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THE EURASEC CUSTOMS UNION
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ТАМОЖЕННЫЙ СОЮЗ ЕВРАЗЭС
И ГЕРМАНСКИЙ ТАМОЖЕННЫЙ СОЮЗ:
ПОЛЬЗА И ГРАНИЦЫ АНАЛОГИЙ

The German Customs Union established in 1834 was the first-of-its-kind integration structure in Europe. Nowadays Belarus, Kazakhstan and Russia are trying to create the first post-Soviet customs union. They intend to deepen their economic ties in order to form a single market in the near future. A comparison of the two customs unions can highlight the main issues that arise during the initial stages of economic integration.

POST-SOVIET INTEGRATION. CUSTOMS UNION. CUSTOMS UNION THEORY. GERMAN CUSTOMS UNION. INTEGRATION THEORY.

Основанный в 1834 году Германский таможенный союз был первой интеграционной структурой такого рода в Европе. Сейчас Беларусь, Казахстан и Украина пытаются создать первый постсоветский таможенный союз. Они намереваются углубить экономические связи друг с другом до такой степени, чтобы сформировать единый рынок в ближайшем будущем. Сравнение двух таможенных союзов может высветить основные проблемы, возникающие на начальных стадиях экономической интеграции.

ПОСТСОВЕТСКАЯ ИНТЕГРАЦИЯ. ТАМОЖЕННЫЙ СОЮЗ. ТЕОРИЯ ТАМОЖЕННОГО СОЮЗА. ГЕРМАНСКИЙ ТАМОЖЕННЫЙ СОЮЗ. ТЕОРИЯ ИНТЕГРАЦИЯ.

The Customs Union of Russia, Belarus and Kazakhstan exists for two years and it is seen by many researchers as «the most impressive achievement to date in the post-Soviet integration» [1]. The Customs Union, in fact, is the backbone of all new integration initiatives in the post-Soviet space, such as the Eurasian Union and the Common Economic Space.

Therefore, a question emerges: what is the future outlook of the post-Soviet or «Eurasian» integration? Historical examples can point to certain complex issues, which appearance is highly conceivable during the creation and further development of customs unions. The first one of these samples is the German Customs Union established in 1834.

Then the German Customs Union (hereinafter referred to as GCU) consolidated 18 states of fragmented Germany with a total population of 23 million; they adopted a common customs line and unified customs tariff. It was the first-of-its-kind structure in modern Europe, and thus, it has traditionally attracted attention of researchers, who often compared it to the European Economic Community [2]. What conclusions can be drawn from the comparative similarities between the GCU and the EurAsEC Customs Union?

1. Integration area. The GCU was originally created as a part of the German national paradigm, even if it has not always been a conscious intention of its creators). Only German states inhabited mainly by Germans became

members of the GCU). Luxembourg joined the GCU in 1842, but it could be hardly seen as an exception to the rule. This small duchy was a part of the German Confederation — amorphous and inefficient structure created after the Congress of Vienna to replace the Holy Roman Empire of the German Nation. From time to time there were suggestions to include in the GCU Belgium or the Netherlands, but they have not been implemented. We can say that the GCU succeeded in the scope of so-called «closed regionalism», which, above all, is characterized by the pre-defined boundaries of an integration area. Generally, these boundaries are set up by certain ideological motives or existing (preexisting) forms of spatial organization. In the case of the GCU we are talking about an idea of German unity (especially important in the later stages of the Customs Union) and the German Confederation, the territorial limits of which the GCU has never broken).

In principle, you can see some similarities with the post-Soviet integration, which is also based both on the idea of the post-Soviet space and on the structure of the Commonwealth of Independent States. The CIS, like the German Confederation, has not proved its effectiveness, but certainly was an institution that provided an institutional framework and spatial conditions for the formation of the EurAsEC Customs Union. For the time being, the post-Soviet / Eurasian integration projects also fit into the concept of the «closed regionalism» recruiting participants only from the CIS member states — the former Soviet republics. Some experts consider a transition to the «open regionalism» and suggest that the post-Soviet customs union shouldn't shut the door on the states that did not belong to the Soviet Union. Because of the short history of the EurAsEC Customs Union, it is difficult to predict which path the newly created organization will choose — whether it remains limited to the «post-Soviet space,» or moves up to the construction of a new («Eurasian») integration region.

2. Integration of hegemony. Primarily, the GCU was the result of the Prussian policy. Prussia was a state that at the time possessed the largest economic, demographic and financial resources in Germany, as well as the largest territory. None of the other states of the German Confederation with exception of Austria (which was left out of the Union) could compete with Prussia. Prussian

hegemony, however, played a dual role. On the one hand, greater economic and political power often allowed Prussia to determine the rate of customs integration on its own and the Berlin officials continued to guide their colleagues in other countries. On the other hand, the advantage of one state created anxiety of smaller states; they feared of a Prussian threat for their sovereignty. In some cases, this led to a conscious resistance to the integration project. Spatial development of the GCU was repeatedly suspended for a long time because of the struggle with the Prussian hegemony. Another important consequence was a creation of alternative customs unions and free trade areas in Germany, which in the end could not stand the Prussian competition.

In the EurAsEC Customs Union one of the states (Russian Federation) also has a much larger economic and political weight than the other two partners (Belarus and Kazakhstan). At the initial stages of contemporary customs integration this disproportion appears as an inhibiting circumstance, particularly by attracting of new members. However, a possible success of the EurAsEC Customs Union depends on the massive domestic market of Russia (the Russian share in a mutual trade between the member-states of the customs union was 66.9 per cent in the first quarter of 2012 [3]).

3. Institutions. Even considering the time of its creation, the structure of the GCU was characterized by simplicity. There were only two administrative authorities. The main body was the General Congress, which actually held a meeting every two years and consisted of representatives of all the GCU states. Solutions at the General Congress were possible only by consensus; it means that each state had the right to veto. In Berlin there was a seat of so-called «Central Office», which was in charge of statistics. Customs duties are levied on the borders of the GCU by customs administrations of the participating states in accordance with the general tariff. Such a structure was the result of many compromises; it had to overcome doubts of small and medium-sized German states that Prussia could be a reliable GCU leader. Another insightful experience was made by the South German governments, which unsuccessfully tried to create a supranational governing body in a proposed separate South-German customs union for eight years (1820–1828, the concept of «Third Germany»). For these

reasons, the GCU was completely devoid of any complex supranational structures.

On the contrary, the EurAsEC Customs Union has been created as a part of a supranational organization, the Eurasian Economic Community. Additionally, the political will to make a rapid progress in the post-Soviet integration has led to creation of the Single Economic Space (SES), which should form a single market between Belarus, Kazakhstan, Russia (and possibly Kyrgyzstan and Tajikistan) in 2015. The hierarchy between these three structures is complicated and not consistently defined. In November 2011 the Commission of the Customs Union was transformed into the «Eurasian Economic Commission», which should be responsible both for the Customs Union and the Single Economic Space. The Eurasian Economic Commission consists of a «council» and a «collegium». The first one is designed for the communication with the «High Eurasian Economic Council», which embodies the political leadership of the post-Soviet integration project. The «collegium» is an executive body, similar to the European Commission in the EU.

The simplicity of institutions was a big advantage of the GCU. Of course, in 2012, you cannot create a management structure that was effective in 1834. But if the modern supranational («EU-like») complex institutions will not be able to prove their efficiency in the EurAsEC, then all further development of the post-Soviet integration will be at risk.

4. Public support. Both the EurAsEC Customs Union and the GCU were projects of the relevant governments rather than products of a broad public demand. In case of the GCU we could remember the All-German Union of Merchants and Manufacturers, headed by Friedrich List. This non-governmental organization took over the role of spokesman for the interests of all stakeholders in the industry and trade. However, the ideas of List had been quite different from the shape that the GCU took in 1834. The liberals from the West and South of Germany always treated the GCU very suspiciously because of the autocratic Prussian state behind it. The revolution of 1848 couldn't change this situation, and till the time of Bismarck the GCU had been suffered from a lack of democratic legitimacy.

The Eurasian customs integration does not have anything that could be compared with the List's Union. There are no significant civil initiatives backing the idea of the EurAsEC Customs Union. Moreover, there are no demands for greater transparency or discussions about «a democratic deficit» as we know it from the European Union. Nonetheless, the opinion polls in 2012 have shown that the majority of citizens in the participating countries have a positive attitude to the customs union (nearly 80 per cent in Kazakhstan, 76 per cent in Russia and 60 in Belarus [4]). Unfortunately there have not been a great number of studies on the views of a private business. In 2011 61.5 per cent of SME representatives in Belarus rated the accession to the customs union positively [5]. However, only 39 per cent believed that they could effectively compete in the single market of the customs union. Nearly three-quarters have said that the internal market of Belarus was more important for them than the markets of Kazakhstan and Russia.

5. Economic prospects and conclusion. The GCU was a success primarily because of its financial benefits. The net profit from the customs duties doubled between 1834 and 1845 [6]. The impact on the industrial revolution and the general economic development is also not in doubt. The market has grown, the competition has become harder, the need for adaptation mechanisms such as railways and innovations in production processes has led to the «economies of scale» and to the industrial «take-off». A harmonization of tax laws and a monetary union with a creation of a new currency unit were inevitable next steps.

But the GCU was not the only factor that led to economic growth and national unity of Germany. A policy decision-making has always played a role in all relevant matters, regardless of all financial and economic benefits of the GCU. Obviously, it is too early for any conclusions about the EurAsEC customs union. Now the customs duties are not so important for the country's financial system as it was in the 19th century. Dynamic effects of a customs union (trade-creation) are much more significant, but it is not possible to analyze them now, two years after foundation of the EurAsEC customs union. However, the old German experience has showed that the customs union could be an effective instrument of the initial economic integration, able to further spillovers, but depending on political considerations and regional reservations.

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FROLOV, Andrey S. − *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: andrej.s.frolov@gmail.com

ФРОЛОВ Андрей Сергеевич − *доцент кафедры международного бизнеса Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, кандидат исторических наук.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: andrej.s.frolov@gmail.com

N.I. Didenko, A.S.Dudnikov, D.F. Skripnyuk

RUSSIAN'S REGION THE ECONOMIC STRATEGY UNDER THE GLOBAL ECONOMY EVOLUTION

Н.И. Диденко, А.С. Дудников, Д.Ф. Скрипнюк

ЭКОНОМИЧЕСКАЯ СТРАТЕГИЯ РЕГИОНА РОССИИ В УСЛОВИЯХ ЭВОЛЮЦИИ ГЛОБАЛЬНОЙ ЭКОНОМИКИ

The article discloses the principles of forming foreign economic strategy of a region in the face of general and regional integration of the Russian economy into the Global Economy. The authors focus on the aims and priorities of the foreign economic strategy of regional development. The article emphasizes the role of innovation technology factors in the economic development of a region.

FOREIGN ECONOMIC STRATEGY OF A REGION. INNOVATION TECHNOLOGY DEVELOPMENT FACTORS. GLOBAL ECONOMY.

Раскрыты принципиальные подходы к формированию внешнеэкономической стратегии региона в условиях общей и региональной интеграции экономики России с глобальной экономикой, выделены цель и приоритеты внешнеэкономической стратегии развития региона. Отражена роль инновационно-технологических факторов в развитии экономики региона.

ВНЕШНЕЭКОНОМИЧЕСКАЯ СТРАТЕГИЯ РЕГИОНА. ФАКТОРЫ ИННОВАЦИОННО-ТЕХНОЛОГИЧЕСКОГО РАЗВИТИЯ. ГЛОБАЛЬНАЯ ЭКОНОМИКА.

The most important process having a significant impact on the future of mankind is globalization. The result of globalization in economic sphere is creating global economy. Global economy is a multi-level, multi-aspect, and highly non-uniform system, which owns an assortment of properties based upon openness of national economies, economic integration, competition of national economies, and production transnationalisation.

The integration of a country into the global economic system manifests itself in two forms: general integration and emerging regional economic alliances of countries. General integration means accepting and using the rules, standards, and procedures accepted globally within a certain country. An example of general integration is Russia's joining the WTO and using the rules and procedures accepted in multilateral international agreements. The establishment of the Customs Union of the Euroasian Economic Community is an example of regional integration.

Russia's Integration into the global economy has generally been spontaneous. In Russia the economy has been built on the undervalued exchange rate of the rouble, which made it possible to give the competitive edge to the goods whose natural properties meet the demand in the world market. This produced a relatively high-yielding export primary-commodity market (extractive industries) and low-efficiency home-orientated sector (manufacturing, farming, infrastructure industry, education, health care) in Russia and caused a striking disparity of Russian regions, with the WTO membership entailing further differentiation.

The character of Russia's integration into the global economy is non-optimal, which is expressed in two facts: firstly, Russian economy is highly dependent on the fluctuations of the world economy growth and the conditions of the world markets for primary sector products. Secondly, while having rather high GDP growth rate due to the primary exports and the petrodollar inflow, in practice, Russia's economy is growing less and less competitive in the international market.

In these circumstances, it is essential for a regional economy to create a new foreign economic strategy, aimed at the effective integration of the region into the world economy

and tapping the potential of foreign economic activity to enhance competitiveness and the sustainable development of the region.

The aim of the foreign economic strategy of a region is to develop potentials of an individual in the region, which involves enhancing the competitiveness of regional economy through the development of it competitive advantages.

In the most general way, one can get an idea of the competitiveness of a region with reference to the potentials of an individual from the following definitions. [3]

The competitiveness of a regional economy is the ability of the regional economy to obtain production factors or use the existing ones with a view to develop potentials of an individual compared to other regions. Such understanding of the regional economy competitiveness defines the national economy competitiveness as the possibility of the national economy to obtain production factors or use the existing ones with the aim to create a high and improving standard of living of the society and to avoid the striking disparity of regional competitiveness in comparison with other countries.

The development of potentials of an individual in a region implies the following points: an individual should live long, be educated, have an income higher than minimum wage which enables them to have a decent standard of living.

For the quantitative regional competitiveness estimation, the following indicators are suggested and derived from the above definition of the individual potentials development.

The assessment of the development of individual potentials is based upon two main characteristics of individual development (a) and (b) plus two specific regional characteristics (c) and (d): a) life expectancy in the region measured with life time predicted at the birth date [1]; b) education in the region measured by the literacy level among adults, and the percentage of students among children and young people aged 7−24; c) poverty in the region measured by the percentage of people living below the poverty line; d) income in the region measured by the indicator of Gross Regional Product per capita.

The foreign economic strategy of a region should take into account all other factors connected with globalization: an industry-specific and technological structure of the global economy, a growing internationalization of production-marketing chains, and an intensification of integration processes in the global economy.

The way to implement the foreign economic strategy consists of building the economy of a region into the global economy and globalization processes to use foreign economic factors for the benefit of the socio-economic development of the region.

Fig. 1 shows a general pattern of the proposed mechanism for building foreign economic strategy, monitoring its implementation and introducing the necessary changes that come from the current events in the world economy and innovation technology development as well as a mechanism for implementing foreign economic and socio-economic strategy of the region.

The mechanism for building and implementing foreign economic strategy includes 17 units. Full lines show the sequence of stages and dash lines represent the patterns of feedback. The mechanism contains the dynamic cycle from setting the aims of the foreign economic strategy to implementing the decisions taken as a result of comparing factual socio-economic indicators of the national and regional development as well as the indicators which should be provided by the foreign economic strategy.

There may be 8 reasons for deviation of factual indicators from the planned ones. They are as follows:

− incorrectly defined foreign economic strategy aim;

− mistakes in choosing the units of foreign economic strategy;

− mistakenly or inaccurately developed variants of innovation technology base of the foreign economic strategy; they depend on GRP structure, innovation-technology potential of the region, the availability of economic development factors in the region;

− incorrectly chosen base of innovation-technology development of the region;

− inefficient mechanism of creating and reproducing technology clusters in the region;

− mistakes in working out the variants of the foreign economic strategy on the basis of innovation-technology development;

− inaccurate choice of the foreign economic strategy variant from the host of variants; the latter depend on the directions of innovation-technology development;

− ineffective mechanism of implementing the foreign economic strategy.

14 The results of analysing GRP structure

15 The results of the analysing innovation-technology potential of a region

16 The results of analysing the possibilities of region integration into the international global economy chains

17 The results of analysing country's / region's economic development factors endowment

1 Formulating the aim of foreign economic strategy: enhancing the potentials of an individual and the socio-economic development level by building into the global economy processes, justification of the change in the indicators of socio-economic development

2 Working out foreign economic strategy units 1...6

3 Working out variants of innovation-technology base for foreign economic strategy

4 Choosing the base for innovation-technology development of foreign economy strategy

12 Decisions taken as a result of comparing

9 De fac De facto change of socio-economic development indicators obtained as a result of implementing foreign economic strategy

11 Analysing the reasons for deviation 1......8

6 Working out variants of foreign economic strategy on the basis of innovation-technology development

5 Working out the mechanism of creating and reproducing of technology clusters in the region, associated with foreign economic strategy

10 Comparing de facto change in socio-economic development indicators with the stated ones

8 Implementing the stages of foreign economic strategy

7 Choosing the variant of foreign economic strategy. Estimating the resources required

13 Tendencies of global economy innovation-technology development

Fig. 1. General pattern of the mechanism for forming and implementing foreign economic strategy

Any problems of interrelation between the elements of the mechanism should be solved in a cyclical procedure.

The proposed ideas that should be implemented in the foreign economic strategy are concentrated in the units of the strategy the number of which corresponds to the number of global economy model components. Fig. 2 shows structural units of the foreign economic strategy in a general way.

Depending on the specific nature of the region, the firms taking part in international trade, their industrial and geographical sphere it is possible to single out the following units of the foreign economic strategy:

− product and geographical diversification of exports creating forms and mechanisms of diversification;

− creating international production-marketing chains in partnership with Russian residents, building into international production chains;

− creating the pattern of attracting investors into the national economy (development of certain stages of technology cycle, development of economic areas)

− creating an effective structure for intellectual activity (international intellect exchange, international licence exchange, enhancing the role of universities);

− development of import-substituting production (import of technology equipment, encouraging the development of import-substitution);

− reducing unemployment rate and the rate of expatriate workforce.

The implementation of the above mentioned units within the foreign economic strategy requires

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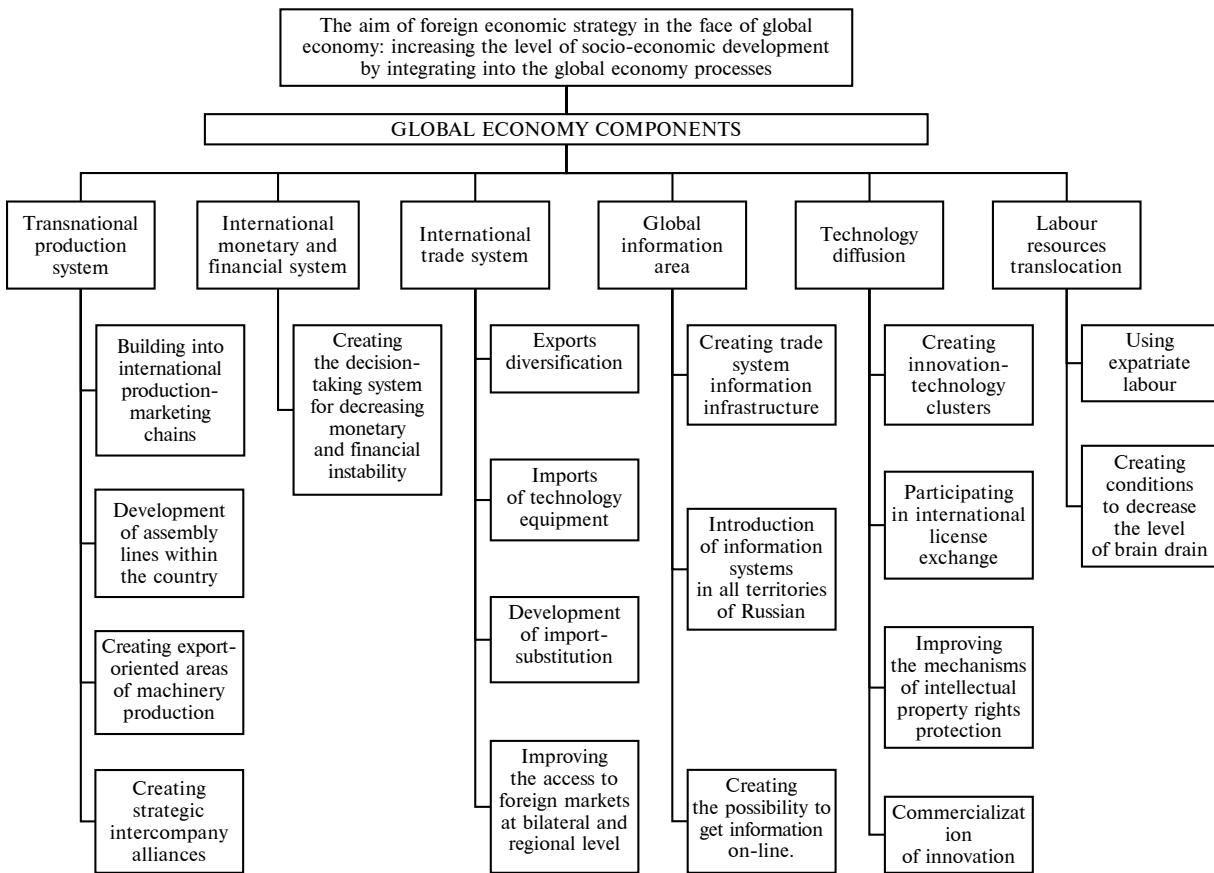
Fig. 2. Structural units of foreign economic strategy

an active participation in international and other negotiations, integration processes, building partnership relations. Bilateral and regional liberalization is, at present, an effective instrument of increasing international competitiveness and winning an edge over third countries.

An important stage of forming a foreign economic strategy is the choice of its base, which should result from the possible national and regional economic development strategy. Possible regional economic development strategies and thus the base for foreign economic strategy can be defined by giving preference to this or that set of factors. The assessment of resources exporting strategy perspectives shows that the GRP growth will be low even in the best possible conditions [4]. Then only one variant will be left, i. e. combining resources and new technology on the basis of the resource-innovation strategy. Here, the new technology in extractive and manufacturing industries can play the role of a multiplier. In future, the resource-

innovation strategy will gradually transform into an innovation-technology strategy.

The variants of innovation-technology base of the foreign economic strategy depend on the existing GRP structure, innovation-technology potential of the region, possibility of region integration into international chains of the global economy and the region's economic development factors endowment.

The central question should be the transition to the economic growth model, first of all, through the economy diversification and enhancing innovation sources of growth. The international experience of mature economies demonstrates that the structure of production and exports changes in favour of high technology products. In recent decades the world economy has seen the growing significance of complex system products, increasing part of knowledge-intensive industries, creating the market for knowledge-intensive products and services.

Analysing GRP structure and comparing innovation industry development and GRP complexes with the perspective trends of innovation-technology development of the world economy, as well as analysing the correspondence of the innovation-technology potential of the region to the perspective trends of the world economy development will make it possible to understand in which spheres the national economy is able to generate and implement new technologies, and which spheres are lagging behind.

The guideline for studying the innovation-technology potential of the region and its components is as follows:
− find out the economic agents interested in the outward-looking innovation-technology development;
− study the characteristics of the outward-looking innovative activity practiced by the economic agents;
− summarise the problems of the outward-looking innovation-technology potential development;
− work out a system of technological cooperation between companies in the sphere of innovation development − a system of outward-looking technology clusters.

Inward-and outward-looking technology clusters combining sufficient technical-scientific and technical-industrial potentials will lay the basis for the development of high-tech plants. The forecast of these markets development will be the basis for forming the requirements for the technology clusters structure. Technology clusters include business firms, state-owned companies, such as banks, stock exchanges, universities, research institutions, and factories. The organizational form of the technology clusters could be public private partnership.

The variants of foreign economic strategy are worked out on the basis of technology cluster development analysis and the choice of a certain variant is based on the resources required and the efficiency of the variant.

As a result of implementing a foreign economic strategy on the basis of innovation-technology development in the region, financial, innovation, and intellectual resources should be mobilized to radically renovate the region's economy. Foreign economic activity, in this case, will produce a multiplicative effect on all industries contributing to gross regional product and will enhance the scope of innovation activity in the region and increase region economy competitiveness.

The idea of the transition to the economy development on the basis of innovation-technology factors is gaining popularity among politicians and business executives in Russia. However, the pace of the transition is too slow. This is explained by system and economic reasons.

The system reasons are as follows:
− absence of demand for new technology among business entities;
− absence of sound support of fundamental research from the government;
− unwillingness of business entities to support applied research;
− absence of partnership between the government, the scientific world, and the business world.

The economic reasons embrace the influence of macroeconomic structure within which the innovation activity is carried out and are as follows:
− absence of sufficient investment in innovation;
− high interest rates in the economy;
− high inflation rate in the economy;
− underestimated role of the rouble and the underestimate rouble.

One of the main factors of successful development of innovation in the country is investment into this sphere. The insufficiency of investment suppresses the development of innovation activity, which is able to influence the steady pace of growth of export-oriented and import-substituting machinery production.

Direct foreign investments are also the factors having an impact on innovation activity. They produce different effects in emerging and mature economies. In mature economies, they are an extra incentive for innovation economy development. In emerging economies, their impact on innovation sphere depends upon competition between local companies in the receiving country. In case there is a competitive environment, direct foreign investments stimulate innovation, increase productivity, stream line production process. In case there is lack of competition between local companies, direct foreign investments enjoy monopoly and have a negative impact on the economy of the recipient country.

