: measures initiated to ensure a favorable investment climate for foreign companies, further improvement of preferential regimes, planned creation of financial center and offshore area at Russky Island, establishment of techno park "Russky", International Cooperation Center construction (at Russky Island) and formation of Sino-Russian investment fund for regional development with capital of 100 bln yuan [26].

Technological cooperation should be extremely beneficial. Far Eastern Federal University will be converted into a large scientific and educational center [26]. Techno park at FEFU basis has a potential to develop into a mechanism for science and business cooperation and commercialization of innovations. FEFU undertakes special actions to raise technological interactions with China. At the same time, we cannot expect serious effects of HSR in the short-run since all the innovations are expensive and risky and neither Heilongjiang province nor Primorsky Krai may be considered as innovation centers in respected countries.

- Growth of educational exchanges and business trips. According to statistics for the first half of 2018 only 14 % of Chinese citizens entered Primorye were not tourists [27]. The expected positive trend in investment cooperation of Russian Federation and China and plans suggesting the development of respective territories and foreign investments will result in higher inflow of foreign business visitors in Primorye. HSR construction will help to make visits to Vladivostok and Primorye more comfortable and provide for an additional growth drive in this area.

Therefore, among the three HSR construction projects under OBOR initiative analyzed we can identify the best prospects for the line Vladivostok-Mudanjiang. The actions initiated for Primorky Krai development (in case of success) will increase the financial results of this project. Under the best possible scenario (the projects are successful and the HSR is built) the line Vladivostok-Mudanjiang may become a brilliant example of a mutually beneficial cooperation between Russian Federation and China under OBOR initiative and the first case when the HSR is constructed by two large nations not linked by any supranational institution.

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EMPIRICAL STUDY ON THE RISK REGULATION OF BLOCKCHAIN

Based on the analysis of the risk regulation strategies at home and abroad, the risk assessment models such as the SMART Chain model, as well as other capital market risk management models, this paper uses R language and OLS multiple regression method to build the modified model to discuss the important factors affecting the risks of blockchain application projects. This paper provides a solid foundation and creative thinking for the regulation of the application of blockchain via highlighting the importance of systematic risk management, technological regulation evaluation and market price fluctuation prediction.

***Keywords**: blockchain, risk regulation, adjusted model.*

Application of block chain in the capital market reduces some risks. However, it brings some uncontrollable risks as well, for example, chain information can be obtained by hacker, appearance of financing leverage forbidden by law, fraud risk and so on.

1. CURRENT INTERNATIONAL REGULATION MODELS

1.1. CREDIT RISK MODEL

Credit risk is still the main risk for the financial institutions. Expert Score, Credit Evaluation, KMV Model, Credit Metrics are widely used for assessing credit risk. KMV model can observe the movement of default rate of the enterprises. Credit Metrics was put forward by J.P. Morgan in 1997, which measures firms' default risks based on Asset Portfolio Theory and VaR. In recent years, with the wide usage of machine study and neural network in risk management, Bayes Model and Logistic Regression Model start to be used in measuring credit risk.

1.2. SMART CHAIN MODEL

SMART Chain Model is composed of Smart Analysis and Smart Quantity. Among which, Smart Analysis evaluates blockchain from the aspect of strategy, market and product; Smart Quantity Model assesses blockchain from the perspective of strategy, marketing, activity, risk and technology.

Ajusted Model of SMART Chain

Based on the previous models and features of the risks of capital market, we choose market focus, marketing, technology stability, market price and future development to measure the risks of blockchain application.

X1 (market focus): mean of Google index in the past 12 months (starting from February 21, 2018), the figure is from the on-line data. The higher the data, the higher the market focus.

X2 (marketing): comprehensive consideration of the transaction market, public offering, turnover rate of daily settlement and turnover rate of daily transaction, marketing score is based on mean value, which is between 0-9. The higher the score, the better the market flow.