If a country counts on foreign investments in order to develop innovation sphere, this could cause a number of problems. The central one is that foreign investors have their own aims which may not coincide with the aims of foreign economic strategy of the receiving party.

Interest rate also has a serious impact on innovation activity, and the implementation of innovation projects is simplified with lowering bank interest rate. Low bank interest rate makes capital more available, investment less risky and efficiency of projects much higher. However, a high interest rate in Russia makes it difficult to develop innovation environment. The Central Bank of Russia's base rate wich shows what money is worth in the economy,is much higher than the cost-effectiveness of many innovation projects in the real economy. The 2008-2009 banking crisis dramatically lowered the level of savings accumulation, thus limiting the availability of credit resources for the innovation sphere.

The impact of **inflation** on innovation processes is crucial. There is a growth of innovations in production if the innovation efficiency growth rate is higher than inflation rate. Innovation activity is hindered when the inflation growth is quicker than innovation efficiency growth. Constantly high inflation makes innovation activity hardly probable because the company activity characterized by regular cost-effectiveness is not able to provide the money for innovation projects. It is also difficult to get credit resources for innovation activity in the time of high inflation, as investment in innovation is long-term and risky while investors are interested in projects that ensure quick return.

The impact of **rouble exchange rate** on innovation activity is multiple-valued. In general, strengthening rouble position in relation to Russia's basic trade partners' currencies is a positive phenomenon, which shows economic consolidation. But when rouble becomes more expensive, exporters' goods become less competitive as their price expressed in foreign currency increases. The price of imported goods expressed in roubles decreases, which makes it possible to import high-technology machinery, high-precision research instruments that are otherwise unavailable. In general, a high local currency exchange rate makes companies implement innovations and encourages the flow of capital from exporting raw materials into home-oriented industries.

To sum up, the emphasis should be laid on the fact that, for the sustainable development of the region, it is vital to create foreign economic strategy which will take into account all internal and external factors connected with globalization. Besides, the government and the business community should concentrate their efforts on enhancing the processes of streamlining and intensification of economy on the innovation-technology basis.

The means of solving this problem are as follows: destroying monopoly in the economy, creating national innovation system, substantially increasing financing of fundamental and applied science, improving higher education system, lowering inflation growth rate, and strengthening rouble exchange rate so that it can encourage innovation technology development.

Unless these problems are solved, Russia, in the short term, will host mostly engineering and manufacturing operations of TNCs which bring low added value or are ecologically burdensome; besides, Russian companies will manufacture low- or mid-technology products with the majority of high-technology products being imported.

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DIDENKO, Nikolay I. — *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: didenko.nikolay@mail.ru

ДИДЕНКО Николай Иванович — *профессор кафедры мировой и региональной экономики Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, доктор экономических наук, профессор.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: didenko.nikolay@mail.ru

DUDNIKOV, Anatoliy S. — *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: wecon@fem.spbstu.ru

ДУДНИКОВ Анатолий Сергеевич — *докторант кафедры мировой и региональной экономики, Инженерно-экономического института Санкт-Петербургского государственного политехнического университета кандидат технических наук.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: wecon@fem.spbstu.ru

SKRIPNYUK, Jamilya F. — *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: djamilyas@mail.ru

СКРИПНЮК Джамиля Фатыховна — *профессор кафедры мировой и региональной экономики Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, доктор экономических наук, профессор.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: djamilyas@mail.ru

T.Ju. Kudryavtseva

PROBLEMS OF RUSSIAN PUBLIC PROCUREMENT REFORM*

Т.Ю. Кудрявцева

ПРОБЛЕМЫ РЕФОРМИРОВАНИЯ РОССИЙСКОЙ СИСТЕМЫ ГОСУДАРСТВЕННЫХ ЗАКУПОК**

This article describes the problems of the Russian system of government procurement since reforming in 2005. The main problems are incorrect targeting of the State customer at the time of the conclusion of public contracts: budgetary savings orientation at the expense of quality products; insufficient or partial regulation of the methodology of public procurement; dysfunction of the International Institute of public procurement transplantation in Russia.

PUBLIC PROCUREMENT. COMPETITIVE BIDDING. PERFORMANCE. PRICING. COOPERATIVES. TRANSPLANTATION INSTITUTE.

Описаны проблемы функционирования российской системы государственных закупок после ее реформирования в 2005 г. Основными проблемами являются неверное целеполагание государственного заказчика при заключении государственных контрактов — ориентация на экономию бюджетных средств в ущерб качеству продукции; недостаточная или частичная регламентация методологии организации государственных закупок; дисфункциональность трансплантированного в российскую экономику международного института государственных закупок.

ГОСУДАРСТВЕННЫЕ ЗАКУПКИ. КОНКУРСНЫЕ ТОРГИ. ЭФФЕКТИВНОСТЬ. ЦЕНООБРАЗОВАНИЕ. КООПЕРАЦИЯ. ТРАНСПЛАНТАЦИЯ ИНСТИТУТА.

Government procurement system in Russia as an institute of market economy was formed in 1992 year by the Presidential Decree «On measures for the formation of the Federal contracting system», which initiated the establishment of a contractual mechanism for interaction between government customers and contractors and covenant of state contracts on a competitive basis. World Trade Organization considers a system of public procurement as a major tool to fight corruption in emerging market economies. In 1997, the President Decree «About urgent measures to eliminate corruption and budget cuts in the organization of the procurement of products for state needs» was issued with the aim to develop this principle in Russia. Nowadays, the main goal of public policy in the government purchasing market of the Russian Federation is to improve the contracting system, to increase the efficiency of budget spending, and ensure transparency of all procedures of the state order. To achieve this goal, in 2005 the Federal Law № 94-FL «On placing orders to supply products, production performance, rendering services to satisfy public and municipal needs» (the 94-FL) was adopted.

Materials of official statistics from The State committee of statistics of Russia help to suggest the following conclusions. Public procurement market in Russia is developing rapidly. The volume of state orders grows every year, which makes the market more attractive to entrepreneurs. So, the total value of procurement conducted on a competitive basis at all levels of government increased in the year 2010 compared with 1999 7.3 times. Currently, the share of public expenditure in the form of public order is 8.5 % of the GDP [1].

Informal statistics data, expert opinions, business and government representatives, numerous publications in the mass media reveal that numerous attempts have been made to improve legislation, long-term reform of public procurement, but not all results are positive, namely, it has also

significantly increased the size of corruption in the budget spending, and has made procedures for delivery of goods for public needs more complicated, which often leads to short delivery of the products and the decline of its quality.

The evidence of significant problems in this area are constant disruptions in the supply of medicines and drugs, poor quality, shortfalls and delayed implementation of the construction, repair and road works, the difficulties in organizing the purchases of scientific equipment and technically sophisticated goods, overvaluation and cost requirements of budget organizations in procurement, etc.

So, the question arises: why does the introduction of the international practice and a successful tool for ensuring the effectiveness of budgetary funding cause such unexpected and controversial results in Russia?

To explain the reasons of this phenomenon, we can divide them into three main groups of factors, determining the current level of low efficiency or inefficiency of the current system of public procurement:

1. Problems of evaluation and performance criteria of public procurement.

2. Disadvantages of methodology of public procurement.

3. Problems of transplantation of international institute and principles of public procurement.

Let us view each group of factors in details:

1. Problems of evaluation and performance criteria of public procurement.

From the point of view of many officials, public procurement seems to be effective, according to the official statistics, and the system of government orders has reached high efficiency.

According to the letter of the Ministry of Economy of the Russian Federation № 2000AS-751/4-605, efficiency of budget expenditures is measured as the absolute and relative amount of budget savings due to holding of procurement procedures. This indicator is calculated as the amount of money that wasn't spent due to holding of procurement procedures and due to usage of electronic platforms.

Indicators of savings are calculated as follows:

1) Absolute reduction of budget spending , as a result of all tenders for the supply of goods:

$$C_{\Sigma}^{abs} = C_n^{\Sigma} - C_c^{\Sigma} - C_{nc} - C^{\Sigma},$$

where C_{Σ}^{abs} − Absolute reduction of expenditures in government funds as a result of all tenders for the supply of goods, rub.; C_n^{Σ} − The total value of all the bids of the customer, rub.; C_c^{Σ} − Total value of customer contracts, rub.; C_{nc} − Total cost of the proposals that have not led to a contracts; C^{Σ} - The cost of the customer to organize and conduct competitions.

2) Relative reduction of spending of budgetary funds as a result of all the competitions for the supply of goods (%):

$$C_{\Sigma}^{rel} = \frac{C_{\Sigma}^{abs}}{C_n^{\Sigma} - C_{nc}} \cdot 100,$$

where C_{Σ}^{rel} − Relative reduction in budgetary funds as a result of all tenders for the supply of goods, %.

According to the Ministry of Economic Development, budgetary savings during the period from January 2008 to December 2011, shown in Tab. 1, are 210 109.944 million rubles.

The state order satisfies the state or, identically, the public demand and is aimed at meeting social needs. Such requirements are well known, their volume is due, on the one hand, to the theory of market failures, on the other hand, to measuring rod and the role of government in the economy. While carrying out procurement procedures, public authorities represent interests

Table 1

Information about all orders in the period 01.2008−12.2011

Method of placing orders	Number of placed orders	Number of customers	C_c^{Σ}, mln rub.	C_{Σ}^{abs}, mln rub.	C_{Σ}^{rel}, %
Open tender	54473	9914	1306723.162	118866.187	9.1
Open auction	38981	5285	548566.869	55080.369	10.4
Request for quotations	493084	14574	162472.754	36163.387	22.26

of society. Under these conditions, the efficiency is defined as the utility maximization of consumption of public goods in conditions of budget constraints. Consequently, in the existing legislation, the idea of efficiency is replaced by the concept of economy; the objective function of the state being an economic agent is aimed to minimize budgetary costs. Such behavior is aimed at minimizing costs, for the care of the producers. However, manufacturers function in competitive conditions and an alternative to public goods may not exist or is not accessible to the entire population. The question arises: whose interests does the state government advocate during the bidding procedures for the purchase of goods for public needs?

The system of performance indicators of public procurement from the perspective of utility or satisfaction of society requires that the public administration reform and introduce results-based budgeting, where the purpose of government is to ensure the results, rather than budgetary savings.

2. Disadvantages of methodology of public procurement.

Russia »borrowed» the concept of government procurement from the US economy. The Federal Contract System (FCS) of the USA is considered as the most successful in the world. The history of its formation and development goes back to the 1890s: in that period, it was used extensively in the US military, and then gradually spread to other government departments. For more than a century, the establishment and development of the FCS has become a well-organized mechanism with a binding legislative regulation. According to many experts and lawyers, no sphere of the activity in the United States has such tight regulation as the FCS.

The FCS of the USA is based on the following methodological principles (Fig. 2): methods of procurement; methods of price-making; methods of contractor's co-operation.

Fig. 2 highlights the principles which are not regulated in the Russian Federation. During the grafting of the institute of public procurement in Russia, procurement methodology was implemented only partially.
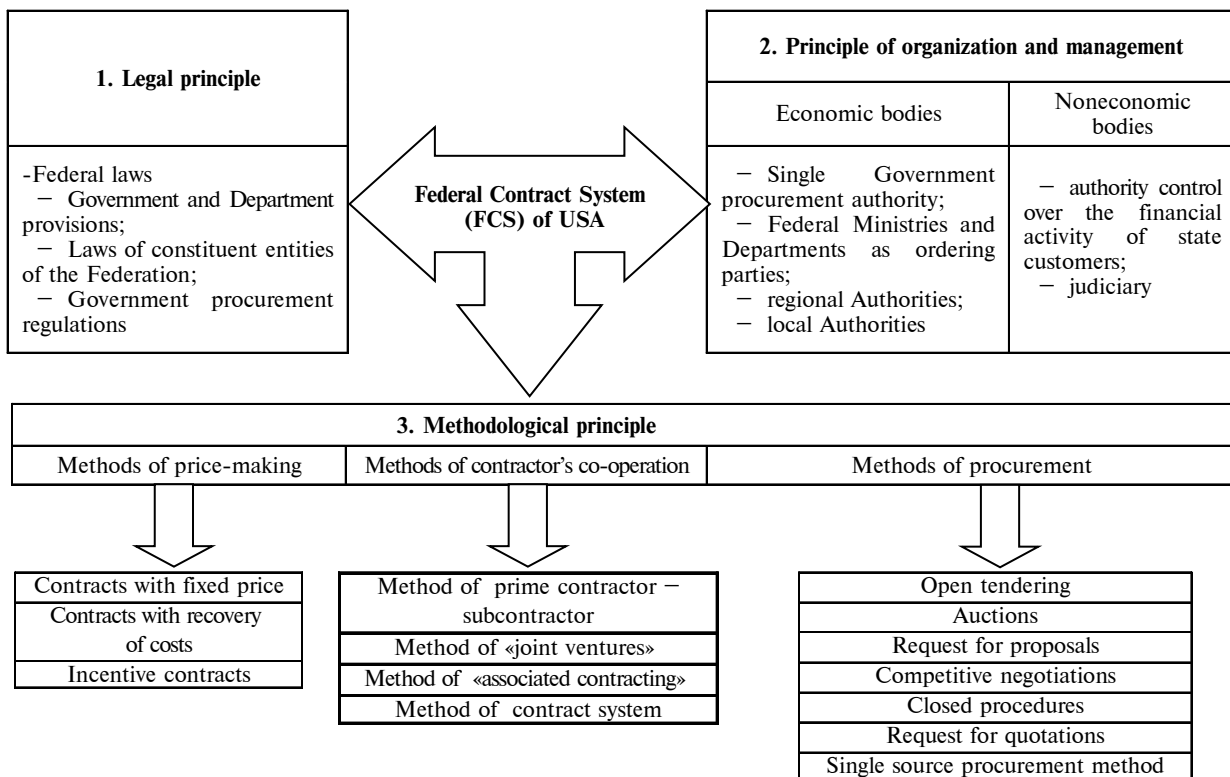
Fig. 2. Principle of public procurement in the USA

Basic methods of pricing in the contractual relations between enterprises and the state [3]

Pricing methods	Calculation base	Method of profit determining	Sphere of using
Contracts with fixed price	planned costs and planned profit	Profit lies in the a predefined price of the contract	Used in areas where it is possible to predict the arising costs with a reasonable degree of probability
Contracts with fixed price promotional type		Correction of the final profit margin depends on the performance of the company	
Contracts with recovery of costs	Evidence costs	Earnings are established separately, usually as a percentage of the actual costs	Used in areas where it is impossible to predict the arising costs with a reasonable degree of probability
Contracts with costs recovery promotional type		Correction of the final profit margin depends on the performance of the company	

The current law establishes the use of competitive procedures, simplified procurement, such as auctions, request for quotations, and closed procedures. In Russia, methods of procurement for technically sophisticated products are not applied, thus it cannot effectively organize the procurement of major construction works, research projects and innovative products.

Let us consider the purpose and functions of different methods of pricing in the FCS. The pricing mechanism is based on such characteristics as technical parameters of the orders, target price and earnings, the actual price and profits, as well as a complicated matrix of incentives or sanctions in case the failure of the order or for not complying with the technical and economic parameters of the contract [2, 7].

Tab. 2 shows the basic pricing mechanisms which are used in contracts concluded between enterprises and the state, being currently developed and applied in practice with its numerous modifications.

Profit for contractors is considered as the main incentive for efficient perfomance of government contracts. The difference between forms of government contracts firstly is that the profit is included in the price of the contract and all the risks associated with over-cost are run by the contractor. Secondly, the profit is established by the state customer individually, as a special contractor's fee, a percentage of the costs and the state runs all risks of overspending of planned costs. Finnaly, there is a risk of overstating the actual costs of the contractor and the introduction of this method of pricing is only possible in ensuring effective control over contractor's costs.

In the world practice, the fixed-price contracts are most common. Restrictions of the use of fixed price contracts is the ability to obtain reasonable estimate of future costs, for example, when dealing with high degree of scientific and technical uncertainty.

In the system of government procurement, Russian methods of pricing are not regulated by any legal act, the only exception being the price index for the procurement in the Ministry of Defense. Usually, the method of fixing prices is used there.

The Russian legislation and public procurement practice does not establish that profit is the main promotion tool for companies participating in tenders and obtaining the state contract. State customers are not interested in cost and size of the contractor's profits, as in the case of using the fixed-price, when all risks associated with inflation, rising prices of raw materials, changes in customs tariffs and currency fluctuations are taken by the contractors. As a result, government contractors try to compensate the possible risks in the contract price, which increases the cost of similar products for state needs, compared with market purchases. If this is impossible in view of high competition during the bidding procedures, government contractors seek to collude in order to divide the market of public contracts, for example, on a territorial basis, to reduce competition and establish monopoly power, which, subsequently, affects the growth of prices of products for public use. If there are uncompensated state contractor risks during the implementation of the state contract, government contractors do not accomplish work to save costs,

do not deliver goods or make them with a lower quality. As far as a final consumer of products and a purchaser of products are different economic agents on the public orders market, facts of violation of public contracts conditions are usually hidden from the consumers by purchasers and contractors. In this case they are usually forced to collude.

In the event of unforeseen risks, the contractor is unable to fully meet the conditions of the contract and the only way out, in order to minimize the risk of a breach of contract and the legal consequences of liability for failure to comply with the conditions of the contract, is collusion between government customers and contractors, which leads to the signing of acts of acceptance of outstanding work or contracting for additional budget funding.

The next important methodological principle of public procurement in the FCS is the methods of contractors' co-operation. In order to insure successful implementation of government contracts, there are forms of cooperative contractors ties or sub-contracting system. These forms differ in the distribution of responsibilities between the co-executors of work, their relationships with customers and among themselves. In the essence, they conform to traditional forms of private business market, i. e. have the character of private companies, partnerships, associations or corporations. The choice of the form is usually made by the state customer, given the complexity, scale, urgency of the contract, as well as proposals of applicants.

In Russia, the forms of cooperation of state contractors are not governed by any regulation. In practice, this leads to the fact that the government customer concludes a contract with one firm for execution of work, and he enters into several subcontracts in turn, and work is performed by a third company. This company has not participated in the bidding system, its experience and qualification of staff may be insufficient, but the government customer has neither the right to interfere in the economic activities of the contractor, nor the control over its relationship with other contractors. On the one hand, involving subcontractors in the execution of works for public use leads to an overestimation of the value of the contract. On the other hand, there are orders for large civil works, where a contract with one firm is unreasonable, because such firms do not have enough production capacity.

In order to reduce the concentration of the industry, the state may require the main contractor to transfer part of the contract according to the subcontracting system. The main advantage of the customer in case of not spontaneously formed subcontracting system, but regulated by the state, is that the state has the ability to monitor the implementation of the state order over all sub-contractors to choose the optimal form of interaction, providing a higher level of performance of government contracts, promoting cross-sectorial and intra-industry cooperation and specialization, and the decrease of concentration in sectors of the national economy. The choice of optimal form of interaction is important in an innovation economy, where a small innovative firm can lead the large industrial enterprises of different industries.

3. Problems of transplantation of international institute and principles of public procurement.

In our opinion, the reasons of an unsuccessful transplantation of international institute of public purchases or procurement, whose effects are expressed in the growth of corruption and inefficient spending of budget funds, are in violation of the principles of reforming of the national economy and the low level of development of basic institutions of the market economy in Russia. The process of transplantation involves the process of borrowing institution which developed in different institutional environments [4].

The institution is a social good, but some groups of population may benefit from its introduction, others may suffer losses. Consequently, the same institution can be both a positive and a negative good. Since the earliest stages of the implementation of public procurement market, it has been impossible to define the population group (without members of the shadow economy), which benefits from its implementation: consumers consume low-quality products, companies have additional costs and risks, the state budget overruns. Ultimately, the more negative the demand on the institution, the higher the transformation costs of the state, relating to the maintenance and operation of the institute. Resistance force on the introduction of the institute was that during the first ten years of

reform (from 1992 to 2003) the Antimonopoly Committee, the main supervisor in this area, noticed that most regions of the country do not organize competitive bidding for the purchase of goods for state needs and buy mostly from a single source and this is the main type of breaking the law [5]. As a result, from 2003 to 2005 a new law was developed and adopted now in force: 94-FL.

The current institution of procurement in Russia is dysfunctional. This dysfunction shows up the atrophy and degeneration of the institute. Its destructive function intensified as a result. In the USA, the Institute's country donor, the level of corruption in public procurement is estimated 60 % of the value of all major contracts [7]. In Russia this rate reached 90 % or more of the cost of all government contracts [6]. The Institute maintained a formal identity, but has become a tool of the shadow economy for managing flows of budgetary funds.

Polterovich V.M. identifies three causes of dysfunction of the institution [4]:
 − socio-cultural characteristics;
 − initial social and macroeconomic conditions;
 − technology selection transplantation.

The degree of functional differences of market economy institutions in Russia as a recipient, and the USA as a donor of the institution, is great. The level of the development of entrepreneurial culture, the degree of effectiveness of the judicial system, the degree of community participation in the control over the actions of the state, have significant differences. It should be noticed that the institute was grafted after carrying out lots of reforms and changes in a market economy.

The lack of institutional infrastructure of the market economy make a barrier to successful transplantation in Russia. Successful operation of the judicial system, an open civil society would limit the conclusion of corruption or disadvantageous contracts for the sake of society view as a consumer of public services and contributed to the redistribution of losses and their compensation as a result of judicial decisions, but this does not happen.

The way of transfer of the public procurement institute also leaves much to be desired: this institute was copied only partially. As it was mentioned above, in Russia there were implemented only parts of the International Procurement Institution, such as organization of tenders in form of advertised bidding and closed bidding, requests for quotation and auctions. Such important elements of public procurement as method of pricing and co-operation, which ensure achievement of objectives for government contractors and customers and ensure risks management for government contracts, were not implemented. Mechanisms of public procurement were also affected by mistakes in organization and management, such as the absence of a single body coordinating and controlling operations of the system at federal, regional, and local levels.

The implementation of the Russian Federation system as the FCS in a direct way is impossible, due to the impossibility, in the short term, to build a complex hierarchical system with strong vertical links, and with a strong system of regulation and control. The lack of a single coordinating authority in Russia leads to a constant problem of control over the budget spending.

Conclusion. To sum up, we can distinguish the following reasons for the failure of reforming the public procurement system Russia from 1999 till 2010. which appeared in the growth of corruption and the delivery of low-quality public goods.

The first reason is incorrect behavior of government customer whose aim is to save budgetary funds during creation of government contracts, while the primary aim should be the satisfaction of social needs and interests of society during the procurement operation. Thus, in Russian practice the main goal of public procurement is not efficiency but money savings, which leads to delivery of low quality goods, works and services to the public market.

The second reason is due to inadequate or partial regulation methodology of public procurement. Transplantation of only separate elements of the American FCS − tender and »fit to meet international standards» of federal law has not led to effective spending of budgetary funds. On the contrary, it triggered a rise in corruption. Such important elements of government procurement as pricing methods, which encourage the contractor to make a profit providing qualitative products and to control the level of the costs, and also methods of cooperation, which ensure to control all the contractors and subcontractors, are completely excluded from the Russian legislation. As a result, the system is absolutely dysfunctional for

concluding important contracts for construction or purchasing innovative products and researches.

The last but not the least reason of failure is due to unsuccessful reforming of Russia's institutional environment to take the institute from advanced market economy, which resulted in the dysfunction of the transplanted institution.

The underdeveloped institutional environment is attributed to the low level of entrepreneurial culture, a low degree of effectiveness of the judicial system and the lack of public participation in controlling the actions of the state, the lack of public confidence in government and non-professionalism of civil servants, and reformers.

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KUDRYAVTSEVA, Tatiana Ju. – *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: tankud28@mail.ru

КУДРЯВЦЕВА Татьяна Юрьевна – *доцент кафедры финансов и денежного обращения Санкт-Петербургского государственного политехнического университета, кандидат экономических наук.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: tankud28@mail.ru

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L.B. Gushchina, M.G. Livintsova

ACTIVITY ANALYSIS AND PERSPECTIVES OF DEVELOPMENT OF POWER EQUIPMENT PRODUCTION IN RUSSIA

Л.Б. Гущина, М.Г. Ливинцова

АНАЛИЗ СОСТОЯНИЯ И ПЕРСПЕКТИВЫ РАЗВИТИЯ РОССИЙСКОГО ЭНЕРГЕТИЧЕСКОГО МАШИНОСТРОЕНИЯ

In clause problems of competitive situation in domestic energy machine industry at the present stage are studied. Main tendencies of its development are stated due to growth of sales opportunities and improvement of product quality.

ACTIVITY ANALYSIS. ECONOMICS OF INDUSTRY. THE ENERGY MACHINE INDUSTRY. INNOVATION LEVEL. INVESTMENT APPEAL.

Рассмотрены вопросы, связанные с состоянием энергомашиностроительной отрасли на современном этапе. Определены тенденции ее развития с учетом повышения конкурентоспособности и качества производимой продукции.

АНАЛИЗ ДЕЯТЕЛЬНОСТИ. ЭКОНОМИКА ОТРАСЛИ. ЭНЕРГЕТИЧЕСКОЕ МАШИНОСТРОЕНИЕ. ИННОВАЦИОННЫЙ УРОВЕНЬ. ИНВЕСТИЦИОННАЯ ПРИВЛЕКАТЕЛЬНОСТЬ.

Energy independence characterizes the level of economy development and its growth opportunities. That is why the energy machine industry is one of the main elements of providing the technical level of national security.

The energy machine industry plays the leading role in the development of the most important branches of domestic industry providing the equipment for nuclear power industry, fuel and energy complex, metallurgy, transport, public utilities, defense, and other branches of industry. The energy machine industry includes engineering, production, delivery, assembly, servicing and modernization of equipment for thermal stations, nuclear, hydraulic and gas-turbine power plants, and others.

The equipment produced at the power engineering factories is science intensive, expensive, unique and low volume production with prolonged cycle of manufacturing (up to 5−7 years). At the same time, capital-intensive character of power engineering and high threshold of entry into the industry specifies the high level of production concentration.

The share of Russia's participation in the world market is currently insignificant ($1.5−2.5 bln) and is about 2.0 % (see Tab. 1) [1].

Table 1

The Structure of the Global Market of Power Machine Engineering

Producer	The world market share, %	Volume of output of power equipment, $ bln	
		2010 year	2011 year
General Electric Energy	24.0	29.0	31.1
Siemens PG	16.0	17.3	20.0
Alstom Power	10.0	15.7	15.3
MHI PS & GM	10.0	14.5	16.1
Russian manufacturers	~2.0	~2.0	~2.4

Source: Accounting of companies, Ministry of industry & trade of Russia.

The Russian industrial sector numbers more than fifty enterprises, where the level of competition remains limited because of the historical specialization and uniqueness of the product. «Power Machines», Group of Companies «Atomenergomash», «OMZ» Group, and «ENERGOMASH» Business Group play the key role.

According to data of The Ministry of industry and trade of Russia the share of power engineering industry in the gross domestic product is 0.2 % (until the 1990s − 3.0 %). It refers to the branches which supply the equipment in order to achieve the overall purposes of the national security and dynamics of economic growth [1].

The whole situation in the Russian power equipment market is characterized by the gap between the amount of the applications for the equipment supply and the number of the contracts financed by the customers. In this respect, the export contracts are more reliable and predictable: unlike the Russian contracts they ensure loans to finance manufacturing. Nowadays, production export is 20−30 %, out of which the biggest share (40−60 %) is steam and hydraulic turbines. It is worth noting that export structure preserves the traditional proportions typical of the Soviet export: ~55 % of export (excluding nuclear power equipment) goes to Asia, up to 35 % − to South America, and a small share goes to Europe (the value of export of energy machines in 2011 amounted to more than $300 mln). The biggest import share in the domestic market (about 50 %) is for gas turbines (import value is about $100 mln).

According to Russia's statistics department, in 2011 the summarised financial earnings of the factories of power engineering complex exceeded 45 bln rubles. By the end of the year, 74 % of the factories were profitable. The average efficiency of the production sold in 2011 was 7−10 %, production index was 106.9 %, and the revenue was about 150 bln rubles [2]. One of the reasons of the energy machines production growth became the realization of capacity supply agreements by the Energy companies. It is stimulated by higher tariffs on the capacity, and other benefits, which allow quick return on investments. In addition the demand increased for gas processing units for pipeline transport. The growth of gas turbines production was faster than the growth rate of steam and hydraulic turbines production [3].

The structure of the domestic energy machine industry in terms of the companies' income in 2011 is shown in Fig. 2, and the structure of products manufactured by companies in Fig. 3.

The number of employees occupied in power machine production is close to 105 000 people. The average monthly salary in the biggest enterprises reaches 28 000 rubles, which is up to 93.3 % of the average level in the whole industry.

The tear and wear of test and bench facilities in the majority of factories reaches 90−100 %, industrial funds of the basic activity is 54−57 % including machines, and equipment is above 75 %.

Over 60 % of the main technological equipment in the power machine plants worked off from 20 to 30 years. That is why the productivity of the machinery equipment decreased, labour-intensive job increased, and self-cost and quality of the product conceded to foreign analogues.
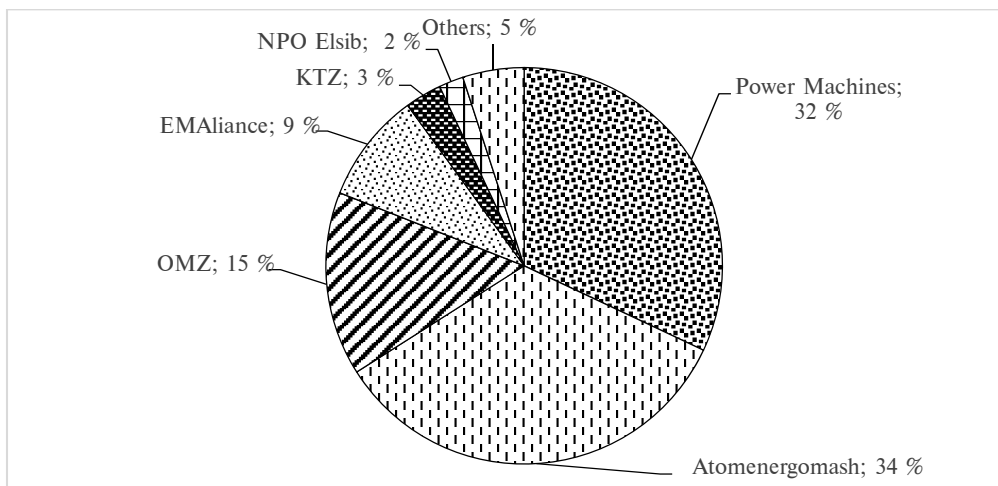
Fig. 2. The structure of energy engineering industry of Russia in 2011.

Source: «Atomenergomash»
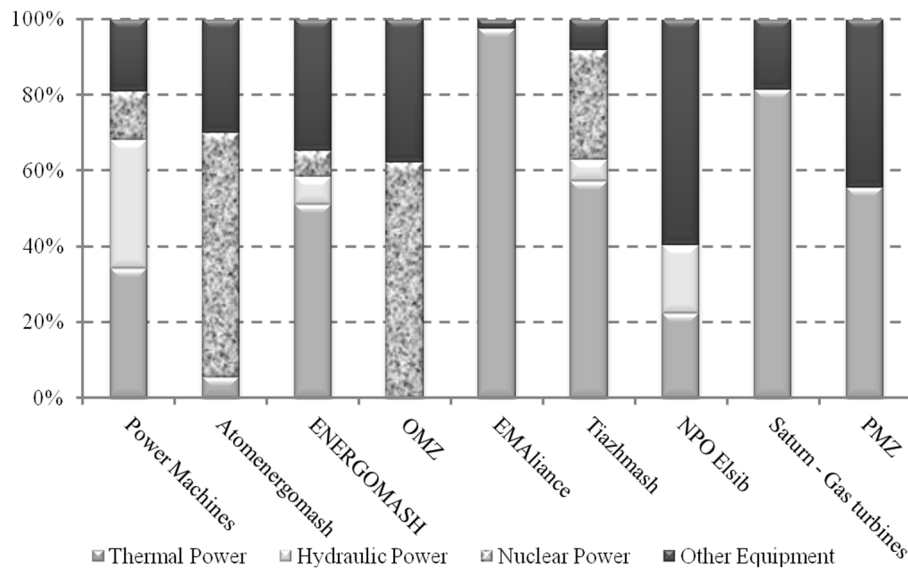
Fig. 3. The structure of products manufactured by energy engineering industry
Source: Accounting of companies.

The level of advanced technologies in this branch of industry is no more than 14 %. At the same time, high-performance equipment is concentrated mainly in the gas turbines production, which is relatively new in Russian power engineering industry. The analysis of the capacity planning shows that the most high machine utilization coefficient at the plants producing gas turbines ranges from 40 % to 70 %. For other types of products, the level of industrial equipment load averages 20−30 % [3, 4].

The current state of the industry leaders raises serious concerns regarding the possibility of self-reliant realization of the projects on sharp increase of power generating capacities in Russia. The main results of the financial-economic activities of the largest enterprises are given in Tab. 2.

The wear and tear of energy equipment in Russia demands technology and innovation breakthrough which requires significant investments and pooling the efforts of all Russian plants. The global competition demands the establishment of large companies in Russia. Otherwise insufficient financing may hold back modernization and renovation.

In order to solve the problems of financing investment projects and competition with the foreign producers, the domestic energy equipment producers underwent expansion of their businesses in the mid-1990s creating financial-industrial groups («Energomashcorporation», «Uralmash-Izhora» (OMZ), «Power Machines», «EMAlliance»). The company «Atomenergomash» was established within the system of «Rosatom» in 2006. The last merger of «EMAlliance» and «Power Machines» took place in February 2012.

As the output of the foreign companies in the Russian market is limited, global cooperation develops. «Power Machines» has the license of the company Siemens to manufacture gas turbines with the capacity of 160 MW and 270 MW (31 units were produced in the last 7 years). In 2011, «Power Machines» signed an agreement with Siemens to establish a joint venture «Siemens Technologies Gas Turbines» to manufacture and provide maintenance of gas turbines of over 60 MW, with the share of Siemens being 65 % and «Power machines» share being 35 %. In 2012, «Power Machines» and the Japanese Corporation Toshiba reached an agreement to construct a plant for manufacturing and supplying power transformers voltage class from 110 kv to 750 kv, with capacity from 25 MBA to 630 MBA worth more than 5 bln rubles in investments. The plant will be built on the sites of «Power Machines» in the town of Metallostroy near Saint-Petersburg, and phase one of the constructions of the new power equipment plant is in progress.

Table 2

Operational and Financial Results

Indicator	Year	Power Mashines	EMAlliance	Atomenergomash	Izhorskiye Zavody (OMZ)	NPO Elsib	Saturn – Gas Turbines	Tyazhmash	Klimov	ZVEZDA	PMZ
The Portfolio of Orders, $ mln	2009	1688	1356	1287	—	69	—	207	—	—	300
	2010	4194	1542	2587	—	63	—	324	—	—	345
	2011	5080	1708	2846	—	154	—	394	—	—	375
The Revenue, bln rubles	2009	51.8	9.6	16.0	6.8	1.7	3.16	4.9	3.3	0.9	11.5
	2010	45.3	13.8	20.0	5.7	2.2	6.2	4.1	5.5	1.37	13.6
	2011	47.3	12.4	50.9	7.2	2.1	7.3	5.4	6.9	0.85	14.3
The Cost, bln rubles	2009	36.6	6.9	12.3	4.7	1.1	2.65	3.08	2.56	0.77	10.8
	2010	30.8	9.98	15.2	4.5	1.44	5.54	2.49	4.72	0.95	11.2
	2011	31.4	9.0	41.5	6.0	1.37	6.67	3.8	6.59	0.87	12.4
The Net Profit, mln rubles	2009	6006	355	1382	231	69	104	990	292	20	-209
	2010	6542	520	725	195	96	183	503	465	224	10
	2011	9253	72	1707	10	21	95	197	−68	0.23	2
The Average Number of Personnel, person	2009	18061	4077	8593	2808	1655	2346	3586	2070	1243	8491
	2010	10573	4192	10027	3247	1879	2348	3468	2000	1177	8178
	2011	10489	4366	21254	3491	1917	2319	3924	2000	1300	8147
The Average Salary, rubles	2009	36500	16000	30200	30133	25688	18330	13760	26100	19242	19100
	2010	37500	16894	34600	33444	27597	23199	15607	31591	27795	21600
	2011	52000	19428	38000	36690	29620	23647	17091	35697	33248	25151
Investments, mln rubles	2009	1990	174	1615		297	134	—	—	16	437
	2010	3927	418	12838	2400	264	301	—	10	110	494
	2011	4300	1760	5245		231	362	2736	19	44	453
	2012ᵖ	4700	200	—		—	—	4000	—	—	—

Source: Consolidated Accounting of companies in 2009−2011.

According to the agreement, the Russian-Japanese joint venture will allow to solve the problems of complex modernization of the main electric grid facilities on the basis of the advanced innovative technologies.

Since 2007 a priority direction of «Atomenergomash» activity becomes the development of the international cooperation and the output in the global market. Joint venture «Alstom Atomenergomash» was created together with the French company Alstom Power Holdings SA to produce half-speed turbines and generators for nuclear power plants on the basis of the licensed technology «Arabell». «Zio-Podolsk» is the shareholder of 51 % of this company. Besides, a working group with Toyota was established in 2008. And in 2009 «Atomenergomash» in the face of a group of companies REMCO signed the

license agreement with the Dutch company NEM to promote the boiler equipment for thermal power engineering.

In 2007 the Japanese Corporation Mitsubishi Heavy Industries concluded an agreement on partnership with Ural turbine plant to produce by the Japanese license gas turbines with the capacity from 170 MW to 270 MW and also steam turbines of high power (up to 660 MW). Such a strategy would allow to increase its production level up to the world level within a short time.

General Electric cooperates actively with the Russian aircraft building plants in production of turbines of small capacity. General Electric (has a 50 % share in the capital), the holding company «InterRAO UES» and «United engine-building Corporation» in face of «Saturn − Gas Turbines» (each has 25 % of shares) signed an agreement to establish a joint venture to build a plant in Yaroslavl region of Russia for manufacturing and further implementation of the high-performance industrial gas turbines with low emission 6FA with the capacity 77 MW. The start-up of the plant value of 5 bln rubles is planned for 2013. The enterprise should produce 14 sets a year.

In 2008 General Electric and REP Holding in the framework of the license agreement on the localization technologies signed the contract for assembly of gas-pumping units GPA-32 «Ladoga» on the basis of gas-turbine plants GE MS5002E at «Nevskiy zavod». The technology GE MS5002E is an improved version of the production line GE MS5002. The new turbine is distinguished by its high industrial type of efficiency 36 %, the low level of emissions, and significant resource of work, high reliability, and operating longevity in comparison with the Russian units. The gas turbines GE fifth series are in operation around the world more than 16 mln of hours.

The companies Alstom and «RusHydro» have established a joint venture «AlstomRusHydroEnergy» in 2011. «RusHydro» has 50 % plus one share in the capital of the joint venture. The joint venture will manufacture the equipment for small hydropower plants with the capacity 25 MW, and with the average capacity 100 MW, for pumped storage power plants with the capacity of up to 150 MW, and also the support equipment in Ufa

(Bashkortostan) up till 2013. Alstom ensures the implementation of best practices of operational management and the transfer to the joint venture of advanced technologies for the equipment production and its further maintenance in accordance with the license agreement. The total project investment will amount to 125 mln Euro.

The opportunities of development of the power engineering market in Russia are connected with the plans for introduction of new generating capacities which are defined in the basic provisions of the «Energy strategy of Russia for the period up to 2030», approved in 2009, and corrected in 2010. in «General scheme of accommodation of objects of electric power industry in Russia up to 2020 with perspective up to 2030» of the Ministry of energy of Russia, as well as the business program of the state corporation «Rosatom» on a long-term period (2009−2015) for the nuclear power industry.

General scheme of accommodation of electric power industry objects in Russia fixes the key provisions of the requirements to the volume of the production capacities and necessary technologies:

entering of not less than 4 GW per year;

the transition to a steam-gas cycle, decommissioning of outdated steam power equipment. The development of gas turbines production with the capacity 65−350 MW and PSU on their basis with the capacity 400−1000 MW;

the transition to clean coal technologies (including on coal-fired power units with the capacity 330 and 660 MW on the ultra supercritical steam parameters, PSU with gasification of coal);

the development of typical co-generation systems including half-power on the basis of GPU-, GTU-, PGU-CHP (with specific electricity generation with consumption 1200 to 1500 kWh/Gcal);

minimization of various equipment, modular delivery, type design;

the creation of intellectual networks (SMART GRID). At the first stage the development of electrical networks on the basis of digital technologies, DC systems, flexible AC system with devices vector control is being planned;

increasing the usage of alternative renewable energy sources;

the development of the directions of service and modernization, and the others [1].

The analysis determined the investment program. It provided realization of more than 100 investment projects with the total volume of input of generating capacities NPP, hydroelectric power station, hydroelectric pumped storage power station, thermal power plants, and renewable energy sources for the period 2010–2030 as amended by 161.3 mln KW. The total investments will amount to 20 bln rubles (in the prices of 2009) to implement the General scheme of the electric power industry development, from them of 9.8 bln rubles for the improvement of power plants. The plans of the government of the Russian Federation take into account the tendency of increasing the capacity of the world's energy system. Accordingly domestic companies should take 15 % of the global market of electrical and engineering goods by 2030.

The role of the energy engineering industry will increase in the forthcoming period to solve the problems of energy development, first of all the replacement of physically worn out and obsolete equipment, to prescribe expectancy as well as the creation of cost-effective power equipment on the basis of high-performance environmentally energy processes.

The maximum unification of the power units is assumed in the document «Main provisions of the technical policy in the electric power industry of Russia for the period up to 2030» developed by RAO «UES of Russia» with RAS. It will increase the mass production of their construction, and therefore the serial production of the equipment for power plants. It is planned to reduce the number of types of turbines for thermal power plants in three times and produce 11 types of units: 7 types – for gas and 4 types for coal-fired turbines. Serial production will allow reducing the terms of manufacturing of the main energy equipment on 30 % and its cost reducing on 20 % compared with piece order. This will allow saving significant funds in scales of the global energy system.

«The Program of activity of the state Corporation for atomic energy «Rosatom» for a long-term period up till 2015» was adopted in the field of nuclear energy in 2008. According to this program 5 nuclear power plants should be constructed up to 2015 and 8 power units installed on them with the total capacity of 12.3 mln kW.

However, the General scheme provides development of 11 new sites with placing on them 26 units with the total capacity of 2,.0 mln kW up to 2030. The amount of recommended commissioning of generating capacities of the nuclear power plants is defined in the amount of 37 units with the total installed capacity of 40.3 mln kW up to 2030. Two units will be put into operation on the floating nuclear power plant (FNPP) [5].

The technological development of power engineering plays a crucial role in the innovative development of the country, as directly linked to the realization of a number of national priorities of the scientific and technological development.

«The Strategy of development of power engineering of Russian Federation for 2010–2020 and on prospect up till 2030» was adopted in 2011 [1].

The realization of the Strategy will be implemented in three stages:

1 stage (2010–2016). The system of innovative development of the power industry is formed on the basis of scientific-technical and innovation potential of the country's power engineering. Technical re-equipment of the enterprises of the power engineering industry is planned to produce the unified power equipment competitive in the domestic market.

2 stage (2017–2020). The serial production of competitive products in the world market of power engineering should be organized. The share of power units with the use of imported equipment should draw up to 2015 no more than 40 %, further to be sustained at the level of 10–15 %.

3 stage (2021–2030). To meet the domestic needs in power engineering production, gaining 15 % of the world market.

The Ministry of industry and trade of Russia estimates forecast financing of actions of the Strategy in the amount of 157.37 bln rubles in the prices of the corresponding years at the expense of all sources of financing for the period up to 2020. including the accounts of the funds of the Federal budget 22.33 bln rubles for a period of 2021–2030 – 155 bln rubles, including 15.6 bln rubles at the expense of funds of the Federal budget.

The nearest plans for the power engineering development should provide for every eventuality investment climate improvement in the innovative field.

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GUSHCHINA, Larisa B. – *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: glb2006@list.ru

ГУЩИНА Лариса Борисовна – *доцент кафедры экономики и менеджмента недвижимости и технологий Санкт-Петербургского государственного политехнического университета, кандидат экономических наук.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: glb2006@list.ru

LIVINTSOVA Maria G. – *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: livintsova@hotmail.ru

ЛИВИНЦОВА Мария Геннадьевна – *доцент кафедры экономики и менеджмента недвижимости и технологий Санкт-Петербургского государственного политехнического университета, кандидат экономических наук.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: livintsova@hotmail.ru

UDK 330.322.214

L.V. Nikolova, Ju.V. Radionova

A MODEL FOR THE OPTIMIZATION
OF A REGIONAL INVESTMENT PROGRAM

Л.В. Николова, Ю.В. Радионова

МОДЕЛЬ ОПТИМИЗАЦИИ ИНВЕСТИЦИОННОЙ ПРОГРАММЫ РЕГИОНА

The article reviews the question of building a regional investment program in the context of limited resources. When building a regional investment program in the context of limited resources, a need arises to construct a portfolio of orders with regard to their hierarchical priority, which, in this case, means a criterion for optimization. Using this approach, a program includes, first of all, objects which have qualitatively assessable indicators with higher values. To solve this task, we can use mathematical modeling tools and optimization (normative) tools containing expressions with algebraic operations, which can be maximized or minimized with certain limitations.

INVESTMENT PROGRAM. OPTIMIZATION. PRIORITY. REGION. HIERARCHICAL ANALYSIS METHOD.

Рассмотрен вопрос формирования инвестиционной программы региона в условиях ограниченности ресурсов. При формировании инвестиционной программы региона в условиях ограниченности ресурсов возникает необходимость формирования «портфеля заказов» с учётом их иерархической приоритетности, что является в данном случае критерием оптимизации. При таком подходе в программу включают, в первую очередь, объекты, имеющие количественно измеренные более высокие показатели. Для решения этой задачи можно использовать аппарат математического моделирования, модели оптимизации (нормативные), содержащие выражения с алгебраическими операциями, которые можно максимизировать или минимизировать при определённых ограничениях.

ИНВЕСТИЦИОННАЯ ПРОГРАММА. ОПТИМИЗАЦИЯ.ПРИОРИТЕТНОСТЬ. РЕГИОН. МЕТОД АНАЛИЗА ИЕРАРХИЙ.

Introduction. At the current stage of market relations development, unlike in preceding periods, a priority assessment of permanent facilities is a must for the purposes of the development and optimization of a regional capital construction program. To solve this task, we can use mathematical modeling tools and optimization (normative) tools containing expressions with algebraic operations, which can be maximized or minimized with certain limitations. Priority assessment criteria should conform to the following requirements:

goals and objectives of investment activity participants must be taken into account as fully as possible;

possibilities for constructing and developing investment objects, along with investment outcomes, must be assessed comprehensively with due regard for technical and economic characteristics of capital construction;

an ordered hierarchical set must be applied in its composition and content [1].

This set of data must underlie the process of building a hierarchy of criteria, which, in turn, is a structural organization of compound multilayered systems.

1. A mathematical economic model of priority assessment for capital construction objects

Let us build a mathematical economic model of priority assessment for objects of capital construction. For this purpose, application of the method of paired comparison seems to be most practical; the method is used when compared objects can be matched only subjectively, i. e. when precise measurements are impossible to help decide which of the two is more preferable. The chief goal of this comparison is to organize objects. The Tab. 1 shows a set of criteria for object priority assessment to be used for the

Criteria for priority assessment of capital construction objects

Groups of criteria	The content of a group of criteria
Target criteria	Composition of target criteria is defined by performance/operational requirements of investments object users. Overlapping of some target criteria with criteria of other groups is acceptable.
External and environmental criteria	Object construction enforceability
	Influence of an investments object on employment rates
	Environmental friendliness of object construction
Criteria by EPCM carrying out the construction works	Brief description of EPCM's management personnel
	Financial stability of the EPCM
	EPCM's economic activity results and tendencies
Engineering criteria	Maturity level of the construction object
	Technical and economic parameters of the object
	Positive impact on other objects
Economic criteria	Construction costs
	Risks related to the allocation of capital investment for the construction
Regional-specific criteria for object construction	Object construction compliance with regional legislation
	Regional resource potential
	Regional infrastructure situation (communications and banking services)

development of regional investment programs. When using the paired comparison method, we need a qualitative assessment to help us objectively assess the compared pairs of elements with the aim of revealing the preferred ones [2].

There are three main forms to obtain data on the preferability of this or that element:
− quantitative data based on substitutions;
− information based on the interpretations of a linguistic variable: to compare alternatives, meanings of a linguistic variable are specified − «approximately equivalent», «slightly better», «significantly better», etc.;
− information in the form of an ordinal scale.

The application of the most convenient ordinal scale for paired comparisons in the range between 0 and ∞ may prove useless because human faculty of discerning is limited. Therefore the scale must be a limited range, in accordance with the possibility of making relational assessments. Because 1 is a standard unity for measurements [3], the upper limit of the scale must not be too far from this value.

On the other hand, this range must at the same time correspond to the ability of a decision-maker to perceive changes in the value being measured. So, we have to increase the measured quantity s by a minimal value Δs, in order to reach the state when our perception is already capable of discerning between s and $s + \Delta s$.

Perception changes are observed when the measured quantity is increased by a constant percentage, which happens when Δs is insignificant if compared with s; perception change practically vanishes when s is too small or too large. If s_0 is the first value of the measured variable, then the next perceived change of it (s_1) will be defined in the following way:

$$s_1 = s_0 + \Delta s_0 = s_0 + \frac{\Delta s_0}{s_0} s_0 = s_0(1 + r). \quad (1)$$

Similarly,

$$s_2 = s_1 + \Delta s_1 = s_1(1 + r) = s_0(1 + r)^2 \equiv s_0 \alpha^2. \quad (2)$$

In the general case,

$$s_n = s_{n-1}\alpha = s_0 \alpha^n \quad \text{when} \quad n = 0.\ 1,\ 2... \quad (3)$$

Thus, perceived changes of the variable s are ranged along the exponential progression. On the other hand, the time of perception is an arithmetic series of discrete points where only barely discernible differences are observed. These points can be defined if we solve equation (3) for n; as a result, we have:

$$n = \frac{\lg s_n - \lg s_0}{\lg \alpha}. \tag{4}$$

If we indicate perception by $M = \lg \acute{\alpha}$ and solve the equation (4) for this variable, we have:

$$M = \frac{1}{n} \lg s_n - \frac{\lg s_0}{n}. \tag{5}$$

By indicating $a = 1/n$ and $b = -\lg s_0$ we have the Weber-Fechner law:

$$M = a \lg s + b, \quad a \neq 0. \tag{6}$$

When perception is $M = 0$. which happens if the object (criterion) is compared to itself, it follows that if $b = 0$ $\lg s_0 = 0$ or $s_0 = 1$.