X3 (technology stability): assessed from three perspectives including project application stability, code advantage and code alliance, which is between 0-9. The higher the score, the more stability of the block chain application.

X4 (market price): derived from KMV credit risk model, the variance is determined by the daily transaction price of Feb. 21, 2018 (unit: $).

X5 (future development): it includes community construction and financing support, each accounts 5 points. Community construction covers the score of official forum activity, relevant discussion, participation, website and maintain of Wiki; financing measures project financing

status, early investors, outsider supporters, advertise input &output. The score is between 0-10, the higher, the brighter of the future development.

The samples are from the top 20 of the market value of Huobi Blockchain Company. All the samples are related with figure assets except Ripple and Tether which belong to global payment account.

Table 1

Explained variable Y and sample data（unit: thousand $）

变量	变量定义	Bitcoin	Litecoin	NEM	Decred	Dogecoin	Dash	Monero	Zcash	PIVX	Ethereum	Ripple	Tether
Y	市值	198,647,988	13,546,457	4,539,303	532,236	833,648	5,739,443	4,678,410	1,523,401	337,943	90,961,955	44,018,779	2,210,583

Source：Crypto Currency Market Capitalizations

2. EMPIRICAL STUDY

Figure 1 shows the descriptive statistics analysis.

```
       Y                  X1              X2              X3
Min.   :3.379e+08   Min.   : 0.000   Min.   :0.000   Min.   :0.40
1st Qu.:1.351e+09   1st Qu.: 2.000   1st Qu.:2.625   1st Qu.:1.00
Median :4.609e+09   Median : 3.000   Median :3.625   Median :2.60
Mean   :3.063e+10   Mean   : 6.583   Mean   :3.771   Mean   :2.85
3rd Qu.:2.116e+10   3rd Qu.: 8.500   3rd Qu.:5.562   3rd Qu.:3.85
Max.   :1.986e+11   Max.   :24.000   Max.   :7.250   Max.   :7.80
       X4                 X5
Min.   :    0.007   Min.   : 1.500
1st Qu.:    1.060   1st Qu.: 3.000
Median :  154.235   Median : 4.500
Mean   : 1159.307   Mean   : 5.500
3rd Qu.:  497.560   3rd Qu.: 8.125
Max.   :11266.800   Max.   :10.000
```

Fig. 1. Sample Descriptive Statistics

Via R language, based on OLS least square method, this paper constructs multi-linear regression model, which defines Y as dependent variable, X1 (market focusing), X2 (transaction activity), X3(technology stability), X4 (market price) and X5 (future development) as independent variables. Fitted model are displayed as Fig. 2.

Equation of linear regression of market value and independent variable is:

$$Y = -1.334 \times 10^{10} - 1.625 \times 10^{09} X1 - 2.251 \times 10^{09} X2 + 1.391 \times 10^{10} X3 + 1.270 \times 10^{07} X4 + 1.601 \times 10^{09} X5 \quad (Formular\ 1)$$

```
Call:
lm(formula = Y ~ X1 + X2 + X3 + X4 + X5)

Residuals:
       Min         1Q     Median         3Q        Max
-2.211e+10 -6.665e+09  1.234e+09  6.145e+09  3.036e+10

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -1.334e+10  1.422e+10  -0.938  0.38427
X1          -1.625e+09  1.249e+09  -1.301  0.24090
X2          -2.251e+09  3.012e+09  -0.747  0.48307
X3           1.391e+10  7.462e+09   1.864  0.11165
X4           1.270e+07  3.023e+06   4.202  0.00567 **
X5           1.601e+09  3.546e+09   0.451  0.66757
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.818e+10 on 6 degrees of freedom
Multiple R-squared:  0.9487,    Adjusted R-squared:  0.906
F-statistic:  22.2 on 5 and 6 DF,  p-value: 0.0008344
```