The next observable perception with $s_0 =$, according to equation (3) will be defined in the following way:

$$s_1 = s_0 \alpha = \alpha, \tag{7}$$

In formula (4), its value is $\lg \alpha / \lg \alpha = 1$. The next observable perception of the measured variable will be defined in the following way:

$$s_2 = s_0 \alpha^2. \tag{8}$$

It takes the value of «2». Thus we have a series of 1, 2, etc.

In practice, the key qualitative distinctions are few: approximately five of them, while additional ones are compromises between the adjacent key distinctions, thus making the total number = 9. Besides, there are other reasons for fixing the upper limit of the scale [4]:

− qualitative distinctions are significant, they have some accuracy when compared objects are homogeneous or close to each other in terms of the property (criterion) used for assessment;

− human faculty of making qualitative distinctions is very well represented by five definitions (equal, slight, strong, very strong, absolute), while, for even greater accuracy, we need to compromise definitions between the above five, which eventually gives nine meanings;

− for assessment of individual objects a *distinction zone trichotomy* is used (unacceptable, indifferent, and acceptable), and for their more precise classification this trichotomic principle underlies each of these zones: low degree, moderate degree, high degree, which, in its turn, produces another nine meanings.

Considering the above and bearing in mind that qualitative perceptions are subjective in nature and do change with time, we propose a relative significance scale [4] shown in Tab. 2 for object priority assessment.

This scale is applied in the following manner:

Table 2

Relative significance scale

Value of intensity r	Description of paired comparison situation
1	Equal significance of an element in a line and in a column.
2	A compromise between 1 and 3
3	The element in a string is slightly more superior in significance than the element in a column.
4	A compromise between 3 and 5
5	The element in a string is largely more superior in significance than the element in a column.
6	A compromise between 5 and 7
7	An element in a string is practically superior in significance than an element in a column.
8	A compromise between 7 and 9
9	An element in a string is obviously superior to an element in a column.
1/a	The above situations with a vice versa comparison of the same elements

In case C_1, C_2, ..., C_n is a set of elements, quantitative expressions about pairs of elements (C_i, C_j) are presented on the relative significance scale as a matrix $n \times n$ of order $A = (a_{ij})$ with $ij = 1, 2, ..., n$. At the same time, matrix elements a_{ij} take the values of relative significance intensity r depending on the relevant correlation of criteria that are being compared.

When a criterion is compared with itself, 1 is written in the corresponding cell of matrix A

denoting equal value on the scale. When other pairs of criteria are compared, their values of relative significance intensity are defined depending on subjective assessments proceeding from the analysis of available input data.

Let us assume that criterion C has strong superiority over criterion B. Then in the matrix of paired comparisons, at the intersection of line C with column B «5» should be written (see Tab. 2), while at the intersection of string B with column C is the opposite value, i. e. «1/5», etc. This way, after all paired criteria comparisons have been done, the matrix or paired comparisons may take the following form:

$$A = \begin{bmatrix} 1 & a_{12} & ... & a_{1n} \\ 1/a_{12} & 1 & ... & a_{2n} \\ ... & ... & ... & ... \\ 1/a_{1n} & 1/a_{2n} & ... & 1 \end{bmatrix}. \qquad (9)$$

For processing the resulting matrixes on the relative importance scale, we need an appropriate mathematical model [5]. At the same time, for reasonable model building we only need to reveal and consider all the main factors influencing the final result, and to reflect correlations between them with the sufficient entirety. Quantitative data obtained as a result of using the model will be used for developing a solution.

Let us denote a quantity corresponding to object significance x_i compared to x_j by a_{ij}. The matrix containing these numbers will be denoted as $A = (a_{ij})$, where $a_{ij} = 1/a_{ji}$. If comparisons (assessments) have been done in the right way, then $a_{ik} = a_{ij}a_{jk}$ for all i, j, k, and matrix A is called *consistent*. For such a matrix, there is an evident case when comparisons are based on precise measurement, i. e. when weights $w_1, ..., w_n$ are known. Then $a_{ij} = w_i/w_j$ if $i, j = 1, ..., n$ and, respectively, by inversion of indexes i and j in the expression a_{ij}, we obtain properties of the pared comparison matrix:

$$a_{ji} = w_j/w_i = \frac{1}{w_i/w_j} = \frac{1}{a_{ij}}. \qquad (10)$$

In the matrix theory, a matrix equation $Ax = y$, where $x = (x_1, ..., x_n)$ and $y = (y_1, ..., y_n)$ is equivalent to a short formula:

$$\sum_{j=1}^{n} a_{ij}w_j = nw_i, \quad i = 1, ..., n. \qquad (11)$$

This is equivalent to an expression:

$$Aw = nw. \qquad (12)$$

This formula reflects the fact that w is matrix A's proper vector with its own value n. Equation (12), if presented element by element, looks like this:

$$\begin{bmatrix} w_1/w_1 & w_1/w_2 & ... & w_1/w_n \\ w_2/w_1 & w_2/w_2 & ... & w_2/w_n \\ ... & ... & ... & ... \\ w_n/w_1 & w_n/w_2 & ... & w_n/w_n \end{bmatrix} \begin{bmatrix} w_1 \\ w_2 \\ ... \\ w_n \end{bmatrix} = n \begin{bmatrix} w_1 \\ w_2 \\ ... \\ w_n \end{bmatrix}. \qquad (13)$$

Since a_{ij} is based not upon precise measurements but on subjective assessments, then a_{ij} will deviate from precise relations w_i/w_j. Therefore, equation (12) cannot be used in this form. Let us use two matrix properties:

1. If $\lambda_i, ..., \lambda_n$ are numbers that satisfy equation $Ax = \lambda x$ and if $a_{ij} = 1$ for all i, then $\sum_{i=1}^{n} \lambda_i = n$.

2. Accordingly, if we have (12), then all its proper values $= 0$. except for one which is $= n$. In case of consistency, n is the largest proper value of A.

If elements a_{ij} of a positive matrix A are slightly changed, then proper values will also change insignificantly.

In this way, if a matrix diagonal consists of unities ($a_{ij} = 1$) and A is a consistent matrix, then with slight changes of a_{ij} the largest proper value λ_{max} will remain close to n, while other proper values will remain close to 0. Consequently, a mathematical economic model of priority assessment for objects of capital construction means developing results of paired comparisons of objects (criteria) into matrixes (9) and defining the matrixes' key proper vector satisfying the following condition:

$$Aw = \lambda_{max}w, \qquad (14)$$

where A − matrix of values for object (criteria) paired assessments; w − key proper vector A, i. e. the vector of priority of compared objects (criteria); λ_{max} – the largest proper value of A.

Numerical values of the resulting vector $w = (w_1, ..., w_n)^T$ are the priorities of corresponding elements that are being compared in the matrix.

To calculate priorities compared in the matrix of elements, let us use the following formula:

$$w_j = \frac{R_j}{\sum\limits_{j=1}^{n} R_j}, \qquad (15)$$

where $R_j = \left(\prod\limits_{i=1}^{n} a_{ij} \right)^{1/n}$.

The calculation of the largest value of the main proper number of the matrix λ_{max} is done according to the following formula:

$$\lambda_{max} = \sum\limits_{i=1}^{n} \sum\limits_{j=1}^{n} w_j a_{ij}. \qquad (16)$$

The resulting value λ_{max} is used to define consistency of paired comparisons in the model, which generally means that, provided we have the main array of unprocessed data, all other data can be obtained from them logically. To do paired comparisons of *n* objects, provided each of them is presented at least once, we will need ($n - 1$) comparisons. We can deduce all other paired assessment from them using transitivity relation. The consistency within the considered economic mathematical model is equivalent to a requirement for equality of λ_{max} to the number of compared elements n. This way we can specify consistency deviance by determining the Consistency Relation (CR) and by its subsequent comparison with a threshold value:

$$\text{ОС} = \text{ИС}/\text{СИ} \le 0.2, \qquad (17)$$

here ИС = ($\lambda_{max} - n$) / ($n - 1$) − consistency index,

СИ − random index.

The random index is a consistency index of a matrix of the same dimension as A, which has been built randomly on the 1−9 scale but with correspondingly opposite values of its elements. The results of average random indexes' calculation for matrixes sized 1−15 are shown in Tab. 3.

Thus, the consistency relation imposes a limit upon the resulting economic mathematical model used to assess object priority. To control consistency and precision of object (criteria) priority values, their number must not exceed 15.

T a b l e 3

Values of СИ

n	1	2	3	4	5	6	7	8
СИ	0	0	0.58	0.9	1.12	1.24	1.32	1.41

n	9	10	11	12	13	14	15
СИ	1.45	1.49	1.51	1.48	1.56	1.57	1.59

If the condition OC < 0.2 is not met, causes for inconsistency are found and analyzed, and the correction of the paired comparisons of assessment criteria is done.

The sequence of actions aimed at defining local project priorities in relation to the criteria and checks of paired comparison consistency are the same as in the definition of local priorities of the assessment criteria. This means that the matrix of paired comparisons (9) must be built in the same way, but the comparison should be done not according to criteria importance, but according to the value of the criteria for individual objects. Then a proper vector is calculated for the matrix, whose (vector's) elements w_{ij} are determined using formula (15) and now reflect local priorities of the *i*-object of investment by *i*-criteria of comparison. After that, the matrix's proper number is calculated using formula (16) and a check is done for the fulfillment of the consistency condition using formula (17). If the consistency condition is not met, the correction of paired comparisons of criteria values is carried out.

After all arrays of stored data on local criteria priorities and investment projects related to these criteria have been calculated, a synthesis operation is carried out according to the following formula:

$$w_i^p = \sum\limits_{j=1}^{n} w_j w_{ij}, \qquad (18)$$

where w_i^p − integral priority of *i*-object; w_j − local priority of *j*-criterion; w_{ij} − local priority of *i*-object of investment by *j*-criterion; *n* − number of criteria.

The analysis has revealed that the regional investment object priority assessment has to be carried out using a set of criteria.

The obtained priority values help organize the objects according to their significance during the development and optimization of a regional capital construction program.

The economic mathematical basis of this model is the definition of the key proper vector if a paired comparison matrix has been built using the 9-point scale of relative significance. The numerical values of the resulting vector are priorities of the elements compared within the matrix. During this process, the consistency of paired comparisons is checked, which helps assess the calculation accuracy.

2. Application of the model to the development of an investment program

Let us look at possible applications of this economic mathematical model for determining a specific priority of construction objects exemplified by an investment program in one of North-Western regions of the Russian Federation.

To simplify the analysis, we assess only two objects planned for investment. To determine which of the two investment objects has a higher priority, we do a paired comparison of them. We choose the criteria according to a couple of principles: 1) the optimal use of regional resources already existent on the site of the planned construction; 2) availability of well-developed infrastructure.

Proceeding from these two principles, five criteria have been chosen:
1. Optimal use of construction equipment.
2. Available communications and utility lines.
3. Available electric power substation.
4. Development of infrastructure.
5. Environmental situation.

Having chosen the criteria, we do paired comparisons in order to determine their relative significance. To present the numerical results of our calculations we use Tab. 2. We present our results as matrix (9). All comparisons are done on the basis of subjective assessments.

Below is one comparison provided as an example: the optimal use of equipment has a much higher significance than the available communications and the utility lines. Therefore, we place digit 5 at the intersection of a line with optimal use of equipment and a column with communications/utility lines and 1/5 at the intersection of the line of communications/utility lines and the column with the use of equipment.

As a result, we have a necessary matrix of paired comparisons (Tab. 4). When the matrix has been built, we can calculate the priority values for each criterion using formula (11). The calculation results are shown in Tab. 4.

After the calculations have been done, we have to make sure that the condition of the consistency in the paired comparison matrix is met, for which purpose we use formulas (12) and (13). The calculation results demonstrate that the matrix is consistent. This means that the obtained values of criteria priorities can be used for further computations.

Now let us define local priorities of investment projects in relation to the criteria. For this purpose, we build matrixes of criteria value comparisons for investment projects 1 and 2. This means that we have to determine the degree of compliance of each criterion with the other ones. This assessment has a subjective nature, as in the case of criteria comparison. For instance, ten houses are being built on site 1, and they are

Table 4

The matrix of paired comparisons of priority criteria and the column with values and priorities of the criteria

	Optimal use of construction equipment	Communications	Availability of electric power substation	Infrastructure	Environmental situation	Priority of the investments object related to criterion w_{ij}
Optimal use of construction equipment	1	5	5	7	9	0.549
Communications	1/5	1	3	5	7	0.231
Availability of electric power substation	1/5	1/3	1	3	5	0.126
Infrastructure	1/7	1/5	1/3	1	3	0.062
nvironmental situation	1/9	1/7	1/5	1/3	1	0.032

located close to each other. This allows us to use only one pillar crane mounted on rails for the construction of all the houses. Communications and utility lines on the site are inexistent and, therefore, we have to lay and construct them. Thus we write digit 9 at the intersection of the line with optimal use of equipment and the column with communications/utility lines, and 1/9 at the intersection of the string of communications/utility lines and the column with the use of equipment.

Using formula (11), we calculate local investment project 1 priorities for each criterion w_{ij}. Here i refers to the serial number of an object while j is the serial number of the criterion. The calculation results are shown in Tab. 5.

After the calculations have been done, we have to make sure that the condition of consistency in the matrix of local priorities of the investment project is met, for which purpose we use formulas (12) and (13). The calculation results demonstrate that the matrix is consistent.

Having obtained the criteria priorities (Tab. 5) and the local priorities of the investment project according to these criteria, we can carry out a synthesis of the criteria using formula (14) and define the integral priority w* of object 1. As a result, we get the value w1* = 0.380.

Now we can do the similar calculations for investment project 2 and present them in Tab. 6.

Table 5

The matrix of local priorities of investment project 1 in relation to the criteria, and local priorities of object 1 according the criteria

	Optimal use of construction equipment	Communications	Availability of electric power substation	Infrastructure	Environmental situation	Priority of the investments object related to criterion w_{ij}
Optimal use of construction equipment	1	9	5	7	7	0.604
Communications	1/9	1	1	1	1	0.083
Availability of electric power substation	1/5	1	1	5	5	0.179
Infrastructure	1/7	1	1/5	1	5	0.088
Environmental situation	1/7	1	1/5	1/5	1	0.046

Table 6

The matrix of local priorities of investment project in the town of Lomonosov, and local priorities of object 2 according the criteria

	Optimal use of construction equipment	Communications	Availability of electric power substation	Infrastructure	Environmental situation	Priority of the investments object related to criterion w_{ij}
Optimal use of construction equipment	1	2	4	4	4	0.366
Communications	1/2	1	7	7	7	0.388
Availability of electric power substation	1/4	1/7	1	5	6	0.141
Infrastructure	1/4	1/7	1/5	1	3	0.064
Environmental situation	1/4	1/7	1/6	1/3	1	0.040

We see that the matrix is consistent, and we do calculations of the integral priority of object w^* using formula (14). The resulting value is the integral priority for object 2: $w2^* = 0.314$.

Having defined the integral priorities of investment objects 1 and 2, we can determine a higher priority object by applying a simple comparison: $w1^* > w2^*$ because $0.380 > 0.314$.

The comparison demonstrates a considerably higher priority of investment project 1 over investment project 2w. Therefore, *project 1 is chosen for further implementation*.

Conclusion. The current context of the regional investment market must facilitate the determination of investments' effectiveness according to their priority level, which requires the calculation of the value of a priority criterion. This is particularly important in a situation of financing deficit. The economic mathematical model presented above helps choose a more advantageous project during investment-related decision making. The chief goal is the organization of the objects according to the selected priority criteria. The proposed approach, reflected in the economic mathematical model, helps built an optimal investment program of a region in the context of a financing deficit.

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NIKOLOVA, Liudmila V. – *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: nikalvsk@yandex.ru

НИКОЛОВА Людмила Васильевна- *профессор кафедры финансов и денежного обращения Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, доктор экономических наук, профессор.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: nikalvsk@yandex.ru

RADIONOVA, Julia V. – *Saint-Petersburg State Polytechnical University.*

РАДИОНОВА Юлия Владимировна – *аспирант кафедры финансов и денежного обращения Инженерно-экономического института Санкт-Петербургского государственного политехнического университета.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: conly@mail.ru

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D.S. Demidenko, M.S. Babarin

THE PECULIARITIES OF ECONOMIC AND FINANCIAL ANALYSIS OF AN ENTERPRISE WHEN MAKING OPTIMAL DECISIONS

Д.С. Демиденко, М.С. Бабарин

ОСОБЕННОСТИ ЭКОНОМИЧЕСКОГО И ФИНАНСОВОГО АНАЛИЗА ПРИ ПРИНЯТИИ ОПТИМАЛЬНЫХ РЕШЕНИЙ НА ПРЕДПРИЯТИИ

In article analysis methods for interpretation of optimum economic decisions for the enterprise, concerning efficiency of investment activity and production improvement of quality, are considered.
QUALITY STRATEGY. OPTIMIZATION METHODS. ECONOMIC BALANCE.

Рассматриваются методы анализа для интерпретации оптимальных экономических решений на предприятии, относительно эффективности инвестиционной деятельности и повышения качества продукции.
СТРАТЕГИЯ КАЧЕСТВА. МЕТОДЫ ОПТИМИЗАЦИИ. ЭКОНОМИЧЕСКОЕ РАВНОВЕСИЕ.

The wide range of problems of optimum economic decision making in market conditions can be reduced to maximizing of the level of individual's and society's satisfaction received from products and resources. Thus there are some economic, financial and other opportunities that can hinder the process of identifying of the way or plan of actions that make it possible to receive the maximum or minimum result of consumption and consequently it can be called the optimization of the level of satisfaction of the requirements at available financial and, in broad sense, resource restrictions. When using the mathematical and other models providing achievement of optimum economic or financial decisions, the correct economic interpretation of received results of the solution of an optimizing task play a very important role.

Let's present an economic rendering of a problem of drawing up the optimum financial plan providing investments into expansion of production of the company known and described in scientific economic literature as Myers and Poga model [1]. Let's consider the enterprise planning investments into implementation of a certain investment projects. The amount of investments (I) and amount of loans (Y) are the variables of this task. The last amount also indirectly characterizes the financial risk caused by investments into enterprise expansion if they are financed by the loan capital.

The optimum financial plan has to provide an increase or gain of the market value of a company or an enterprise value (MVC) as a result of implementation of the project. As restrictions the most admissible size (limit) of attracted investments into the project of expansion and the most admissible share of loan sources of financing of new investments serve. This task at the stated preconditions can be presented as a problem of linear programming and is formulated in the following look:

$$kI + tY \rightarrow \max$$

under the following conditions:

$$I \leq I_0, \quad Y \leq aI,$$

or

$$I \leq I_0 \quad (Z_1),$$

$$-aI + Y \leq 0 \quad (Z_2),$$

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where k − stands for internal / demanded profitability of unit of the investments which are carried out at the expense of own sources of financing of a company; t − a profit tax rate, is equivalent expresses tax effect from unit of the loans, the second composed expresses to criterion function the full size of the tax effect gained by the enterprise from use of external/loan sources of financing; I_0 − limit of investments; a − the most admissible share of external financing.

The solution of the task defines the optimum plan of investment activity of the enterprise in the planned period. It is the direct task (DT). Here Z_1 are shown, to Z_2 − dual problem (DP) variables.

MVC gain as a result of investments consists of two components − the income from investments (the first composed criterion function) and so-called «tax effect» from use of borrowed funds (the second composed criterion function) which consists in receiving by the economy enterprise on the taxation when using the loan capital. As the enterprise receives this economy during the whole planned period, the capitalized size of tax effect makes a certain part of a gain of MVC. The main peculiarity of this task is that the restrictions cover not only absolute values also ratios of variables. Similar restrictions are often used by optimization of economic decisions, for example in problems of economy of quality. When using linear models what the most part of practical economic models of optimization, for the correct interpretation of received results is the analysis of dual models matters. Let's provide the analysis and interpretation of the dual problem (DP) of the optimum financial plan which isn't considered in [1]:

$$Z_1 I_0 \to \min$$

under the following conditions:

$$Z_2 \geq t,$$

$$Z_1 - Z_2 a \geq k.$$

So next, our interpretation of DT and DP will be given. As the solution of DT allows defining the optimum plan of action, and the solution of DP − the price (assessment) of the optimum plan, the Z1 variable on sense is the price of attraction of all volume of the capital invested in expansion the enterprise. As for expansion it is used both the shareholder's equity (E) and the loan capital

(LC), it will be so-so weighed price of attraction of all capital (Z_1 = WACC). The Z_2 variable on sense is the price of attraction of LC. Proceeding from it, by determination of the average price of the capital:

$$Z_1 - Z_2 a = \text{price of shareholder's equity.}$$

Thus, the economic sense of restrictions of DP becomes clear. Concerning WACC and its components we will formulate the clear rule − we will call it «the fundamental economic rule»:

The price of attraction of unit of the capital has to be no more (less or it is equal) to the size of return (profitability) of unit of the invested capital (differently investments are inexpedient, net income from them will be negative). Return from the invested capital is in a broad sense its usefulness, and in concrete expression takes the form of profitability, returns, profitability etc. If the requirement that return from the capital enclosed in production of a product, exceeded limit usefulness of this product follows from conditions of optimization, it means that concerning this product the rule has to work: it is more favorable to make a product, than to consume. Otherwise − on the contrary, a product it is more favorable to consume, than to make.

Being guided by this rule, and also proceeding from DT and DP conditions, the minimum return from unit of E has to exceed demanded profitability of E, and the minimum return from unit of LC has to exceed tax effect from LC unit.

From the stated positions we will consider related according to the economic contents a problem of optimization of quality of production. Similarity of these tasks is explained by the fact that quality optimization belongs to the class of problems of optimum planning of production, also it contains restrictions on a ratio between variables.

Let's present a quality optimization problem in a general view:

$$\begin{pmatrix} \textit{utility of certain} \\ \textit{consumption set} \quad (CCS) \end{pmatrix} \to \max$$

$$\textit{constraints}:$$

$$\begin{pmatrix} \textit{resources required} \\ \textit{for the production of CCS} \end{pmatrix} \leq \begin{pmatrix} \textit{available resources} \\ \textit{for the production of CCS} \end{pmatrix}$$

$$\begin{pmatrix} \textit{minimum demand} \\ \textit{for products} \\ \textit{of certain quality} \\ (CQ) \end{pmatrix} \leq \begin{pmatrix} \textit{quantity} \\ \textit{of each product} \\ \textit{from CCS} \end{pmatrix} \leq \begin{pmatrix} \textit{maximum allowable} \\ \textit{product consumption} \\ \textit{of CQ} \end{pmatrix}.$$

Resource constraints can belong both to product consumption and to their production, to CCS as a whole and to separate products from CCS, can be as in cost, and in the natural form.

Consumer restriction for all set of products is the most admissible size of sales of all types of the products entering into CCS which, at the fixed prices of products, shouldn't exceed available financial resources, i. e. the maximum permissible market capacity of products from CCS, set in a cost look, or the budget of sales can't be exceeded.

Consumption optimization on quality of production provides use of the utility function (UF) as criterion function. Concerning UF it is necessary to accept some basic preconditions, allowing using it in linear problems of optimization. Besides known neoclassical assumptions concerning character and UF properties, we will consider that UF is defined by consumption of a certain quantity of each type of a product from CCS:

$$U(X_1 \dots X_n) = U(X_1) + \dots + U(X_n)$$

$$U(X_i) = u_i X_i, \quad i = 1 \dots n.$$

Proceeding from these provisions,

$$U(X_1 \dots X_n) = u_1 X_1 + \dots + u_n X_n =$$

$$= \sum_{i=1}^{n} u_i X_i,$$

where u_i − limit usefulness of i product consumption from CCS in number of X_i of units.

The classical optimum consumption plan of CCS including products of various quality, is defined from the following condition (DT):

$$\sum_{i=1}^{n} u_i X_i \to \max$$

under conidition

$$\sum_{i=1}^{n} p_i X_i = M(Z),$$

where P_i − price of product i; Z − dual variable; M − available budget of financial resources.

DP formulation:

$$MZ \to \min$$

$$p_i Z \geq u_i \vdots i = 1 \dots n.$$

Here the dual Z variable is «the price of money», or an interest rate. Thus, profitability of investments in acquisition of products has to be not less, than limit usefulness of consumption of a product. This condition can give the following interpretation according to fundamental economic rule: it is more expedient to invest, than to consume until a condition it is satisfied.

Let's consider a simple task for determination of features of optimization of quality of production. Let there is an economy in which only two types of products are made and consumed: «the improved quality» (with an index 1) and «usual quality» (with an index 2). In reality, certainly, the considerable number of categories of quality of products that will find expression in dimension of an optimizing task can be considered. But the problem definition and treatment of results will be any dimension of bigger unit identical to a problem. The task with dimension «two» is chosen for possibility of use of graphic interpretation of results.

DT formulation:

$$u_1 X_1 + u_2 X_2 \to \max,$$

$$p_1 X_1 + p_2 X_2 \leq M,$$

$$B_1 \leq \frac{X_1}{X_1 + X_2} \leq A_1.$$

Sense of the top restriction that production of the improved quality can't be consumed and made only. It is necessary as well production of «usual» quality as more quality production possesses also higher usefulness, the price of it is higher and it can be inaccessible to socially vulnerable groups of the population. The bottom restriction generally speaking has no value for a problem of maximizing. Here A_1 and B_1 respectively the upper and lower bound of consumption and production of the improved quality. Similar restrictions can be defined and for production of usual quality

The transformed problem definition:

$$u_1 X_1 + u_2 X_2 \to \max,$$

$$p_1 X_1 + p_2 X_2 \leq M \quad (Y_2),$$

$$(1 - A_1)X_1 - A_1 X_2 \leq 0 \vdots (Y_1).$$

Here Y_1, Y_2 − dual variables. DP formulation.

$$Y_2 M \to \min,$$

$$Y_1(1 - A_1) + Y_2 P_1 \geq u_1,$$

$$-Y_1(A_1) + Y_2 P_2 \geq u_2.$$

Sense of dual variables − limit usefulness of one monetary unit (Y2) and limit usefulness of one structural unit (Y1). According to fundamental economic rule, the price of attraction of monetary unit is equivalent to return from it or its limit usefulness. Therefore criterion function of DP is the requirement of minimization of expenses of attraction of monetary resources, and restrictions define a condition of efficiency of these expenses. The solution of DP allows defining value of these variables for the optimum consumption plan of products.

According to provisions of the economic theory (ET), the interrelation of quantity of a made or consumed product of a certain look «X» and the prices of the product «P» is defined by the demand function (DF) which represents generally speaking curvilinear, but at simplifying preconditions − the linear interrelation «P» and «X» as it is represented in drawing. In a case when products differ on a usefulness or quality factor (at an invariance of other operating factors), or on any other factor under the same conditions, DF represent family of parallel lines (see drawing).

At the fixed number of production or consumption of products dependence between quality and quantity of products, as quality − the quantified parameter, as shown in the left part of drawing can be received. Dependence characterizes objective communication of quality and the product price − the quality is higher, the price is higher. It means that the aspiration of the enterprises increase sales can be reached at the expense of modernization of strategy and policy of quality.

At a linear problem definition of optimization of quality of production the problem is represented in the simplified look. For achievement of optimum quality it is necessary to execute all restrictions on separate products, within restrictions the preference has to be given to products with the greatest usefulness (the greatest quality).

More realistic is quality optimization taking into account the integrality of variables − the quantity of products is expressed by an integer.

$$\sum_{i=1}^{n} p_i X_i \to \max,$$

$$X_i \le \bar{X}_i,$$

$$\sum_{j=1}^{m} \sum_{i=1}^{n} r_{ij} X_i \le R_j,$$

where X_i − whole numbers.

Here restrictions reflect production capabilities, − demand for the production i or the available capacity, a consumption rate of «j» type of a resource on «i» type of a product, m − quantity of types of the resources, an available limit by each type of resources. In our opinion it is expedient to solve this integer problem a method of dynamic programming (Bellman's method).

The problem of optimization of quality is reduced to optimum distribution of a limited limit of resources between various products from available CCS. This task can be traditionally solved by a method of dynamic programming. Steps of the decision are separate types of products. On the first step the case of allocation of all limited limit of resources for the first product is considered. On the second step expenses on resources for the second product, on «n-volume» − expenses on «n-volume» to a product etc. join. In a general view process of the decision is represented in the following look.

Step 1.

$$\varphi_1(X) = \min 3_1(X), \quad 0 \le X \le A,$$
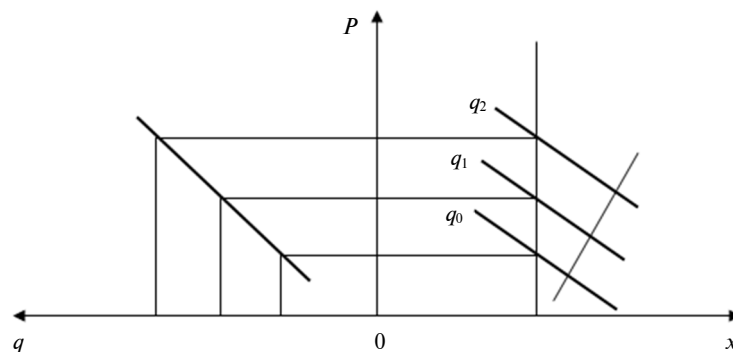
Step 2.

$$\varphi_2(X) = \min[3_2(y) + \varphi_1(x - y)],$$

$$0 \le y \le x, \ 0 \le x \le A$$

. . . .

Step n.

$$\varphi_n(X) = \min[3_n(y) + \varphi_{n-1}(x - y)],$$

$$0 \le y \le x, \quad 0 \le x \le A,$$

where 3_i − sales of each step; φ_{i-1} − optimum sales of the previous step.

It is expedient to consider search of the optimum decision on an example.

There are three levels of quality of a certain product, in essence it is equivalent to existence of three products of the various quality, to everyone there corresponds demand function. Limited resource is capacity for considered products and is expressed by the greatest possible quantity of let-out products, in an example equal to four units. In the conditions of the set restrictions it is necessary to define the maximum sales volume which under considered conditions corresponds to optimum quality of CCS.

The decision is presented in calculation tables. Search of the strategy leading to the optimum decision on each step, is carried out as it should be, the return to search of the optimum decision by means of the same calculation tables. To each diagonal of the table there corresponds a certain sales volume for each step of the decision. The maximum size of sales it is allocated on each diagonal (it is noted *). In the first calculation table capacity distribution between 0 and 1 product is considered, in the second table to optimum distribution of capacity between 0 and 1 product the second product is added.

The family of functions of the demand reflecting various levels of quality/usefulness of a product is presented in the following table.

The optimum decision can be not the only thing. So, for example, from the last calculation table follows that there are two decisions, providing the maximum sales volume equal to 40 e. It agrees to one of decisions, having made 2 units of the product 2, the remained resource of capacity should be distributed between products 0 and 1. Thus the maximum sales on the corresponding diagonal of the last table are equal 22 e. In the

X (ед.)	1	2	3	4
P_0	8	7	6	5
P_1	10	9	8	7
P_2	12	11	10	9

Search of the optimum decision

X 0/1	0	1	2	3	4
0	0	10*	18*	24	28
1	8	18*	26*	32*	
2	14	24	32*		
3	18	28			
4	20				
φ_1	0	10	18	26	32

$X (0 + 1)/2$	0	1	2	3	4
0	0	12*	22*	30	36
1	10	22*	32*	40*	
2	18	30	40*		
3	26	38			
4	32				
φ_2	0	12	22	32	40

previous table on a diagonal corresponding to production of two products, the maximum value of sales equally 18 that corresponds to production on 1 unit of a zero and first product. Thus the general maximum sales volume is equal 18 + 22 = 40 e. that coincides with earlier defined value.

Thus, accepted by production of the solution of rather economic justification of investment projects and programs of expansion of production, increase of MVC, quality of production can often be quasi optimum or advantages of optimum decisions aren't always obvious to practice because of insufficiency of their substantial economic interpretation. For bigger validity it is necessary to use more widely additional receptions of the economic and financial analysis, such the formulation of dual task in linear optimizing models, wider use of nonlinear methods of optimization.

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DEMIDENKO, Daniel S. — *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: demidenko11@rambler.ru

ДЕМИДЕНКО Даниил Семенович — *профессор кафедры финансов и денежного обращения Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, доктор экономических наук, профессор.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: demidenko11@rambler.ru

BABARIN, Michael S. — *St. Petersburg State University of Economic and Finance.*
191023, nab. ran. Griboedova. 34, St. Petersburg, Russia.

БАБАРИН Михаил Сергеевич — *Санкт-Петербургский государственный университет экономики и финансов, кандидат экономических наук.*
191023, Россия, Санкт-Петербург, наб. кан. Грибоедова, д. 34.

I.V. Ilyin, Ju.L. Levchenko, A.I. Levina

SOME ISSUES OF THE FORMATION OF ENGINEERING COMPANIES' ARCHITECTURE

И.В. Ильин, Ю.Л. Левченко, А.И. Лёвина

ВОПРОСЫ ФОРМИРОВАНИЯ АРХИТЕКТУРЫ ИНЖИНИРИНГОВЫХ КОМПАНИЙ

The article states a problem of correspondence between system of management business processes and organizational structure of the engineering company and its strategic goals and growing business interests. Authors proposed the approach for restructuring of enterprise architecture based on reengineering of management business processes and reforming of organizational structure to provide business growth.

ENTERPRISE ARCHITECTURE. ORGANIZATIONAL STRUCTURE. PROJECT MANAGEMENT. BUSINESS PROCESS. ENGINEERING COMPANY.

Сформулирована проблема обеспечения соответствия системы бизнес-процессов управления и организационной структуры инжиниринговой компании её стратегическим целям и растущим потребностям бизнеса. Предложен подход к перестройке корпоративной архитектуры на основе реинжиниринга бизнес-процессов управления и реформирования организационной структуры для обеспечения роста бизнеса.

АРХИТЕКТУРА КОМПАНИИ. ОРГАНИЗАЦИОННАЯ СТРУКТУРА. УПРАВЛЕНИЕ ПРОЕКТАМИ. БИЗНЕС-ПРОЦЕСС. ИНЖИНИРИНГОВАЯ КОМПАНИЯ.

Engineering is a specific activity related to the provision of services for the creation and exploitation of infrastructure facilities (according to the definition of the United Nations Economic Commission for Europe) i. e. industry, energy and transportation systems, civil engineering etc.

Initially the key process of engineering is production technology development. As a rule Western European engineering companies include several key departments (or subsidiary companies) which are specialized in engineering and development, construction, supply and installation of equipment, project management, technical supervision, engineering support of investment projects, subsequent works (repair, service, maintenance, etc.). Engineering companies in Russia develop their organizational structure as well and build different functional departments. At the same time they have inherited result-oriented approach for projects after soviet engineering institutes despite of the dynamic and rapidly growing market of engineering services.

Authors of the article suppose that the current stage of Russia engineering companies' development is caused by the engineering institutes experience which were a source of highly qualified experts who now represent top management of present engineering companies.

Many of contemporary Russian engineering companies were founded on a base of soviet engineering institutes which served specific needs of particular branches of industry or even single industrial objects according to the state order. Intensive development of construction business in post-soviet Russia caused the increasing demand for engineering services and engineering companies started to enlarge. The former approach to organization of engineering business inherited after soviet engineering institutes caused the fact that many engineering companies with high quality of project execution have the level of project management organization that does not completely provide business interests of the company and does not allow to use completely the opportunities of the growing market of engineering services. As a result, many companies of the industry have started to pay serious attention to the need of organizational structure reforming, which means management architecture restructuring in the mean times.

**Some issues of the formation
of management architecture**

The main reasons of the need of architecture restricting based on the projects of business processes reengineering and organizational structure reforming are the following:

1. Absence of the precise strategy of management architecture development.

2. Absence of an integrated architecture adaptability to market conditions.

3. Discrepancy between the organizational structure and increased business demands.

4. Discrepancy between the organizational structure of companies and organizational structures of projects.

5. Absence of a common corporate standards of project management.

6. Absence of precisely prescribed roles and responsibilities in the current organizational structure.

7. Absence of detailed and transparent business processes.

Enterprise architecture is a system view of the key structural sections (certain key components and their relationships), applied for various practical problem solving of the organization [1]. The feature of the enterprise architecture is its heterogeneous composition − organizational structure, functions, processes, information technology, etc.

While forming the enterprise architecture it's necessary to solve the following tasks in coherent and interconnected manner:

1. Mission and strategy of the company, strategic goals and objectives;

2. Business architecture «as is» and «to be» for the following sections:

a) organizational structure;

b) business processes structure;

3. System architecture «as is» and «to be» for the following sections:

a) Information system;

b) data bases;

c) technical tools and solutions;

4. Developed projects for transition from its current state («as is») in the planned state («to be»), including:

a) projects for business processes reengineering and organizational structure reforming;

b) projects for ISO standards implementation (ISO 9000. ISO 20000 and others).

**Architecture development strategy
for engineering companies**

The mission of the company as the main objective of its development defines the strategy, including the strategy of architecture development management. The first step in the formation of the system architecture is the reengineering of business processes and the subsequent formation of the organizational structure. The organizational structure of the engineering company, on the one hand, should match the system of its business processes, providing its effectiveness, and the other hand − it should match the accepted system of project management, the standard of which should be the same for the entire company. This is determined by the nature of engineering business, which means project orientation of the company.

The basis of the business of engineering company is the portfolio of contracts for execution of engineering projects. To form the efficient portfolio of contracts the real option approach for contract system management can be used [4]. For effective project management it is necessary to implement a project management approach that would allow to create a flexible, effectively-managed and controlled system of execution of single engineering projects and the portfolio of project as a whole, and would establish unified procedures project delivery and monitoring at various stages and levels.

Project approach for business management has its features:

− the project is considered as a unique combination of project delivery processes;

− rights and responsibilities for project results delivery belong to project manager and project management team;

− certain budget of the project;

− implementation of specific project organizational structure and motivation of project management team members;

− development and implementation of specific standards of project processes performing [1].

One of the possible effective project management standards that can be implemented in engineering companies, is the PRINCE2 method, which is known worldwide and acknowledged by the International Project Management Association (IPMA). PRINCE2 (**Pr**ojects **in** a **C**ontrolled **E**nvironment) is a structured method of project management based

on thousands of best practices of successfully realized projects. This method has the following advantages:

1) includes the best practices that has proved its effectiveness;

2) can be implemented for any kind of the project;

3) is widely known and provide the common language for all the members of the project;

4) is oriented on strategic goals achieving;

5) sets certain roles and responsibilities for project management;

6) is oriented on delivery of project results.

Basic principles of project management according to PRINCE2 are:
– continuous business justification;
– learning from experience;
– defined roles and responsibilities;
– management by stages;
– management by exceptions;
– focus on products;
– tailoring to the environment.

For the purpose of architecture forming of engineering company based on the revision of management processes and organizational structure, the principle of defined roles and responsibilities is particularly important. PRINCE2 allows to create a system of hierarchy and interaction of the participants of the project which form a well-functioning structure that takes into account the interests of the three interested parties in the project – business, future users and suppliers. Such a structure provides certain subordination levels of project management, each of which controls the interests of different levels, ultimately subordinate to the strategic goals of the business (Fig. 1).

Corporate and program management – strategic interests of corporation/project program		
Project management team	**Directing** – business interests of the project	
	Managing – project interests	
	Delivering – project performing management	
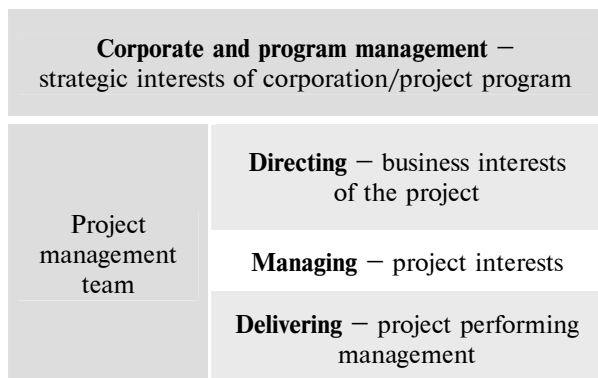
Fig.1. Project management levels (according to PRINCE2)

Responsibility delegation to the higher level is performed according to the «management by exception» principle. This provides the lower levels with more management freedom and the higher ones are not involved into routine processes of lower level processes.

In addition to the distinction between levels of project management, the organization of the project team according to PRINCE2 implies specific roles and responsibilities, which allow to avoid function duplication, to provide a clear procedure of project control at all stages, as well as ongoing expert and administrative support to the project management team.

Practical experience of business processes and organizational structure reengineering

The top management of engineering company (hereinafter referred as a Company) initiated a project of management processes optimization in one of the divisions of the company – Engineering Department. This division provides a key service of complex engineering service – designing of infrastructural objects. Initially, the company was completely focused on the execution of orders of key industry customer. While developing, a positive business reputation has caused a growing demand for the company services by other customers.

Engineering Department as an independent business unit faced the classic problem of growing companies: the existing business processes and roles and responsibilities do not allow to meet the growing demand for the services of the company, and therefore slow down the growth of the business. Roles and responsibilities in the existing organizational structure were designed to provide the quality of single projects. In the mean time it was a lack of attention to management level of the division as a whole, where company's business interests are defined and controlled.

The top management of the company has identified the *goal* to revise the existing business processes and organizational structure in order to optimize management processes to provide the continued growth of the business. This objective implies a re-engineering of business processes and reforming the organizational structure, which on one hand would provide compliance

with the principles of the organizational structure of project management, on the other hand − would create conditions for the further optimization of business architecture based on several criteria: the exclusion of redundant business processes and their segmentation within the various organizational units, minimizing organizational interfaces, improved internal and external communications, increasing flexibility on the market.

To realize this goal the following consequence of *objectives* was set:

1. Modeling and analysis of business processes and organizational structure («as is»).

2. Roles and responsibilities analysis including defining of non-core responsibilities.

3. Modeling of business processes («to be»):

a) business processes reengineering (optimization of business processes on the criteria of business growth on the basis of review of the roles and responsibilities);

b) organizational structure improvement to provide the growth of business.

4. Implementation of the updated system of business processes and organizational structure in order to provide business growth.

The result of the implementation of defined objectives should be: optimized system of management business processes, reformed organizational structure, development and implementation of a standardized approach to project management.

Modeling of company activity based on staff interviewing, analysis of the existing organizational structure (Fig. 2) and general scheme of processes based on Diagram of added value chain [2] (Fig.3) helped to analyze and put in order management processes, main and supporting business processes of the division, to identify «bottlenecks» in terms of duplication and inconsistency of prescribed responsibilities for different roles in the business process management.

Note:

− CPE − Chief Project Engineering

Analyzing the existing organizational structure and current roles and responsibilities it was
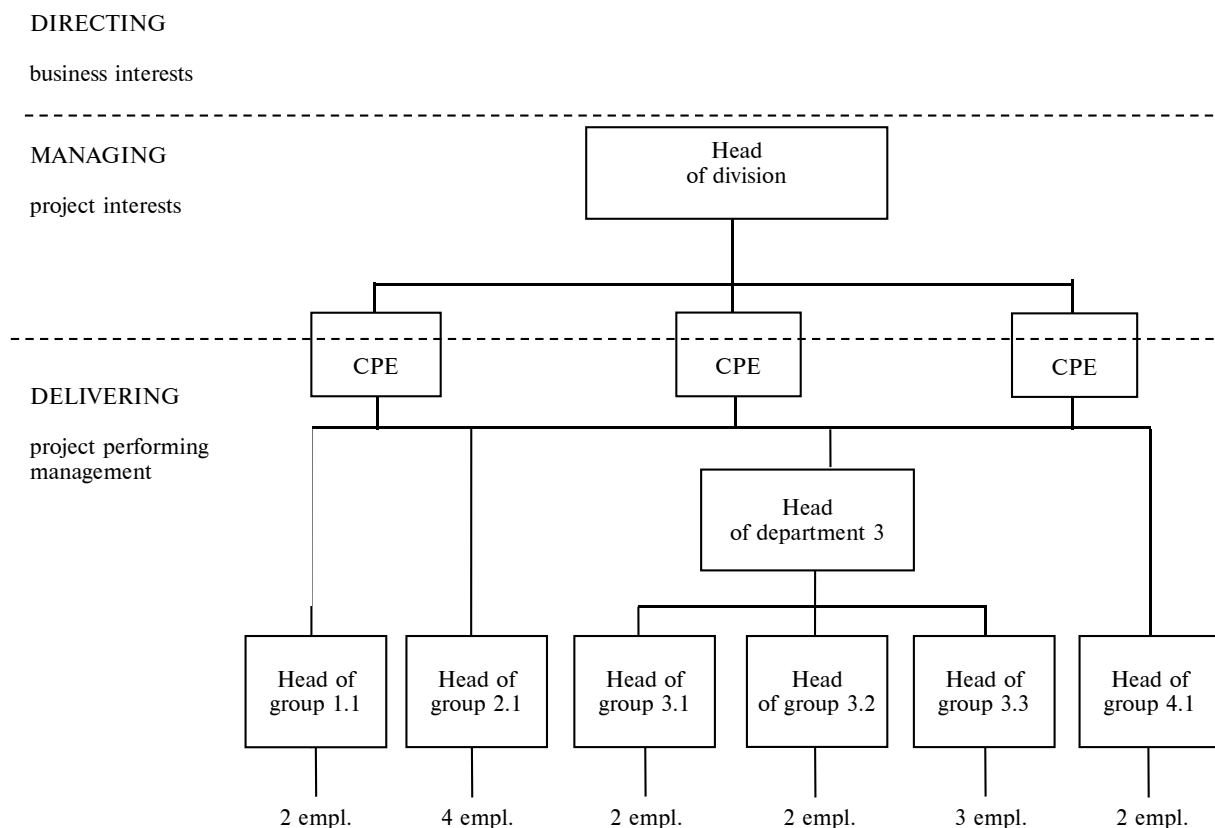
Fig.2. Organizational structure «as is» according to project management levels
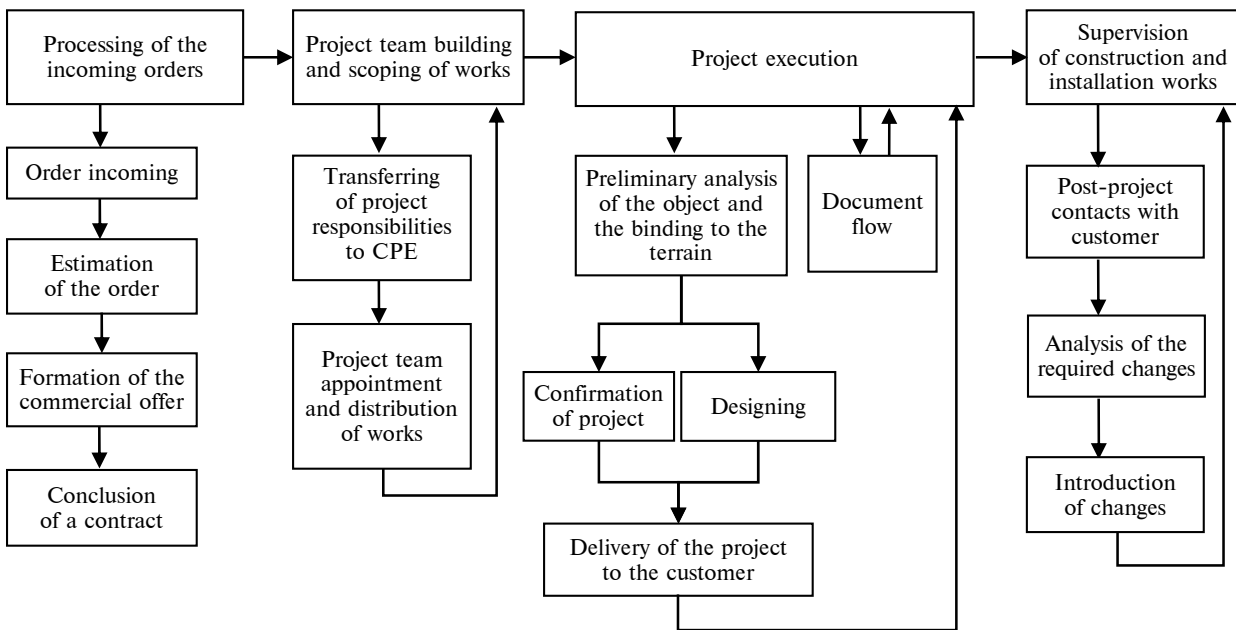
Fig.3. General scheme of processes based on Diagram of added value chain

identified the inconsistency of responsibilities distribution between the management levels and the discrepancy between the management organizational structure and project organizational structure. As a result, on the one hand there is a lack of proper control of the division from the strategic business objectives point of view, on the other hand – duplication of functions and control at lower levels. Thus, managers, responsible for the overall management and coordination of the work of the design («Directing» level) in reality is involved not only in the management of individual projects («Managing» level), but also in the control of the projects' execution («Delivery» level). At the same time, the CPE («Managing» level) factually does not have sufficient authority to carry out project management and is substantially involved in the control of direct execution of projects («Delivery» level).

The analysis of the «as is» data, formalized as a model of organizational structure and process diagrams, revealed the drawbacks of existing management processes. The following changes to the organizational structure and system of roles and responsibilities were proposed:

1. To define clearly the project management roles between the «Directing» and «Managing» levels, prescribing responsibility for the business interests control to the manager of the first level (Head of division) and giving more management authority for individual projects to the second-level managers (CPE);

2. To increase the number of managers the «Managing» level (CPE) to enable the execution of greater number of projects;

3. To introduce the role of administrative support of the project (Project Support) which is not performed in the existing structure in the centralized form and is dispersed among managers at all three levels

4. To introduce the role of expert support of the project (Project Assurance) which is not performed in the existing structure in the centralized form and is dispersed among managers at all three levels

Taking into account all the proposed changes for organizational structure after revising the existing roles and responsibilities, a new «to be» model was performed (Fig. 4).