Fig. 2. Multi-linear regression fitted model

The regression result shows that adjusted multiple coefficient of determination R^2=0.906, which means around 90.6 % dependent variables can pass the independent variable test, the fitted level is good. Obviously, all the T-value and P-value are not obvious except X4, the P-value of X2 and X5 is close to or over 0.5, which displays the multi-collinearity. To test the existence of multi-collinearity, we calculate the correlation coefficient matrix, which is showed in Fig. 3. We can find that the coefficient among variables are a bit high, which affects the fitted model seriously because of the serious multi-collinearity.

```
           Y        X1        X2        X3        X4        X5
Y  1.0000000 0.5843895 0.4784982 0.8835034 0.9127314 0.7190723
X1 0.5843895 1.0000000 0.4928465 0.6685906 0.7164585 0.2723866
X2 0.4784982 0.4928465 1.0000000 0.6492131 0.4636665 0.4820919
X3 0.8835034 0.6685906 0.6492131 1.0000000 0.7750269 0.7869503
X4 0.9127314 0.7164585 0.4636665 0.7750269 1.0000000 0.5178677
X5 0.7190723 0.2723866 0.4820919 0.7869503 0.5178677 1.0000000
```

Fig. 3. Relevant Coefficient Matrix

We use AIC（Akaike information criterion）to measure the difference of adjusted model with deleting partial variables and original model. With step–by-step regression, AIC reaches 568.09 from 570.65, the fitted status goes better. More importantly, step-by-step regression eliminates X2(transaction activity) and X5(future development). We rebuild the model showed as Fig. 4.

```
Call:
lm(formula = Y ~ X1 + X3 + X4)

Residuals:
       Min         1Q     Median         3Q        Max
-2.825e+10 -5.600e+09  2.126e+09  6.955e+09  2.775e+10

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -1.283e+10  1.032e+10  -1.244  0.24884
X1          -2.036e+09  9.766e+08  -2.085  0.07055 .
X3           1.466e+10  3.958e+09   3.704  0.00601 **
X4           1.301e+07  2.752e+06   4.727  0.00149 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.672e+10 on 8 degrees of freedom
Multiple R-squared:  0.9422,    Adjusted R-squared:  0.9205
F-statistic: 43.45 on 3 and 8 DF,  p-value: 2.687e-05
```

Fig. 4. Fitted Model after Eliminating Multi-collinearity

Currently, the multi-linear regression model of market value and independent variable becomes:

$$Y = -1.283 \times 10^{10} - 2.036 \times 10^{09} X1 + 1.466 \times 10^{10} X3 + 1.301 \times 10^{07} X4 \quad (Formular\ 2)$$

The P-value of X3(technology stability) and X4(market price) are obvious which illustrates that technology stability can perfectly demonstrate the fluctuation of market value. Adjusted multiple coefficient of determination R^2=0.921 has been improved. Table 2 shows that model's fitting degree and variable coefficient go better after eliminating disqualified independent variables.

Table 2

Comparison of the models before and after step-by-step regression

	线性回归		逐步回归	
	Estimate	Pr(>|t|)	Estimate	Pr(>|t|)
X1	-1.63E+09	0.2409	-2.04E+09	0.07055
X2	-2.25E+09	0.48307	/	/
X3	1.39E+10	0.11165	1.47E+10	0.00601
X4	1.27E+07	0.00567	1.30E+07	0.00149
X5	1.60E+09	0.66757	/	/