The proposed model of organizational structure «to be» has a number of advantages:

– it enables the use of common and proven approach to project management (such as PRINCE2);

– provides a basis for distinguishing between the roles and responsibilities in the project management team and the organizational structure of the whole unit;

DIRECTING

business interests

MANAGING

project interests

DELIVERING

project performing
management
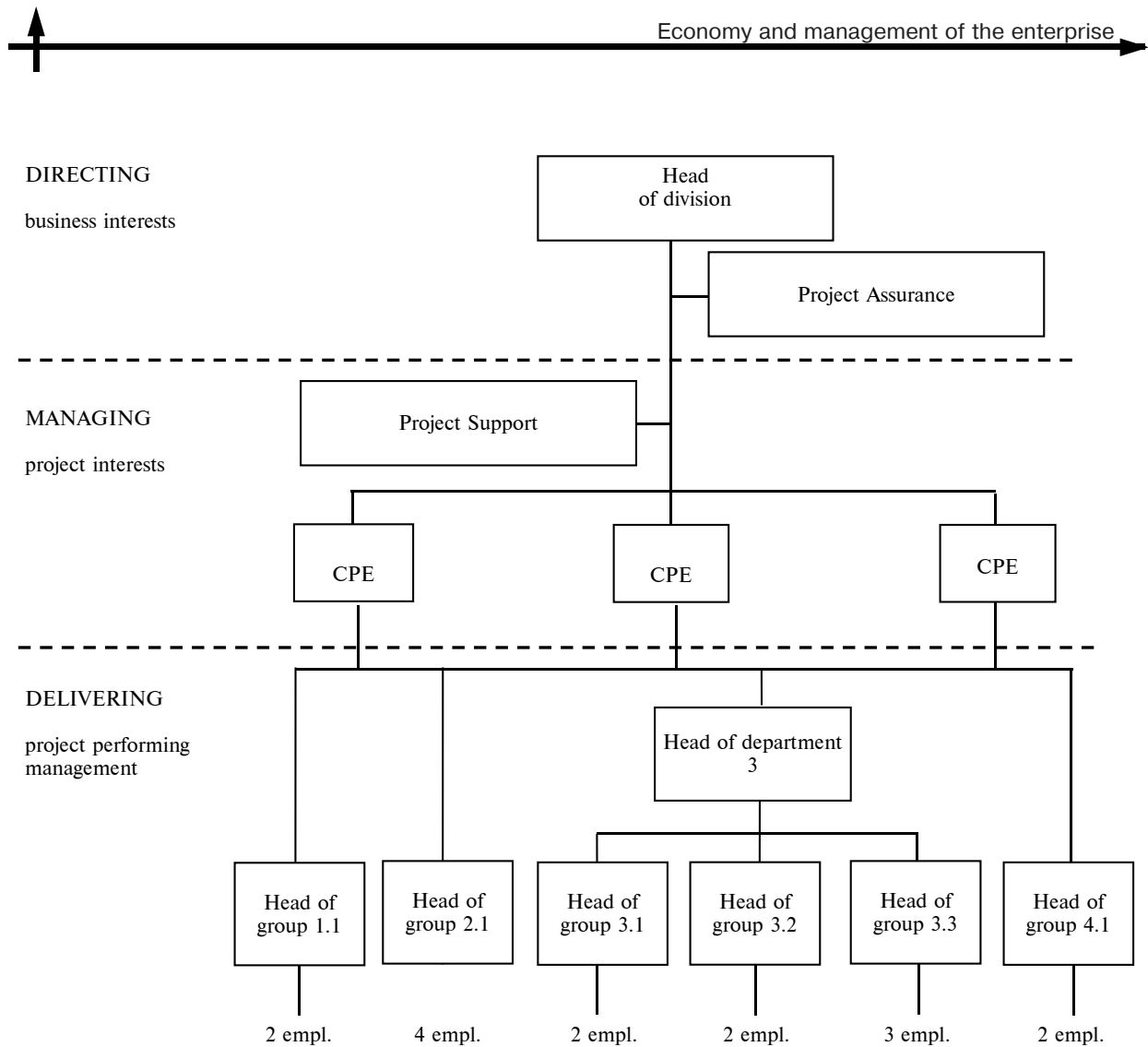
Fig. 4. Organizational structure «to be» according to project management levels

− forms the organizational basis for further growth of the company in accordance with the strategic goals of the company.

The approach for enterprise architecture formation proposed for the engineering company in this article means using of project management methods for reforming of management business processes and organizational structure. This will allow to fill different management levels with real responsibilities, to provide correspondence between system of management business processes and organizational structure of the engineering company from one hand and its strategic goals and growing business interests from the other hand.

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ILYIN, Igor V. — *Saint-Petersburg State Polytechnical University.*

195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: ilyin@fem.spbstu.ru

ИЛЬИН Игорь Васильевич — *заведующий кафедрой информационных систем в экономике и менеджменте Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, доктор экономических наук, профессор.*

195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: ilyin@fem.spbstu.ru

LEVCHENKO , Jury L. — *Director OOO «SET».*

190005, Obvodnogo kanala nab. 118a. lit. B. St. Petersburg. Russia. E-mail: levchenko@set-energo.ru

ЛЕВЧЕНКО Юрий Львович — *генеральный директор ООО «СЭТ».*

190005, Санкт-Петербург, наб. Обводного канала, д. 118 а, лит. Б. E-mail: levchenko@set-energo.ru

LEVINA , Anastasia I. — *Saint-Petersburg State Polytechnical University.*

195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: alyovina@gmail.com

ЛЁВИНА Анастасия Ивановна — *доцент кафедры информационных систем в экономике и менеджменте Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, кандидат экономических наук.*

195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: alyovina@gmail.com

UDK 658.114

O.A. Evseeva

MANAGING SUSTAINABLE DEVELOPMENT
OF SMALL AND MEDIUM-SIZED RUSSIAN COMPANIES
IN THE GLOBAL ECONOMY*

О.А. Евсеева

УПРАВЛЕНИЕ УСТОЙЧИВЫМ РАЗВИТИЕМ
МАЛЫХ И СРЕДНИХ РОССИЙСКИХ ПРЕДПРИЯТИЙ
В УСЛОВИЯХ ГЛОБАЛЬНОЙ ЭКОНОМИКИ**

Opportunities and peculiarities of doing business for small and medium-size enterprises in the global economy are observed in the article. The concept of sustainable development on the basis of managing potential of small and medium-size enterprises is offered by the author. Also there are main directions of a state policy of support that could provide more efficient sustainable development of small and medium business in Russia.

SMALL AND MEDIUM-SIZE ENTERPRISES. GLOBAL ECONOMY. SUSTAINABLE DEVELOPMENT. OPPORTUNITIES. FEATURES.

В статье рассматриваются особенности и возможности ведения предпринимательской деятельности малыми и средними предприятиями в условиях глобальной экономики. Автором предлагается концепция устойчивого развития малых и средних предприятий на основе управления их потенциалом. Также рассматриваются основные направления государственной поддержки в целях обеспечения более эффективного устойчивого развития малого и среднего бизнеса в России.

МАЛЫЕ И СРЕДНИЕ ПРЕДПРИЯТИЯ. ГЛОБАЛЬНАЯ ЭКОНОМИКА. УСТОЙЧИВОЕ РАЗВИТИЕ. ВОЗМОЖНОСТИ. ОСОБЕННОСТИ.

The enterprise focused on long-term business activities, which is not going to leave the market, always looks for the most effective new ways of development. Development is a process and result of quantitative and high-quality changes, acquisition of new qualities, a way of progressive transformation of the person or system. In world practice it is accepted to understand as a sustainable, harmonious (correct, uniform, balanced) development — process of changes in which operation of natural resources, the direction of investments, orientation of scientific and technical development, development of the personality and institutional changes are coordinated with each other and strengthen present and future potential for satisfaction of human needs and aspirations. Transferring this concept to a context of activity of the enterprises, it is possible to notice that successful economic development of managing subjects — one of components of a sustainable development. Small and medium-size business could be referred to factors of dynamic growth of economy. Without development of small and medium-sized enterprises (SME) successful functioning of large business in the country is impossible: small and medium-sized enterprises quickly react to changes of environment and often become sources of innovations which large business further can apply, possessing a large number of resource opportunities. In relation to SME the author understands the balanced development of social, economic and ecological spheres of their activity as a sustainable development.

It is necessary to notice that the sustainable development of any enterprises is a guarantee of progress of global economy as a whole. Thus in development of global economy there was a number of opportunities which can use small and medium-sized enterprises.

1. *Possibility of performance of the separate functions transferred on outsourcing of multinational corporation.* The main tendencies of world economy nowadays: globalization, internationalization, integration, promote development of process of the international division of labor and growth of scientific and technical progress. It leads to more rigid competition, need of expansion and the constant analysis and revision depending on developing preferences of the buyer of the nomenclature of let-out goods, works and services. In such conditions multinational corporation isn't able to make all operations by own forces and, therefore, involves in business processes small and medium-sized enterprises. Such «retraction» of these enterprises is defined, first of all, by scales of their distribution. Transferring to small and medium-sized enterprises performance of part of business processes with outsourcing application, and also production of certain details and knots under subcontract contracts large corporations can concentrate only on the major operations. Thus management transfer of function does not end in itself, and means of obtaining additional competitive benefits. The aspiration to optimize organizational structure of the companies, first of all multinational corporation, leads to principle application «supply from the outside» to many functions and kinds of activity which were carried out by the companies earlier. In the conditions of global economy small and medium business acts as some kind of contrast of orientation to the standardized large-scale production.

2. *Individualization of products and services.* The crucial role in revaluation of SME had been made by shifts in social and economic structure of the developed countries, change of consumer views, motivation of work. The individualization of consumption changed the principles of service, caused emergence of the flexible small divisions capable quickly to respond to inquiries of consumers. Thus, there were new requirements. Initially one of the strengths of small enterprise — personal contact with the client with the purpose to create a situation of trust, communication and, finally, to impose goods, service (the Chinese proverb: «You aren't able to smile — don't get a bench»), turned into ability. The term connected with piece production, — «a mass individualization» is characteristic: combination of a high technological level and the marketing considering (and advancing) demand of small groups of the population.

3. *Customization.* The partial modernization, allowed to build in small and medium business world economic structures, and the main thing, quickly changing consumer demand generated the new principle of production and the sales, called customization. Its sense — orientation of the producer to every possible satisfaction of consumer inquiries, constant «humouring» of the consumer, its «a peculiar binding to the producer».

Small and medium business is an essential unit in system of the international economic relations in a linking of the relations «the large enterprise — small». As small business becomes more modern, its opposition to large business disappears, it turns into an element of the economic environment interacting with others. In the 90th subjects of small and medium business started exporting the final goods. So, for the shoe industry of Italy the accessories are delivered by MT of China, India, Vietnam nowadays. Such coordination helps to globalize and integrate business processes at the international level, to avoid segmentation of labor markets, the capitals and goods.

Difficulties of SME in developing countries are aggravated with weak skills of their mutual aid, they are badly coordinated unlike the similar enterprises in the developed countries (having own organizations, the banks, the developed systems of cooperation) where the state played a huge creative role in the 60—70th and continues to play it now (f. e. regional programs of development of EU), having created modern infrastructure. In the third-world-countries these tasks have not been solved everywhere and in our case it is planned to address it.

Therefore the growth of number of SME and their form directly depend on industrial policy as a whole: small enterprises are closely connected with large that helped the SME updating. The governments of the new industrial countries managed to create the competitive start-ups in

economy, despite strong positions of large national conglomerates. The last it was succeeded to force to follow the rigid line on obligatory attraction under subcontracts SME for production of components and spare parts. Close vertical cooperation of SME with the large enterprises on the basis of transfer of technologies under long-term agreements is formed in India: the Tata group buys components for the productions from 800 small firms. Subcontracting is recognized as the most widespread form of cooperation of the small and large-volume production, one of conditions of participation in globalization.

Achievement of SME of «the critical weight» in national economy can become one of factors of self-sustaining growth. Such direction of a sustainable development is especially important for the transitional economies suffering from consequences of economic giantism and weakness of horizontal production communications.

The effective sustainable development of small and medium-sized enterprises has to promote improvement of quality of life of the population. As the instrument of realization the author suggests to use management of the cumulative capacity of the enterprise on the basis of improvement of quality of life of society. Thus as the mechanism of implementation of this concept increase of efficiency of use of cumulative capacity of the enterprise on the basis of

improvement of quality of life of society (criterion of public usefulness) serves.

The mechanism of a sustainable development of the enterprises of small and medium business has to be developed, on the one hand, at the level of the state — to be stimulated with environment. Small and medium business significantly depends, first of all, on the state support though to misunderstand it literally as the support focused almost on each enterprise. It is a question first of all of creation of the corresponding climate for SME. The state and the large enterprises lay in the economic plan a way to modernization of the small enterprises as the last are incapable to fit into modern economic space independently. For example, as one of the possible directions of the state support of SME it could be support of innovative activity of SME in the external economic. This direction of economic reforms in our country is not developed rather deeply, so that the expected effect, proceeding from world experience, can be so considerable that can affect on the economic growth of the country as a whole.

On the other hand, external incentives will be insufficient if the enterprise doesn't pay attention to its own internal resources and opportunities. Respectively, mechanisms on the basis of increase of efficiency of use of cumulative potential are formed. Criteria of realization of these mechanisms are presented in Fig. 1.
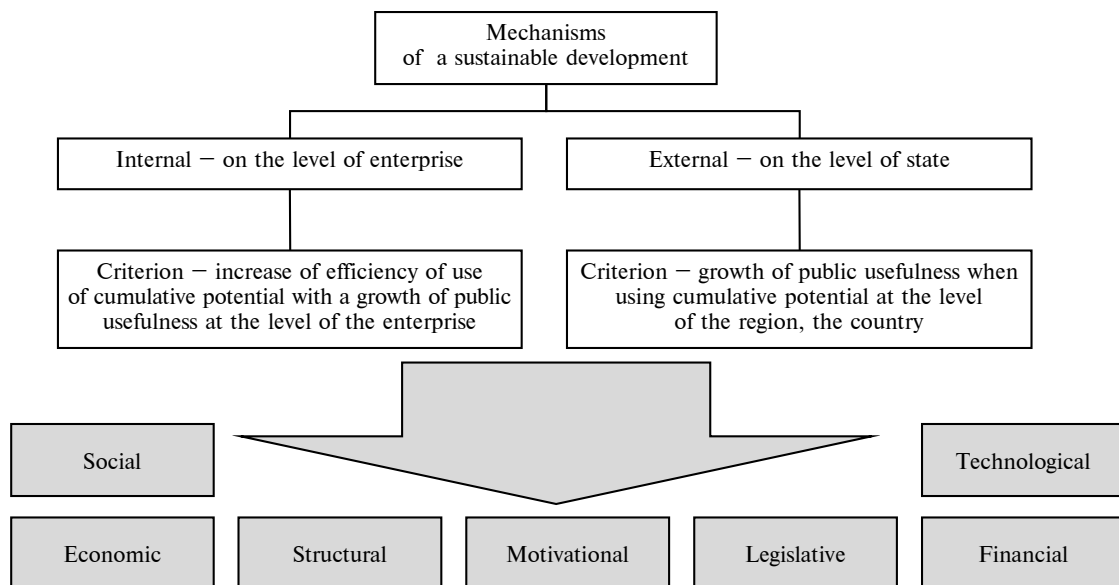
Fig. 1. Criteria and mechanisms of a sustainable development of small and medium-sized enterprises

Use of this mechanism has to meet the requirement of improvement of quality of a standard of living of the population – improvement of at least one of parameters of quality of life in the absence of negative consequences on all to the rests (criterion of public usefulness).

In the course of formation of mechanisms of a sustainable development of SME it is necessary to consider that at the moment society already lives and develops in the conditions of global economy, and, therefore, it is necessary to consider features of the small and medium business involved in system of the international economic relations. They can be reduced to the following:

– Big sensitivity to development conditions during the crisis periods for West economy. Big firms do not so sensitively and quickly react to any fluctuations or changes in economy. Not casually the help to small business in policy of the governments of Germany, the USA and many other developed capitalist countries takes a special place. Small enterprises became a peculiar indicator of the general state of affairs in economy. The small enterprises most sensitively react to change of an economic environment, falling or increase of rate of return in economy areas. The wave of ruins or formation of the new companies arises first of all in not monopolized sector and only later, having gained strength, comes to bigger firms, being reflected in their activity. In the conditions of reproduction deterioration the big companies find «outlet» in the form of capital export. Small firms, as a rule, have no such opportunity. It forces them for a survival intensively to look through the production and marketing activity. Those from them who in the conditions of the 70th beginning of the 80th years managed to adapt – survived, others – were simply ruined. However, in turn, development of small enterprises when overcoming this crisis served as important means of improvement of economy. Also it is explained first of all by that role and functions which small business carries out.

– Greater mobility market conditions, creation of deep specialization and cooperation.

– Ability not only quickly to fill niches which are formed in the consumer sphere, but also rather quickly to pay off.

– Creation of the atmosphere of the competition and that spirit of business, without which market economy is impossible. Antimonopoly function of this sector of economy is defined by this feature. The individual enterprise is a basic cell of market economy. Enterprise initiative, being guided by the consumer, always directs there where there is a pent-up demand, and leaves spheres which cease to answer inquiries of the market. Thus, optimum economic proportions, including «dimensional» structure of production are formed and supported. The positions of small business in economy are steadier, the counteraction which it renders tendencies to the monopolization of the market which is initially inherent in large business is stronger. Thus, the sector of SME is the carrier of the competitive start in economy. Its presence in the market promotes decrease» price level, maintains structural flexibility of economy and constant attention of producers to a consumer demand and quality of production.

– The essential attention is paid to an innovative component of business –more than a half of innovations arises and starts being applied in this sphere. The small knowledge-intensive enterprises – the venture enterprises, working under conditions of high commercial risk, are engaged in searching of essentially new products and processes, and also assume completion and trial development of the scientific and technical innovations which aren't demanding large capital investments. Quite often innovative function of small business is realized in cooperation with the large enterprises. Cooperation in the sphere of research and development allows to reduce considerably the period of development of new types of production (by some estimates from 10-15 % to 4–6 years) and to increase a share of new goods in the total amount of sales. Such cooperation is highly effective from the economic point of view: small firms in the USA make 4 times more novelties counting on one busy, than at the large enterprises, and costs of one researcher or the engineer – are twice lower. Besides scientific and technical innovations the considerable number of small enterprises carries out innovations in the form of updating of technology, management, the organization of work and the production nomenclature.

Analyzing the revealed distinctive features of SME in the international environment, it is possible to draw a conclusion that small and medium business – one the most important

components of modern business in all world economy, giving bases of successful development on the basis of scientific and technical progress.

Despite everything, even in the countries with the developed market economy small and medium-sized enterprises which possess considerable structure and the organizational flexibility increased by a susceptibility to various innovations and are the most important reserve of development of economy, meet considerable difficulties. Among them: lack of own means, the complicated access to the financial market and bank crediting, limitation of organizational and administrative experience, impossibility to use a factor «scales effects», etc.

As for Russia, these difficulties are aggravated with numerous negative factors of environment, among which: imperfection and imbalance of standard and legal base and mechanism of its realization; administrative barriers; shortcomings of a tax policy; backwardness of the resource markets, including real estate and capital markets, and, as a result, deficiency of the starting capital; low investment activity; underdeveloped infrastructure; narrowing of domestic market of sale owing to reduction of the state order; deterioration of a financial position of the enterprises; decrease in a standard of living of the population; unfair competition; excessive criminalization of economy, etc. All these factors, certainly, constrain development of small business and interfere with full realization of its social functions.

For the solution of these and some other problems, and also for restriction of influence of negative factors it is necessary to strengthen existing state institutes of support of small business at the expense of improvement of their organizational structure, granting new methods and mechanisms of stimulation and support of enterprise activity. Their main goals and tasks at the present become: development of financial, information and service infrastructure; broader involvement of small enterprises to deliveries of production and performance of work within a state order; assistance of modernization of business assets of small enterprises; stimulation of priority activities of small business; strengthening of the state control of observance of standards of the labor legislation and labor protection at SME.

The main directions of a state policy of support of small business have to become: improvement of standard and legal base of

formation and development of small business and small business; providing conditions of easier access of small enterprises to financial, material and information resources, and also to new technologies and results of scientific and technical development; granting tax privileges; measures for attraction of private investments; expansion of support of employment and self-employment in the sphere of small business; help in preparation of businessmen and managers; rendering consulting and expert services.

Revival and lifting of the production sphere are impossible without development of small innovative business in which only 20 % of scientific capacity of Russia today are concentrated. For the purpose of stimulation of development of innovative business and increase of integration of science and business it is necessary to create the new high-quality instrument of interaction of businessmen and representatives of the scientific sphere. It is advisable to author to create a common information space «Business science» on all territory of the Russian Federation with support of the governments. Within this space it is necessary to organize information exchange of available data in the scientific sphere and needs which are felt by small and medium business currently, to increase thus knowledge of the economy concerning already developed or perspective innovations to development and deployment.

One more direction of work with the small and medium business, capable to increase his resilience, is the development of regulatory base and special programs of development of intercompany cooperation. The policy of stimulation of cooperation of small and medium-sized enterprises of member countries of the European union carrying out since 1987, including development of legislative bases of intercompany cooperation, creation of information centers, providing the financial help and interest-free loans can be an example of it.

Summing up, it would be desirable to note that it is impossible to build effective market economy and successfully operate on the world markets without SME. It is important to have effective tools which would allow to develop small and medium business in the conditions of global economy, and efforts have to be directed on its improvement and adaptation to changing environment at the moment in our country.

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EVSEEVA, Oksana A. – *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: yevoksana@inbox.ru

ЕВСЕЕВА Оксана Анатольевна – *доцент кафедры международных экономических отношений Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, кандидат экономических наук, доцент.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: yevoksana@inbox.ru

UDK 338.45:621.311

T.V. Malinina

THE PROBLEM OF CHOICE OF THE UNIT COST INDICATORS OF ENERGY EQUIPMENT IN TERMS OF INFLATION

Т.В. Малинина

ПРОБЛЕМА ВЫБОРА УДЕЛЬНЫХ ПОКАЗАТЕЛЕЙ СТОИМОСТИ ЭНЕРГЕТИЧЕСКОГО ОБОРУДОВАНИЯ В УСЛОВИЯХ ИНФЛЯЦИИ

The paper considers the problem of justification of specific indicators of power equipment for transmission lines and substations arising from the feasibility study of energy facilities. It analyzes the impact of inflation on the specific parameters of the cost.
SPECIFIC INDICATORS OF COST. POWER EQUIPMENT. FEASIBILITY STUDIES. INFLATION.

Рассмотрены проблемы обоснования удельных показателей стоимости энергетического оборудования для линий электропередач и подстанций, возникающие при технико-экономическом обосновании энергетических объектов. Анализируется влияние инфляции на удельные показатели стоимости.
УДЕЛЬНЫЕ ПОКАЗАТЕЛИ СТОИМОСТИ. ЭНЕРГЕТИЧЕСКОЕ ОБОРУДОВАНИЕ. ТЕХНИКО-ЭКОНОМИЧЕСКОЕ ОБОСНОВАНИЕ. ИНФЛЯЦИЯ.

The calculations of technical solutions for the power facilities involve the choice of an optimum variant of the development of the power industry facilities. The main criterion for the choice of optimal variant is the maximum synergetic effect or net present value (Э or NPV):

$$\text{Э} = -\sum_{}^{T} \frac{K_t}{(1+E_{\text{н}})t} + \sum_{}^{T} \frac{\text{ЧД}t}{(1+E_{\text{н}})t} \to \max,$$

where ЧДt − net present value of the year t; K_t − capital investments for the year t; $E_{\text{н}}$ − interest rate of the Bank.

$$\text{ЧД}t = \text{РП}t - \text{Н} - \text{И}_{\text{ба}}t,$$

where РПt − sales volume in the year t; $\text{И}_{\text{ба}}t$ − annual costs, excluding depreciation $\text{И}_{\text{а}}$.

It should be noted that the study of energy facilities indicates that the value of sales and annual costs of comparable options for the completion of the facility does not change from year to year if the calculation is performed at constant prices. In this case, if we assume that the capital investments are made in one year, the criterion NPV should be replaced by the criterion adjusted costs, which is a special case of the criterion NPV:

$$\text{З} = E_{\text{н}}K + \text{И} \to \min.$$

Given the fact that the value of the annual costs for power grid enterprises (substations and transmission lines) is a percentage of the value of capital investments, the criterion for determining the optimal decision is a minimum capital investment which is a particular case of the criterion of adjusted costs

$$\text{K} \to \min.$$

In order to justify the technical solutions of electric power facilities the estimation of capital investments in the technical-economic calculations is based on aggregated data value (UPS) of power projects. This approach based on the UPS is used for pre-design stage, when there is no detailed information on future energy projects. UPS of power projects are accepted according to the reference design of electrical power systems [1], which has been developed by JSC Institute «Energosetproject». There are other references for UPS power equipment [3, 4], but they basically use the same value indicators as in the book [1].

Cost parameters in reference the book [1] refer mainly to the year 2000. The recalculation of the current price are made by using indexes of translation costs, which are published in the journal KO INVEST [2]. For example, according

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to the journal index retranslation of 2000 in 2010. the electricity industry index was 4.815 [2]. Such an increase in costs is due to the rising cost of materials for components, wages, and in the end – with inflation. The inflation factor has a significant impact on the price levels of power equipment and makes a substantial error in the determination of prices.

The calculation of the capital investments in power projects based on this approach and the comparative evaluation of the Russian equipment with the foreign one, demonstrate that Russian equipment cost indices are more expensive than those of the imported equipment, although in 2000 the situation was different, with the value indicators of the Russian equipment being 2-3 times cheaper than those of the imported equipment (see Tab. 1).

This difference in value can be attributed to the fact that inflation rates in Russia and in other countries are very different. At home, the rate of inflation from 2000 to 2010 decreased from 20.2 to 9 %.

In developed countries, the rate of inflation is 2–3 %, similarly in many developing countries.

If the inflation rate for the year is 2 %, the growth rate of prices in 10 years was 1.22, while the annual rate of inflation rate of 10 %, the price increase in 10 years is 2.6. Consequently, for 10 years, the difference in the prices of Russian and foreign equipment doubled. As a result, in 2000 the Russian equipment was 2–3 times cheaper than in 2010. when it became 20–30 % more expensive.

Thus, if you use the approach of defining cost parameters of power equipment with aggregate value of 2000. restated to the price of the current year index-based conversion [2], we see that the Russian power equipment is more expensive than its imported substitute. However, this approach does not always provide an objective assessment, as evidenced by the actual data on the cost of equipment from manufacturers. As a result, the cost of equipment does not grow to the extent predicted initially. In particular, comparison of the cost of transformers high voltage levels according to the manufacturer gets a 10–20 % lower, and for gas-insulated switches – 2 times lower than that from [1], with their conversion rates in 2010–2012.

Therefore, the approach currently used to the valuation of energy equipment requires adjustment. The probable reason for price differences is due to inflation. Inflation in Russia is characterized not only by the growth of prices, but also by a significant change in price ratios. Growth rates of prices for certain goods, products differ considerably. This phenomenon can be explained by the relative lack of development of the market infrastructure, monopoly market segments, the presence of barriers to competition, for example, due to established licensing for certain activities, etc. Therefore, the majority of Russian companies use individual price indices of industrial products [5].

It should also highlight some of the factors related to the inflation in Russia. These are, above all, the importance of imports for the Russian economy and the high cost of domestic production. These are purely Russian factors inherent in the domestic economy, like in most developing countries, even the level of production of consumer goods allows them to do without expensive imports.

Table 1

Comparison of specific cost-of-energy equipment for the Russian and foreign producers Equipment Prices 2000 Prices 2010

Equipment	Prices 2000		Prices 2010	
	russian	foreign	russian	foreign
Substation DC	16 % cheaper than their foreign substantes	More expensive	In 2.1–2.5 times higher	Cheaper
Overhead line DC	2–3 times cheaper	More expensive	20–40 % more expensive	Cheaper
Substation AC (switch)	No data	No data	Vacuum switch comparable, circuit breaker is 2–3 times more expensive	Equal, cheaper

The constant growth of imports of both industrial and food products in Russia is also one of the most serious and permanent inflationary factors. Any increase in imports from developed countries will have a tangible impact on the price increase stimulating inflation. [5]. It should be noted that the volume of imports of the power equipment has increased significantly, which is largely due to the higher quality of the power equipment, as well as due to the lack of a technological base for the production of certain types of equipment.

Besides the main causes of inflation in Russia related to the lack of domestic consumer goods, on other factor of accelerating inflation is a disbalance of the formation of incomes and wages, as wage growth has accelerated compared with the indexes of economic growth. Let us compare the prices of production of company codes of power equipment and wage growth. Producer price indices in the energy sector by sector at the beginning of 2010 compared to 2002 areas follows [2]:

1. Manufacture of electrical machinery and apparatus − 2.39.

2. Manufacture of electrical generators and transformers − 2.70.

3. Manufacture of insulated wire and cable − 3.97.

4. Generation, transmission and distribution of electricity − 3.11.

From 2000 to 2010. the growth of average monthly gross wages and salaries of employees of organizations in the economy was 4.70. which is higher than the producer price index in energy.

Thus, among the reasons for the rise in inflation in the energy sector are an increase in the imports of power equipment, as well as the wage growth rate compared with the indices of the growth of production of energy equipment.

It should also be noted that in addition to the factors of inflation, we can identify the factors that promote the reduction of inflationary processes. These factors include the innovative technology used in the energy sector and the emergence of power equipment with improved technical and economic indicators. The use of such equipment may help reduce the growth of prices in comparison with the general increase in prices for the given segment of the market for power equipment.

Conclusions:

1. The current approach of valuation of power equipment in the justification of the technical solutions of electric power facilities by UPS in 2000 prices adjusted for changes in prices using the inflation index does not always give an objective assessment.

2. The costs of power equipment are influenced by various factors that have different effect and require detailed analysis and account for the various types of power equipment.

3. In estimating the cost of power equipment in current prices requires a more detailed differentiation of inflation rates for certain types of equipment. The index for the whole electricity industry provides only aggregate measures, which do not reflect the real value of a rise in prices for certain types of power equipment.

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MALININA, Tatiana V. — *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: t_malinina@mail.ru

МАЛИНИНА Татьяна Всеволодовна — *доцент кафедры экономики и менеджмента в энергетике и природопользовании Санкт-Петербургского государственного политехнического университета, кандидат экономических наук.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: t_malinina@mail.ru

UDK 658.3:331.108.26

M.V. Lopatin, V.K. Potemkin

PROFESSIONAL CAPACITY OF ENTERPRISE WORKERS

М.В. Лопатин, В.К. Потемкин

ПРОФЕССИОНАЛЬНЫЕ КОМПЕТЕНЦИИ РАБОТНИКОВ ПРОМЫШЛЕННЫХ ПРЕДПРИЯТИЙ

The article is defined the problem of employee's professional capacity growth. The work purpose consist in understanding correlation among organizational development of industrial employees` professional skills. The article also discussed the problems of differentiation of professional competencies by type of work.

INDUSTRIAL ENTERPRISES. PROFESSIONAL COMPETENCIES. DIFFERENTIATION OF PROFESSIONAL COMPETENCIES.

Сформулирована задача роста профессиональной компетенции работников промышленных предприятий. Исследована взаимосвязь организационного развития промышленных предприятий и роста профессиональных компетенций работников. Обсуждены вопросы дифференциации профессиональных компетенций по видам выполняемых работ.

ПРОМЫШЛЕННЫЕ ПРЕДПРИЯТИЯ. ПРОФЕССИОНАЛЬНЫЕ КОМПЕТЕНЦИИ РАБОТНИКОВ. ДИФФЕРЕНЦИАЦИЯ ПРОФЕССИОНАЛЬНЫХ КОМПЕТЕНЦИЙ.

Current theoretical and empirical research of the problem of employees' professional competence defines competences as part of mental actions based on various staff functions and their involvement in production, as personal qualities of an individual influenced by external and internal environment of enterprises, as a value orientation to improve the level and quality of life, as a motivation of the development of organizational culture, as socio-psychological perception of their place in the professional structure of a company, as the ability to adapt to changing work conditions.

This definition of the competencies characterizes employee in the following areas:

− respect the dignity of another person and maintain personal dignity in a variety of situations of social interaction (domestic, professional, social), e.g. personal culture, self-control;

− adequate appearance, behavior and communication in the situations of domestic, professional, social interaction, that is culture of life, work, leisure, healthy lifestyle and communication;

− compliance with the ethno-socio-cultural traditions, customs, norms and etiquette in mono- and cross-cultural interaction, e.g. normative cultural behavior and etiquette;

− current ability to use individual knowledge (human, natural, economic, political, legal, etc.), acquired within upper secondary and higher education in the process of solving problems of social interaction, e.g. intellectual and objective activity culture;

− actualization the need of satisfaction and continuance of personal socio-cultural (moral, intellectual, aesthetic, etc.) and self-development, that is culture of self-regulation, personal self-evaluation;

− orientation to the basic values and prevailing in the modern world, country and society and preservation of the cultural heritage of the countries, (painting, music, literature, architecture, etc.);

− social responsibility and the responsibility for the welfare of others, that is, culture of social existence.

In turn, the term «professional» refers to the development and application of employees' skills in the workplace. Factors that ensure the employee's work are as follows:

− organizational and economic factors associated with the labor organization, the legal form of the company, its organizational structure, communicational system, the production organization, economic conditions and peculiarities of the economy, the structure of the production cost and allocation of profits, approaches to workers' remuneration, etc. These factors affect the organization of labor and production, minimization of labor costs and valuation of work, etc.;

— administrative and managerial factors associated with administrative management methods, with control functions features, the choice of principles and methods, with the complex regulatory and legislative acts defining the workers duties, rights, responsibilities, relationship «power structures» and the hierarchy of the system. These factors characterize the parameters of Business Administration:

— technical and technological factors determine the scope of the activities of engineering and technology departments and characterize the impact of hardware on workers' somatic and psychological state, their social self esteem;

— organizational and legal factors related to the application of modern legislation in labor relations, working conditions are reflected in the documents on labor relations. They define the regulatory requirements of work processes;

— specific factors: group and personal. Group factors are associated with the process of socialization, with its demand to work in the group, to play roles, to cooperate, to feel concern and care for others, to assign roles among its members, to set their status enforcing group norms and rules, thus ensuring its sustainability and group goals achievement. Personal factors reflect the system essence of human personality, its uniqueness and conditionality.

Professional competence are formed and implemented in the activities of specific companies influenced by the external and internal environment.

Ambient operation of enterprises is a system of institutions and organizations that regulate and ensure their activities.

Internal environment is a collection of elements of in-process control including the following parts:

— working conditions (occupational health and work safety, working place as a place of passing the time, psychophysiology of work, labor ergonomics, technical aesthetics);

— labor and social relations (the analysis and control of group and interpersonal relations, culture of management and decision making, management of the interaction with employees, the management of industrial conflicts and stress, socio-psychological diagnosis, intra-culture and PR-action work with the staff, the quality of labor life);

— administration: formalization and documentation of recruitment procedures, rotation, release, etc.; formation and controlling of electronic databases;

information and staffing solutions; archiving and storage; information availability change concerning the basic conditions of employment;

— planning and Forecasting: philosophy management development and core HR strategy, outlook and analysis of the social impact of the activity, the introduction of rules, management solutions for social and labor relations, monitoring and analysis of the labor market, the identification of staffing needs, implementation of interrelationships with external sources of employment, the relationships with distribution channels and information, a description of jobs places, the formation of the profile requirements;

— employment: attracting candidates, evaluation of candidates` skills, staff rate;

— adaptation: professional, social, and psychological adaptation of new employees, rotation and dismissal);

— development: (current and prospective training needs, the formation of training programs, the organization and provision of learning, management of investment in staff career planning and control, probationers, students with grants`, planning, preparation and release through rotation, dismissal, retirement;

— motivation and stimulation: identifying motivation and stimulation areas; regulation of the labor process and labor payment by results`, development of the system of material, non-material incentives and promotion; development of the system of staff participation in the profits and capital;

— legal support of personnel work: legal regulation of labor relations; the development of organizational administrative documents on personnel management; regulation of disputes in labor relations, coordination of the legal regulation of labor relations with other professional and functional groups;

— security and trade secrets: development of triangle requirements and schemes regime; security and commercial secrets; formation of the list of information constituting trade secrets, the introduction of regime schemes, security, and trade secrets;

— social security and infrastructure (catering organization; the organization of health and recreation; public service organization; coordination and management of the individual elements of social infrastructure;

— evaluation of the work and activities: development of assessment and of evaluation procedures, organization and coordination of the evaluation; development and application of the

assessment results; certification of personnel and evaluation of personal results;

− information flows: information about staff and organizations to be distributed, channels for disseminating information both inside and outside the organization; getting feedback;

− organizational structure and development of the enterprise: the analysis of the structural inconsistencies, changing: the structure, staffing and management.

System operation of large industrial enterprises is in constant development caused by changes in the external environment: political, economic, scientific, technical and social. These changes characterize the forms and methods of using employees professional skills and create the institutional framework for all industrial structures without exception, industrial structures, and vice versa.

This results in: 1) the formation of the enterprise type: sectoral, intersectoral, technologic, multifunctional, innovative, etc., 2) the identification of the needs in professional competence of employees which must be determined prior to the purposes and objectives of the enterprise, 3) the elaboration of the structure and mechanism of interaction among different professional employee groups for solving management problems, 4) social and labor relations among workers ensuring adaptation, interdependence, complementarity, and employees` professional growth.

Also, the features, characterizing the system of company organization, management technology, organizational structure, professional communication procedures of employees, value orientation, and staff must be defined.

Organizational industry development becomes the basis for a detailed analysis of workers` professional competence and their purposes in the medium and the long-term, as well as the necessary management decisions. The concept of «administrative decision» is diverse. It is often used to refer to the sequence of stages of administrative machinery for choosing the most optimal course of action («decision making»).

In management, decision-making is a complex and systematic process which consist of many phases and stages, starting with the problem formulation and ending with completed action (see Fig. 1):

The first stage of this process includes the following steps:

− recognition of the problem;
− formulation of the problem;
− identification of the criteria for a successful solution.

Phase 1. Admission of making decisions
− understanding of the problem − interpretation and formulation of the problem
Phase 2. Making decision
− indentifying alternatives − estimating alternatives − choosing alternatives
Phase 3. Decision implementation
− organization of decision implementation − analysis and control of implementation

Fig. 1. Stage of the decision-making process.

On the basis of previously made decision another new one occurs (if actions concerning this decision have already been over or have deviated from the original one, or have come into conflict with changes in the external environment of the organization).

If the problem of employee's professional capacity growth is defined and it benefits the organization development, the next step requires the interpretation of the mechanism of the appropriate growth in the professional capacity. It is necessary to take into consideration the following aspects of the actions implementation concerning professional competence growth of employees:

− consequences of the problem (capital intensity, efficiency, impact, etc.);

− impact on the organization (what results from solving the problem);

− urgency of the problem and the time constraint;

− reliance of the manager's skills;

− attention to the problem (the motivation and skills of the participants);

− life cycle of a problem (the problem can be solved by itself or in the process of solving other problems).

However, new unique problem often occurs and its solution does not fit into the usual and standard framework. This case requires a creative approach. There are many methods of creative search for alternatives: the so called «brainstorming «, suggesting ideas, group analysis of the situation, cause-effect diagram, record of opinions. It is important to understand that the executive manager creates a work atmosphere during the search for alternative decisions.

Decision implementation means the elimination of the origin problem in focus while the decision was made.

Decision implementation includes the coordination of the forces. The top manager should try to avoid potential conflicts, to make people interested in the solutions, to place people in such a way, that they are able to use their abilities as well as possible. To do this, firstly, it is necessary to draw an activity plan turning the decision into reality. The rights and responsibilities should be distributed among the participants. It is important to remember the old rule: «Nothing will happen if there is no responsible person.» To exchange information, communication network should be build. And owner-member relationship between the parties should be created. Secondly, the conflict of interests should be taken into account. Different methods of empowerment delegation and employee participation contribute to this.

It is worth saying that the company orientation on the growth of employees' professional capacity depends to a large extent, on the leader. Therefore it is necessary to define the leader's skills (see Tab. 1):

T a b l e 1

Professional characteristics of a business leader when ensuring the growth of employees' professional skills

Professional characteristics of a business leader	Professional qualities of a business leader
A. Personality traits of a business leader	
1. Focus on increasing professional skills	Innovative economic thinking, wide professional outlook, communications development, planning, professional networking
2. Orientation to the employees' professional skills development	Recognition of employees' professional competence, openness and attention to staff
3. Activity and rationality in decision making	Active participation in strategic and tactical issues of workers professional capacity growth. Testing, business games, brainstorming sessions to estimate the important professional qualities of workers
4. Openness to change	Critical reflection of their participation in the growth of professional skills of workers. Self-esteem, self-organization and self-development of their professional skills, increasing professional qualifications
Innovative thinking, development of «winner psychology», moral attitudes and ethical behavior	
5. Development of intellectual abilities	Development of professional memory, increasing professional information
6. Economic and social responsibility for decision making	Admission of responsibility for the growth of workers` professional skills and management decisions
7. Planned work.	Formulation of objectives, business contacts, meetings, business meetings, evaluation of employees` professional competence.
Management style and social orientation on management decisions	
8. Purposefulness	Formation of leadership positions, corporate culture, arrangement of good health conditions for workers, provision of a high standard of living for personnel
9. Counteraction against criminalization of industrial relations	Development standards of staff`s behavior, management of economic and physical personnel security.
The ability to express their thoughts.	
10. Verbal communication	Expressed in clear and understandable form, consider the level of professional knowledge of workers, avoiding conflicts among the workers
11. The ability to represent and implement professional projects	Use technologies, modern methods of delivery, transfer, formalization of professional information

Table 2

The influence of the labor activity on the development of professional competences of professional capacity of enterprise workers

The elements of the labor activity of the enterprises	The number people marked this characteristic	Доля лиц, marked this characteristic in the sample (in %)	Popularity rank of this characteristic	Men (N 302 people.)	Wowen (N 198 people)	Under 30 years (N 269 people.)	Between 31—40 years (N 151 people.)	Between 41—50 years (N 54 people.)	over 50s (N 26 people.)
2	3	4	5	6	7	8	9	10	11
1. Big earnings	410	82	I	86	76	88	79	57	85
2. Good relations in the team	370	74	II	81	64	71	75	89	73
3. The possibility to get the apartment, room in the hostel	319	64	III	67	59	67	69	59	11
4. Good working conditions	310	62	III	55	73	58	60	91	54
5. Interesting work	300	60	III	67	49	64	62	46	42
6. Good relations with the leadership	296	5	III	63	54	57	60	67	65
7. The distance from work to home	238	48	IV	38	62	37	57	61	77
8. The possibility to work by profession	220	44	IV	64	14	46	44	41	35
9. Well-organized physical culture and sports activities	194	39	IV	41	36	43	41	28	8
10. The opportunity to upgrade	168	34	V	43	20	34	37	37	4
11. Well-organized medical and health-improving work	167	33	V	27	43	28	35	41	67
12. Well-organized cultural-mass work	165	33	V	35	29	34	35	31	15
13. The opportunity to learn a trade	148	30	V	36	20	37	32	0	0
14. The opportunity of career development	136	27	V	33	18	25	34	31	4
15. Well organized work in various kinds of creative activity, including the rationalization and invention	74	15	VI	20	7	12	21	19	0
16. The possibility to get a place in a children's preschool institution	62	12	VI	1	30	15	14	0	0
17. Outwork or part-time employment	6	1	VII	0	3	0	0	2	19

Thus, the organizational development of industrial enterprises, in the context of the professional actions of leaders, contributes to the growth of the following parameters characterizing professional capacity of employees:

− Vocational qualification level (education, experience, creative approach);

− Business skills (competence, training staff, innovation in the collective decision-making style);

− The complexity of the work (the content of work, diversity and complexity, independence, scale and complexity, additional responsibilities);

− The results of work (quantity, quality, time for the execution of work);

Furthermore, this work package aimed at the growth of professional competencies of employees helps to fix and evaluate all qualifying factors of the performance of an enterprise. For this

purpose, it is necessary to develop job analysis and psychograms.

Job analysis is a description of the social and economic, production and technical, sanitary and hygienic, psychological and other features of the profession and its specifications. Job description identifies and describes the requirements of the professional qualification, groups of jobs and even a separate work place. Reasonability and the scope of this method and the sphere of its application are determined by the costs and the expected results.

A psychogram is the most important part of the job analysis description of professional requirements (skills) for the personal psychological qualities. The content and volume are determined by a professional selection, vocational training, career counseling, and other elements of the personnel policy.

The psychogram comprises the following data sources: documents (instructions, regulations, chronometer tables, description); oral and written surveys of workers including questionnaires, personal observations, laboratory and natural experiments; «flight» (test, target) research and ergonomic studies in the workplace (kinocyclography, electrooculography, telemetry of physiological parameters, electroencephalography, telechronoreflexometry), etc.

The correlation between the organizational development of industrial enterprises and the growth of employees' professional skills involves:

– Obligatory and regular assessment of the personnel's professional qualities;

– Obligatory use of the estimation of professional competencies when making decision about staff promotion, changing their wages, positions and activities, etc.;

– Control over the use of professional skills by the employees in the implementation of particular types of work;

– Differentiation of the growth of professional competence in certain types of work;

– Differentiation of the growth of professional competencies type of work performed.

The differentiation of professional competencies by type of work implies: a) Obligatory and regular assessment of all professionals and workers under control; b) Obligatory use of evaluation results in making decisions about the advancement of employees, changes the payment and bonuses, line of activity, dismissal, etc.; c) Obligatory recommendations made as a result of the evaluation, d) the involvement of specialists and workers in the evaluation and self-evaluation of work; and e) monitoring the use of the personnel, identifying duplication, and eliminating unnecessary links in the control system.

All said above give us the possibility to specify the degree of the influence of vocational labor activity on the development of professional capacity of enterprise workers (Tab. 2).

As a result of the growth of professional competence of employees of enterprises can be: continuous, correlated with the phases of the enterprises life cycle, focused on the implementation of the mission, goals and objectives realization of the enterprise, defined by terms, methods and resources, addressed, considering specific nature and content of the work, resourced; reproducible in view of employee's socio-psychological readiness to changes in the structure and content of the enterprise.

This approach to the development of professional skills of staff caused by the following reasons:

1) motive is the reason of the employee's professional and social activities,

2) the skills defined the qualifications of employee's professional competence,

3) attitudes and values determine the worker's behavior in the industrial sector,

4) knowledge provides the real and potential intellectual qualities of employee's professional competence,

5) social perception is the perception of reality, thereby sustainable workers health focused on the development of the full range of industrial relations can be created.

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POTYOMKIN, Valery K. – *St. Petersburg State Financial And Economic University.*
191023, Sadovaya str. 21. St. Petersburg. Russia. E-mail: socupr@rambler.ru

ПОТЕМКИН Валерий Константинович – *заведующий кафедрой социологии и управления персоналом Санкт-Петербургского государственного экономического университета, доктор экономических наук, профессор.*
191023, Россия, Санкт-Петербург, Садовая улица, дом 21. E-mail: socupr@rambler.ru

LOPATIN, Mikhail V. – *Saint-Petersburg State Polytechnical University.*

ЛОПАТИН Михаил Валентинович – *заведующий кафедрой стратегическ ого менеджмента Санкт-Петербургского государственного политехнического университета, кандидат экономических наук, доцент.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: m_lopatin@inbox.ru

M. Block, T.Ju. Khvatova

CULTURAL INFLUENCES ON ORGANIZATIONAL KNOWLEDGE AND KNOWLEDGE SHARING: CASE-STUDY OF RUSSIA, GERMANY, FINLAND

М. Блок, Т.Ю. Хватова

ВЛИЯНИЕ КУЛЬТУРНОГО АСПЕКТА НА ОБМЕН ЗНАНИЯМИ В ОРГАНИЗАЦИИ: КЕЙС-СТАДИ РОССИИ, ГЕРМАНИИ, ФИНЛЯНДИИ

Efficient intra-organisational sharing of resources, especially knowledge, defines the level competitiveness of large organisations. The aim of the article is to take a closer look at cross-cultural aspect as one of the most influencing factors of knowledge sharing and discover the impact of cultural background of employees belonging to different nations – Russia, Germany, Finland. The cultural influence on understanding the role of knowledge and knowledge sharing is investigated.

KNOWLEDGE SHARING. LARGE ORGANIZATIONS. CULTURE.

Конкурентоспособность крупных организаций во многом определяется эффективностью совместного пользования внутренними организационными ресурсами, в частности, знаниями. Цель данной статьи – изучение кросс-культурного аспекта, как одного из основных факторов в процессе обмена знаниями, а также влияния на обмен знаниями культурных особенностей сотрудников, принадлежащих к разным нациям (в центре внимания данной статьи – Россия, Германия, Финляндия). Исследуется также влияние культуры на понимание роли знаний и совместного владения знаниями в организации.

ОБМЕН ЗНАНИЯМИ. КРУПНЫЕ ОРГАНИЗАЦИИ. КУЛЬТУРНЫЙ АСПЕКТ.

Introduction. In the «knowledge age», knowledge is recognized as the primary strategic resource of an organisation [1], and those organisations which are able to manage the way how knowledge is shared between employees are believed to gain and sustain their long term competitive advantage [2].

There are many definitions of knowledge and Knowledge Management (KM) in scientific literature. Drucker, for instance, views «knowledge as a utility, knowledge as the means to obtain social and economic results» [1]; Senge defines knowledge as «the capacity for effective action» [3]. Many definitions of knowledge in Knowledge Management theory distinguish between explicit (or codified) knowledge, which is more formal and systematic, and tacit knowledge, which is highly individual, specific to context, and this makes it to be a crucial source of sustainable competitive advantage.

In studying knowledge sharing in an organisation the issue of transferability of knowledge becomes important. In the literature it is generally argued that explicit knowledge can be transferred easier, because it is codified and formalized. However, the explicit knowledge derives from acquired or held relevant tacit knowledge which in turn is decoded, so that both explicit and tacit knowledge interact. The transferability of knowledge depends on the ability to articulate messages of the involved sharing partners. In addition actors in large organisations possess different cultural backgrounds. Therefore, in this article we seek to analyze the importance of individual culture on intra-organisational knowledge sharing process. Studying cultural differences allows seeing possible potentials and contradictions occurring when multinationals work within one organisation.