Source: R Studio

We further use ANOVA（Analysis of Variance）to carry out variance analysis. Figure 5 shows the result of X1, X3 and X4 are all obvious.

```
Analysis of Variance Table

Response: Y
          Df     Sum Sq    Mean Sq F value    Pr(>F)
X1         1 1.3210e+22 1.3210e+22  47.247 0.0001279 ***
X3         1 1.6986e+22 1.6986e+22  60.753 5.264e-05 ***
X4         1 6.2479e+21 6.2479e+21  22.346 0.0014883 **
Residuals  8 2.2368e+21 2.7960e+20
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Fig. 5. ANOVA Result

The Normal distribution is displayed as Fig. 6, with most sample data fitting with normal distribution and satisfying with the condition of multi-linear regression.

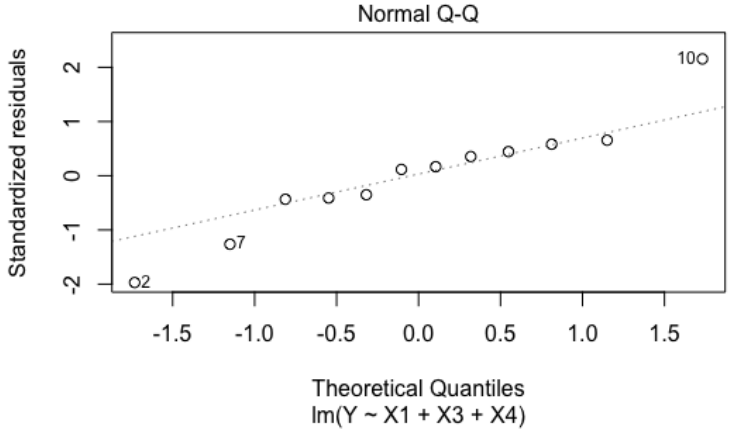

Fig. 6. Normal Distribution Test of Fitting Model

On the basis of data selection, model construction and data test, SMART Chain adjusted model of the risk evaluation of blockchain is as follows：

market value

$$= -1.283 \times 10^{10} - 2.036 \times 10^{09}\text{market focsing} + 1.466 \times 10^{10}\text{technology stability} + 1.301 \times 10^{07}\text{market price} \quad (\text{Formular } 3)$$

3. STRATEGIES FOR RISK MANAGEMENT OF BLOCKCHAIN

Firstly, establish risk pre-warning mechanism to maintain the safety of the blockchain to contribute to the smooth development of the capital market, nurture the talents to meet the

requirement of Fintech as well. Secondly, regulators should spare no efforts to avoid the sharp fluctuation of the market price during the application of the blockchain. Thirdly, relevant institutions should strengthen the technology regulation and evaluation to maintain the stability of the market.

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POSITIONING OF CHINESE SMARTPHONES ON THE RUSSIAN MARKET

The choice of smartphones as an object of research is determined by the fact that these are high-tech consumer goods, and it is possible to demonstrate the potential of positioning methods when working in the modern dynamic consumer markets on their basis.

It has been established that in the smartphone market, which in many countries has reached its maturity stage, products are constantly updated both due to expanding the functional properties of smartphones and by improving their technical characteristics. However, the functional parameters of smartphones are similar. The most important task of management and marketing in this context is clear positioning of the smartphone manufacturer's products on the market.

Traditionally, positioning is understood as a process, resulted into the formation of the idea about a product in the consumers' minds. The main goal of positioning is to help consumers to make a choice among the competing offers of goods on today's saturated markets.

Thus, Apple is positioning its smartphones as "toys for adults." To associate their products with a toy, the company used three typical finger movements in controlling iPhone, which it conveyed to the consumers of smartphones. These are light hand waves, similar to those when reading a magazine, which are intended to cause associations with relaxation; scrolling the page with the index finger from the top to the bottom, as in a slot machine, as well as light pressing as when using a computer mouse[1].

In contrast to Apple, Samsung is positioning its smartphones in the following way: "To satisfy mobile professionals who are oriented to constantly changing technologies. Samsung gives the user a friendly, economical, stylish and innovative products associated with a rapidly changing world." Constant improvements in quality and new technological characteristics of smartphones, which are focused on the needs and desires of the end users, have led to the fact that each new device was well received by the market.

To determine the attitude of Russian consumers to Chinese smartphone manufacturers and to develop proposals for positioning Chinese smartphones on the Russian market, an online consumer survey was conducted. During the survey 375 people answered the survey questions. The survey was conducted in 2017 through the online surveys service Googleforms and social networks ("VKontakte", "Wechat" and "Facebook").

According to the survey results, the respondents were satisfied with the existing models of smartphones, which included the world market leading companies and 3 most famous brands of Chinese smartphones (Table). It was found out that Chinese companies take a rightful place in the top five.

For the comparative assessment of positions of different brands of smartphones on the market, a positioning map (a perceptual map) of smartphones was constructed using the "price-perceived quality" parameters based on the data from the website Product- Test.ru[3], which presents the results of laboratory testing and expert assessment of consumer goods. In the smartphones ranking, that are rated based on a 100-point scale by 13 attributes, we have chosen

[1] Ph. Barden. Decode Marketing. M.: Mann, Ivanov and Ferber, 2014. P. 279–280.
[3] URL: http://product-test.ru/smartfony.

11 well-known brands mentioned by the consumers in the course of our survey. The prices of the considered smartphone models were also taken from the website Product-Test.ru. Average assessments of price and perceived quality were calculated for all the smartphone models.

Table

Respondent satisfaction with the existing smartphone model (% of answers).

Smartphone brand / Respondent's assessment	Apple	Samsung	Huawei	Lenovo	Xiaomi
Rather satisfied	23	31	36	20	24.2
Satisfied	72	55	60	60	69.7
Not satisfied	1	1	4	-	3
Rather not satisfied	4	7	-	13.3	3
Not sure	-	5	-	6.7	-
Customer willingness to recommend (NPS)	4.38	3.96	4.4	3.93	4.36

When constructing a positioning map (Fig. 1), 4 segments are highlighted:

- Premium segment (top square on the right) is represented by high-quality smartphones sold at high prices. It includes Apple, Samsung and Huawei smartphones. This segment is also represented by Sony, LG and Xiaomi (Mi5s) smartphones. At the same time, Samsung, Huawei, Sony, LG, Lenovo (Motorola) and Xiaomi smartphones are closer to the average price range than Apple smartphones. In other words, buyers of the aforementioned smartphones brands get comparable quality for a much lower price. Let us clarify that a lot of points of one brand in the figure reflect the position of different smartphones models of one brand.
- Such brands as Huawei, Lenovo, Xiaomi, Meizu and LG are sold in the "more for less" segment (lower square on the right) on the Russian market. It is obvious that apart from LG, Chinese smartphone brands dominate in this segment.
- The segment of low-cost smartphones (lower square on the left) includes Samsung, LG and Apple (iPhone 5c), while such Asian manufacturers as Lenovo, ZTE and Alcatel are competing here.
- The segment of expensive smartphones, which quality is below average, includes Apple products (iPhone 5 and 5s), Samsung (Samsung Ativ S), Huawei (Huawei Ascend Mate), Lenovo (Lenovo K900), Sony (Xperia M2 Aqua), LG (Nexus 5) and Alcatel (One Touch Idol X). These smartphones are intended for the consumers at the medium-high price range, but now companies are releasing new models of smartphones, and previous models are transferred to the upper square on the left (low quality at a high price).

The positioning map gives an opportunity to understand the marketing strategies of companies. Apple, for instance, operates exclusively in the premium segment, offering new models of smartphones at high prices. At the same time, the company reduces prices for previous smartphones models (iPhone5 and iPhone5s) in order to meet the needs of customers with low purchasing power. Samsung smartphones are represented in almost all the segments and are focused on meeting the needs of different groups of customers.

Most Chinese brands are represented in the segment of low-cost smartphones, with the above average quality. At the same time, Huawei offers a variety of smartphone models, trying to enter the premium segment. The marketing strategy of Lenovo is of interest: after the acquisition of the Motorola division, a part of its products transferred into the high-quality smartphone segment, competing with premium segment smartphone manufacturers. These two Chinese companies want to take a place in the premium segment of the smartphone market.

The perceptual map analysis reveals the problems of companies as well. Lenovo smartphones, for instance, compete with each other in the same segments, which makes it difficult to position them in the consumers' minds and the company, accordingly, must reposition its brands. As for Huawei, it has been found out that it has become the leader of the Russian market among Chinese smartphone brands but, at the same time, it faces a number of problems

when working on the market. They, in particular, include perception of the company's smartphones by Russian consumers as cheap while positioning of various models of the company's smartphones is blurred. To increase brand awareness in Russia and consolidate the company in the high price segment, it was recommended to make a clearer positioning of the company's brands and smartphone models.

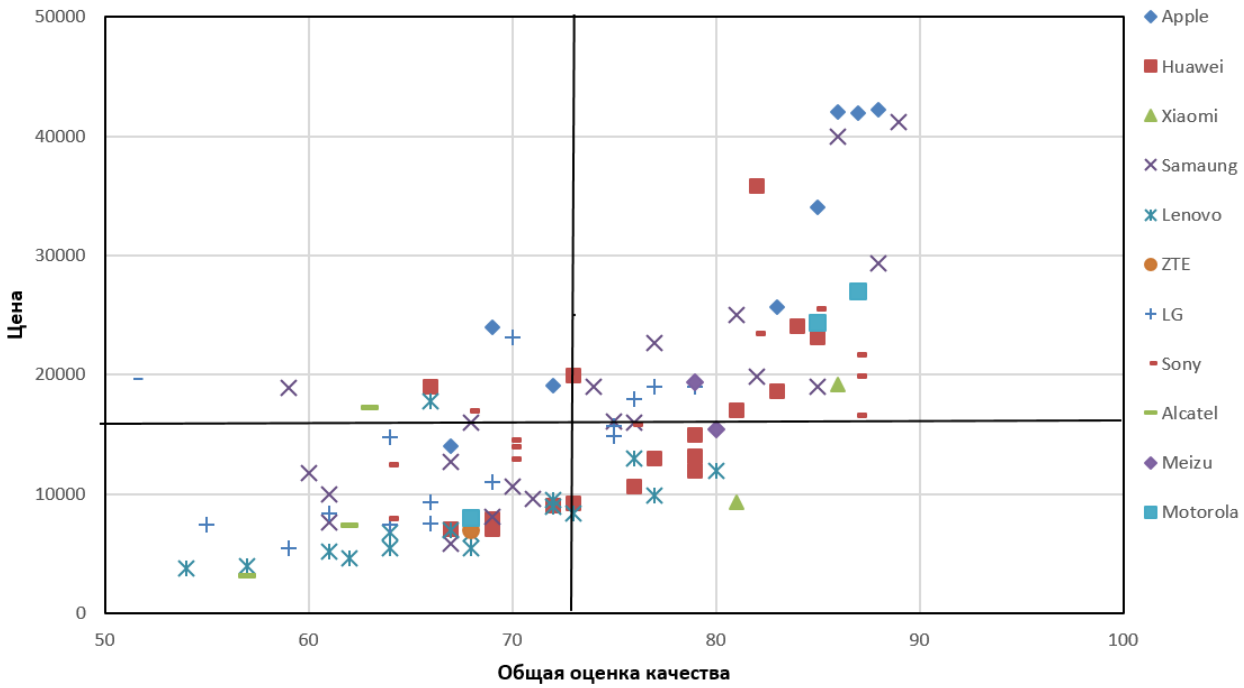

Figure. Positioning map of smartphones on the Russian market

Exemplified by smartphones, it was generally concluded that clear positioning of products in the dynamically developing highly competitive markets is an important factor in the growth of sales and strengthening the company's competitive position. Positioning maps as a visual form of presenting the comparative positions of competing goods, give an opportunity to analyze and make appropriate marketing decisions.

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