The term «culture» is characterized by complexity and is defined in many ways. Scholars agree that culture is not static, but rather changes in time (as much as knowledge does). Hofstede distinguishes between the following layers of

culture: symbols, heroes, rituals, values and customs [4]. According to Schein culture has three layers: basic underlying assumptions, espoused values and artefacts [5]. Cultures can be different not only between continents or nations, but also within the same organisation or even family respectively cultural affiliation or cultural identity. This article does not aim at compiling a new definition of culture or identifying cultural dimensions, but at investigating what the cultural influence on organisations is.

Although the relevance of culture is noticed by large organisations and scholars, the effects of cultural aspects on knowledge sharing are still little considered. Further a case-study oriented analysis is carried out for Russia, Finland and Germany. The starting point for the analysis is the cultural-based study of Hofstede (1980) as well as the more recent empirical study conducted by the GLOBE[1] group [6].

The well-known Hofstede's model aims to explain cultural differences and to measure them. Therefore a set of dimensions was defined: Power Distance, Uncertainty avoidance, Individualism, Masculinity and Long Term Orientation in order to obtain values for a specific group of people and culture [4]. The GLOBE study, conducted in the mid 1990's in 951 organisations, in 62 of the world's cultures, aimed to expand Hofstede's study (1980), especially by exploring the impact of culture on leadership [6]. In similar way to Hofstede nine cultural dimensions were developed, of both societal and organisational cultures: Power Distance, Performance Orientation, Assertiveness, Uncertainty Avoidance, Institutional Collectivism, In-Group Collectivism, Future Orientation, Gender Egalitarianism, Human Orientation. A considerable fact about those cultural dimensions is that each one embraces both actual practices («as is») and values («should be»), thus the study's total is 18 dimensions. Below both studies are analysed separately and later on the results are compared.

Hofstede study. According to the index of Power Distance Germany (35) and Finland (35) belong to low and Russia (93) to high power distant countries. In other words, in both Germany and Finland the distance between supervisor and subordinates is characterised by lower dependency and emotional distance [7].

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[1] GLOBE is the acronym for «Global Leadership and Organizational Behaviour Effectiveness».

Even the flat hierarchy turns more and more into project matrix organisation where teamwork and delegation plays an important role. Ideally, the supervisor acts more as a coach and involves his team members into decision-making process. On the other side, in Russian culture the distance between powers is historically large. Logically, autocratic and patriarchal hierarchies are transferred into organisational context and a person who has authority and takes responsibility is appreciated. The supervisor is all in one: s/he functions as the incubator of ideas, distributor of tasks, controller of the process and results, and the patron of the group interested not only in his team membersr performance but also in their lives in general [7].

Germany (65), Finland (59) and especially Russia (95) are likely to avoid uncertainty according to the index of Uncertainty Avoidance, however the ways differ. German culture concentrates on reducing uncertainty by forcing rigid adherence to laws, rules and contracts, and therefore the emphasis lies more on the written word. Similar to Germany the state of Finland provides their citizens a reliable `safety netr in case of any kind of misfortune in life such in case of illness, unemployment, accidents and bankruptcy. Finnish culture is characterised by law-abiding and universal rules, but also being aware of the relativity of truth and developing their own view on things as well as to be open for changes. Russia is a high-context culture where universal truth does not exist so every situation is treated specifically. It is well-known that Russia developed complex bureaucracy with abundant laws and regulations, but in practice they function only as a guideline, while the emphasis lies more on personal promises.

On the contrary, Russia belongs to a more collectivistic country with an index of 47. It means that belonging to a group offers protection and stability, but requests strong loyalty. Accordingly, individualrs behaviour is determined by group targets supposed by the leader which are valued higher than individual targets. Therefore, in organisational context the emphasis lies more on building up long-term relationships within (important) groups rather than on the task. Consequently, private and working networks become blurred and cannot be treated separately. This more particularistic view allows more flexible and fast decision-making within the group, but

factual and rational argumentation can be easily overlooked [8]. Therefore, in order to hold the group together and avoid conflicts a direct communication style about the task and a more indirect communication style is appreciated, especially in expressing own opinion or even critics. Particular attention is given to non-verbal communication and overall (non-)trustworthy impression [8].

In Germany and Finland life and reality are divided into catchable parts, e.g. working time and free time. Logically rational planning of activities and processes as detailed as possible helps to utilise and manage time at best. Therefore in organisational context keeping deadlines and time commitments is very important. On the other hand in Russia reality and truth are understood globally, and thus they are neither universal nor catchable. Therefore, a plan can only function as a guideline which looks good on paper, and deadlines and time commitments can be changed accordingly to the concrete situation.

The index of Masculinity represents the degree of performance-orientation and competitiveness in society [7]. In regard to the explanations above it seems to be conclusive that German culture is circumscribed as highly masculine (66) and Russian culture (40) as low masculine. While in German organisations work-related competition is seen as a driver for efficient and innovative work embedded in a cooperative atmosphere, in Russia performance is traditionally ruled and guarded by the supervisor. Actual work-related competition between workers does not take place, but is replaced by loyalty and keeping harmony in personal relationships within the group. Therefore employees keep knowledge inside [9]. On the contrary, in the international comparison, Finland is one of the most gender equal societies and the most feminine society where autonomy, personal interests and friends are more important than career and work in life. In difference to Germany where competition and performance is stressed, in Finland the focus lies on equality and quality of work and life. Furthermore, while in German culture the strong, the best and the fast is highly appreciated, in Finland the empathy is given to the weak and to the slow.

In Tab. 1 cultural values derived from the Hofsteders study are summarised whereat the values are grouped into the following four

domains: context, face-saving, time-perception, universalistic versus particularistic. This grouping is chosen, because starting points of the cultural influence on knowledge sharing can be drawn from those cultural values.

GLOBE study. In Fig. 1a and 1b there are nine cultural dimensions of the GLOBE study measured by answers on a scale of 1 «strongly disagree» over 4 «neither agree nor disagree» to 7 «strongly agree». For a better comparison the cultural actual Practices (P) and cultural Values (V) of Germany, Russia and Finland are separately represented in the following two figures X, Y (House et. al 2004). Actual Practices reflect the «as is» state, i. e. the actual observable behaviour, habits, and customs in the society or organisation. The Values reveal the «should be» or ideal state, i. e. the values actual behaviour is based on and peoplesr expectation in attaining those values.

Below the nine dimensions for culture developed by the GLOBE group are circumscribed [8] and applied to Germany, Russia and Finland.

a) **Power Distance**: To which extent people expect and are able to tolerate that in their culture the power is not equally distributed, e.g. held by the state government or by the management of companies. Despite all three countries disagree towards power distance as an embedded value with 2.5 and 2.6, in practice a reversal effect can be observed in Germany, in Russia as well as in Finland with indices over 5.

b) **Performance Orientation**: To which extent a culture encourages members of society or organisation to perform better and rewards it accordingly. While in German (6.0), Finland (6.2) as well as in Russian culture (5.5) people strongly agree to the value of seeking best performance, in practice such performance oriented-behaviour is indifferently observable with 4.2, 4.0 and 3.8.

c) **Assertiveness**: To which extent a member of a society or organisation behaves towards others: self-confidently, aggressively or confronts with others. In both Germany and Russia people more disagree to the value of assertiveness. In Russia assertiveness is also less observable in practice whereat in Germany more people agree to assertive behaviour. On the other hand, in Finland people do not emphasize assertiveness and thus, neither agree nor disagree.

Comparison of cultural values of the Hofstede study

	Germany	Russia	Finland
Context			
Emphasis on written word	Quite high	Not so high, but collecting written documents is very important for reporting	Quite high
Adherence to law	Rigid	Flexible	Rigid
Agreement based on personal promises or written word	Written word	More on personal promises	More on written word, but personal promise is also a promise.
Reliance on words or non-verbal communication	Reliance more on words	Reliance more on non-verbal communication	Reliance on words
Face-saving			
Favoured business approach	Content matters; to the point discussion	Polite and respectful, but conflict avoidant	Politeness strategy, but enough direct plan
View of directness and indirectness	Constructive directness is wished; indirectness may cause misunderstanding	Directness may be impolite; indirectness may cause misunderstanding	Too much directness inconsiderate; indirectness may cause misunderstanding
Amount of verbal self-disclosure	Medium till high	Low at organizational level, high on personal level	Low
Vagueness	Not appreciated. In expectation of something promising, risks are taken.	Not appreciated and even avoidance of any uncertainty.	Not appreciated.
Perception of time			
Keeping schedules	Important, must keep on schedules.	Schedules are flexible and can be changed	Must keep on schedules
Keeping time commitments	Demanded	Desired but not always obligatory	Demanded
Attitude to deadline	Important	Deadline is more seen as a guideline	Important
Universalistic vs. Particularistic			
Main focus: on law or relationship	Main focus on law, but also on relationship	Building up long-term relationships or relationships within important groups	Law
One reality or several perspectives	Mostly one reality	The truth is not universal and depends on the point of view	Mostly one reality
Rational arguments or personal approach	Rational arguments	Rational arguments are important, but personal approach sometimes prevails	Rational arguments

d) **Uncertainty Avoidance**: To which extent a member of a society or organisation feels threatened by uncertainty and counts on established social norms and formal practices. While in Finland people do not put emphasis on the value of uncertainty avoidance, in Germany even more people disagree to uncertainty avoidance as a value (3.3), but in real behaviour in both countries people strongly agree with established uncertainty avoidance mechanisms (5.1 and 5.3). In Russia the situation is different. People agree (5.0) to the value of uncertainty

····· Germany P ——— Russia P ━ ━ ━ Finland P
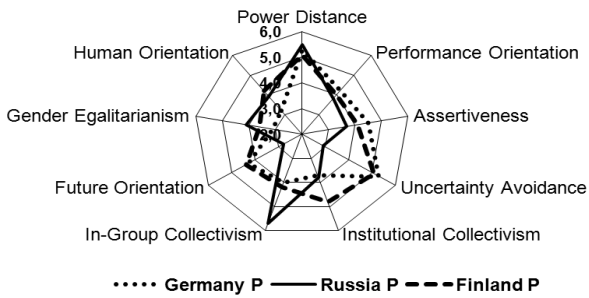
Fig. 1a. Country Scores (Practices)
of the GLOBE study.

····· Germany V ——— Russia V ━ ━ Finland V
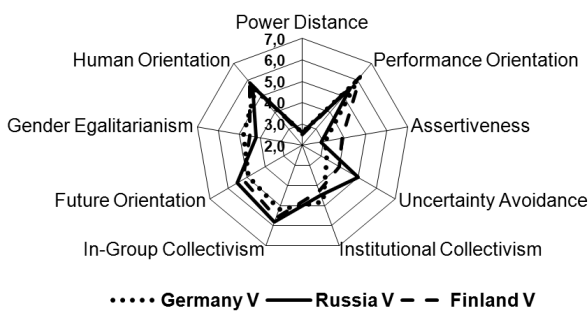
Fig. 1b. GLOBE Country Scores (Values) for Russia,
Germany and Finland.

avoidance and underline its importance. Nevertheless the existence of uncertainty avoidant behaviour is disagreed with 2.9.

e) **Institutional Collectivism**: To which extent institutional acts support the distribution of resources. In Germany (4.8), Russia (4.5) as well as in Finland (4.3) people more agree to institutional collectivism as a value. In actual behaviour Russians and Germans neither agree nor disagree, but Finns tend more likely to agree to institutional support in distribution of resources in practice.

f) **In-Group Collectivism**: To which extent people show their loyalty, pride and connectivity towards their culture, e.g. towards their family or organisation. Russiars index shows a strong agreement to In-Group Collectivism as a value (5.8) as well as in actual behaviour (5.7). In German culture and in Finnish culture this dimension is also quite highly valued with 5.2 and 5.6, but in real behaviour neither agreement nor disagreement exists.

g) **Future Orientation**: To which extent peoplesr behaviour in the society or organisation is future-oriented, e.g. expressed in form of planning and investing. In Germany as well as in Finland people agree to future orientation as a value with 4.9 and 5.2 and also (but a bit less) to actual behaviour with 4.3 and 4.4. In Russia future orientation seems to be highly valued with 5.5, in practice there is reversal behaviour observable displayed by the index score of 2.8.

h) **Gender Egalitarianism**: To which extent the society strives for gender egalitarianism in order to reduce gender discrimination. Gender Egalitarianism is in Germany emphasised and agreed as a value (4.8), however, in practice people even more disagree to certain behaviour (3.1). This tendency is similar to Finland, but the difference between value perception (4.5) and actual practice (3.6) is smaller. In Russia people neither agree nor disagree to Gender Egalitarianism as a value as well as in actual behaviour.

i) **Human Orientation**: To which extent a culture (in society, organisation) honours fair, honest, altruistic behaviour. In all three countries Germany (5.4), Russia (5.6) and Finland (5.8) Human Orientation is quite high valued. While in Russian (3.9) and Finnish culture (4.2) peoplesr agreement and disagreement towards human orientation in practice keep the balance, in German culture people are even more likely to disagree (3.2) to human orientation in real behaviour.

Discussion of the results. The comparison of the results of the GLOBE study shows that there are negative correlations between culture practices and values for all three countries in the dimensions of Power Distance, Performance Orientation, Uncertainty Avoidance, Human orientation, and only for Russia in Future Orientation. Furthermore, there are negative correlations between Hofsteders and GLOBErs cultural dimensions namely Power Distance, Uncertainty Avoidance and Masculinity. In more detail the investigation of Power Distance dimension displays strong contradictions between practices and values in all of those three countries. According to the value indices, for example for Russia, opinions almost completely changed from strong agreement to disagreement in 25 years period (from Hofstede study in 1970 to GLOBE in 1995). On the other hand, in both Hofstede and GLOBE studies people agree that the actual behaviour displays power distance. In Germany and Finland the value of low power distance for both studies is consistent; however, real practices represent strong power

distant behaviour. It leaves the question about the validity of the culture models of those two studies. On the other hand, both models finely reflect the historically shaped features of the three national cultures. So, the contradictive combination of authoritarianism and collectivism, aspiration to unity and tyrannical power in Russia was besides those two studies described in numerous well-known books (for example, in [10]). The historical need for maximal concentration of resources (human, financial, etc.) and collective opposition to numerous dangers predefined the tradition of obeying private interests to the tasks of society. This could possibly bring to the well-known cult of 'levelingr people's in income, standard of living and thinking; it has always been considered to be dangerous to stand out in a crowd and show new ideas, talents, aspirations which is obviously an obstacle to the development of personality and individual abilities. In German and Finnish cultures the focus on the individual is strengthened by historical reason. However, while the 'I-feelingr and striving personal targets lead in Germany to more self-benefit maximisation and competitive and assertive behavior. In Finland personal independence and respect for the autonomy of others are high valued and the kinds of work, the level of education and professionalism are strong indicators of the degree of status in Finnish society.

Cultural influences on knowledge and knowledge sharing. In view of knowledge sharing such researchers as for example Holden [11] see a close connection between culture and knowledge. Some scholars argue that sharing knowledge between different cultures is more difficult than within the same culture, because less shared knowledge or rather lack of shared understanding is present. Other scholars give practical recommendations for the knowledge management in international business, e.g. to create intercultural positions, and to raise the awareness that knowledge sharing is also determined by cultural aspects. Furthermore De Long and Fahey [12] underline that culture has impact on the understanding and role of knowledge and how knowledge is shared in organisations. In this article the areas of cultural influence identified in [12] superimposed onto the comparison between Germany, Finland and Russia.

In German and Finnish cultures knowledge is connected to results and therefore to organisational performance. The understanding of knowledge in Russian culture differs strongly. Knowledge is supposed to be global and abstract, thus not catchable or complete. In consequence any kind of knowledge can be important and collected (just in case), whereat for Germans and Finns knowledge means utilisable, rational, helping to achieve a result so that knowledge which does not directly affect the performance is less considered.

While in Germany knowledge means personal power, in Russia the role of knowledge is undefined. However, while task-oriented knowledge does not mean personal power, relational power does. Consequently, in Germany specialised knowledge is highly valued. Thus the problem of the willingness to share knowledge arises. Some research on management in Russia indicated strong reticence to share knowledge and a tendency to work with whom they are more familiar and to exclude those they consider to be outsiders. Mikhailova and Hutchings [13] found out that in Russia so called «knowledge-sharing hostility» due to strong group affiliation and suspicion for out-group members.

In German culture the emphasis is on written form therefore it is desirable to explicit knowledge also in order to be able to evaluate and store it. In Russia main focus is given to people as carriers of knowledge and oral sharing of knowledge is highly preferred. Speaking about obstacles to knowledge-sharing in international organisations, it is worth mentioning that Russian culture is characterised by high degree of ethnocentricity while deciding who is «belonging to us» or not (manual) which means problems with trust to other ethnicities and of course leads to reducing knowledge sharing to communication only within own clan. Knowledge sharing with foreign colleagues can be also impeded by language problems especially if we consider that Russians prefer verbal communication.

In regard to both empirical studies Hofstede (1980) and GLOBE (2004), Tab. 2 represents a grouping of cultural dimensions and specific criteria for cultural values based on both of these studies. There are five main dimensions of culture (column I in the table): masculinity, learning environment, etc. From these main dimensions, specific cultural criteria referring to knowledge and communication are formulated (column II). As an example, the chosen criteria are used to analyse the influence of German culture on the three proposed knowledge dimensions: understanding of knowledge itself, the role of knowledge [12] and knowledge sharing (columns III−V).

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Impact of cultural values on knowledge and knowledge sharing

Cultural dimensions	Specific criteria of cultural values	Understanding of knowledge itself	Role of knowledge	Knowledge sharing
		Germany		
I	II	III	IV	V
Masculinity	Emphasis on the result	Knowledge is strongly related to its result	Knowledge means valuable resource and is connected with organisational performance	Connection between input (knowledge) and output (reward, result) is important to set. Rewards act as an incentive for knowledge sharing
	Keeping deadlines, commitments	As time, also knowledge can be seen as a valuable resource which can be 'managed'		
	Rewarding performance	Rewards are connected with performance		
Learning environment	Environment to share ideas opinions, criticisms	Knowledge embraces ideas and opponent opinions, constructive criticism	Gaining knowledge means dynamic learning process, knowledge embraces explicit and tacit knowledge	Knowledge sharing opens learning experience; factual and task-oriented knowledge appreciated; language (oral, written) as main sharing medium
	Communication style	Rational and task-oriented argumentation requests low context information; language as main medium, emphasis lies on written form		
	Continuous training and development	Knowledge is complex, therefore demands specialisation; learning by doing		
Uncertainty avoidance	Future-oriented actions	Knowledge is treated as an future investment; it is continuous, but specialised	Knowledge means personal power	Generalised trust into the system reduces uncertainty
	Attitude towards change	Changes are explained, discussed and performed; change can mean chance		
In-Group Collectivism	Teamwork	Individual knowledge as main resource for teamwork; team as medium to solve problems more efficiently	Individuals are carrier of knowledge	Knowledge sharing is a dynamic mutual process of individuals connected by a mission or task
	Face-saving	Constructive criticism is welcome; task-relevant knowledge is centred		
	Shared vision	Shared vision helps for orientation		
Power distance	Supervisor-subordinate relationship	Task-oriented, coach and team	Task-oriented knowledge as main basis for decision-making	Trend to flat hierarchy encourages knowledge sharing
	Decision-making process	Decisions are made by specialists and leader; specialised knowledge is respected		
	Freedom to try things and to do mistakes	Generally valued		

As a result in Germany incentive systems which reward knowledge and knowledge sharing would encourage people to share. In Russia the value of task-oriented knowledge has to be strengthened so that knowledge sharing processes could be more precisely developed e.g. to be innovative in a certain field. The fear of making and admitting mistakes is hindering knowledge sharing in both contexts. In order to encourage knowledge sharing it is important to break stereotypes and create knowledge sharing culture based on specific individual cultural backgrounds.

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BLOCK, Madeleine − *University of Eastern Finland* (*Kuopio*).
P.O. Box 1627. FI-70211. Yliopistonranta. 1. Kuopio. Finland. E-mail: madeleineblock@gmx.net

МАДЛЕН Блок − *аспирантка Факультета общественных наук Университета Восточной Финляндии* (*Куопио*).
E-mail: madeleineblock@gmx.net

KHVATOVA, Tatiana Ju. − *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: tatiana-khvatova@mail.ru

ХВАТОВА Татьяна Юрьевна − *доцент кафедры международного бизнеса Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, кандидат технических наук.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: tatiana-khvatova@mail.ru

I.A. Litnitskiy

PROJECT MANAGEMENT OPTIMIZATION THROUGH INTEGRATION OF AGILE APPROACH

И.А. Литницкий

ОПТИМИЗАЦИЯ УПРАВЛЕНИЯ ПРОЕКТАМИ ПУТЕМ ИНТЕГРАЦИИ AGILE ПОДХОДА

Innovational IT projects are an urgent topic for the last few years. The world is changing, constantly improving technologies have become a part of our lives.

Project management tools in the field of IT are significantly different to the ones used in traditional industries. Today's IT projects require project managers with the profound knowledge and practical skills enabling to manage constantly changing requirements of stakeholders. The aim of the article is to take a closer look at the advantages of Agile approach over traditional models when it comes to project management in IT field.

PROJECT MANAGEMENT. AGILE APPROACH. TRADITIONAL MODELS. IT PROJECTS. PROCESS OPTIMIZATION.

Инновационные ИТ проекты становятся все более актуальной темой. Мир меняется и постоянно совершенствующиеся технологии входят в нашу жизнь.

Инструментарий Управления Проектами в сфере Информационных Технологий существенно разнится от используемого в традиционных областях. Современные ИТ проекты требуют участия менеджеров, обладающих знаниями и практическими навыками, достаточными для управления постоянно изменяющимися требования заинтересованных участников проекта. В статье рассмотрены преимущества Agile подхода по сравнению с традиционными подходами при управлении ИТ проектами.

УПРАВЛЕНИЕ ПРОЕКТАМИ. AGILE ПОДХОД. ТРАДИЦИОННЫЕ МОДЕЛИ. ИТ ПРОЕКТЫ. ОПТИМИЗАЦИЯ ПРОЦЕССА.

IT projects failures are quite common, in reality not that many projects fulfill clients' expectation on 100 % in regards of time and budget. That's why organizations apply a lot of affort trying to minimize risks leading to project failure.

Frequently fiasco of IT projects (and other projects aimed at unique product development) are caused by usage of Traditional approach in project management (e.g. Waterfall), which can already be considered as outdated tool for present day projects. In other words, numerous IT companies firstly spend significant time and financial resources on gathering and consolidation of all requirements to the new system, then they attempt to design ultimate solution in advance, which could be laid as the basis for programming detailed evaluation. In connection with this evaluation (including evaluation of the budget) is often inaccurate, there are unexpected problems, requirements and risks when development moves into the implementation phase, which greatly reduces the accountability of projects. The following basic assumptions typical for the project in IT field preventing adequate project development:

Assumption 1: It is possible to determine full set of requirements (*project, technical, product*) *in advance*

This assumption can be correct only in case of small IT projects where technical requirements to the new product are unambiguous and its determination doesn't cause difficulties both among developers and project managers.

Assumption 2: Initially defined requirements are not being changed throughout the project

There is an inevitable discrepancy between the beginning of a software development project and its final results, and even if it were possible to define a complete and accurate set of requirements in advance, ever-changing business environment causes constant requirements change.

Assumption 3: It is possible to carry out assessments with a high degree of accuracy

Research in this area shows that the average fixed scale projects cost almost two times more than it was indicated in the evaluation. Besides the problem of constantly changing requirements, the reason for this could be artificially low initial estimates, first priority of which is to approve the contract.

Assumption 4: Realization (development) phase is just a mechanical process of conversion of architecture into code

Software development sustains losses due to conduction of attempts to assimilate it with construction industry processes in regards of predictability of each project phase. However, in practice programming is much less straightforward than managers see it [4].

To sum up all the written above, it is possible to make a conclusion that in most cases IT companies fail their projects due to its management style or in other words traditional approach. As a result, modern IT companies practicing traditional practices in tough competition environment sooner or later face certain challenges. Nowadays rigid management model inherent to traditional approach doesn't allign with the market dynamics, its project work suffers of the strict requirements, improper planning, inability of project team to adapt to changes. Most of the time both clients' and users' requirements are constantly changing througout the development cycle in a way that by the time of product market launch, the product itself dramatically differs of what was planned in the beginning. In addition to that, absence of adaptation tools significantly affects the scope of resources by the end of the project both in time and in financial matters.

That is the reason why many companies consider of project management style shift from Traditional towards Agile approach. Many studies have shown that most successful projects are those that follow principles of flexibility, thus proving that the methods based on rigid models are not always the best (in particular, when it comes to change management, emergency project execution or even meeting constantly changing market needs) [5].

Agile management implies iterative and periodic process during which all the stakeholders actively work together in order to fully understand the scope of work, define requirements, prioritize features and functions.

Agile method is to be used when the following conditions are fulfilled:
− Meaning of the project is clearly defined
− Client is actively participating in development throughout the whole process
− Client, designer, developers and project managers are closely located or they sustain regular communication which has to be regulated
− Incremental development based on functions is possible
− Visual documentation is preferred to the formal one

Agile method of development consists of many short iterative cycles of planning and development, allowing the team to continually assess evolving product and get instant feedback from users and participants. The team learns and improves the product and the method of work in each successive cycle. After well-established planning, determination of needs and corresponding solutions, phase ends, and the project goes through the iteration with more detailed planning, needs analysis and implementation, taking the form of waves [1]. The process described is shown on the Fig. 1 below:
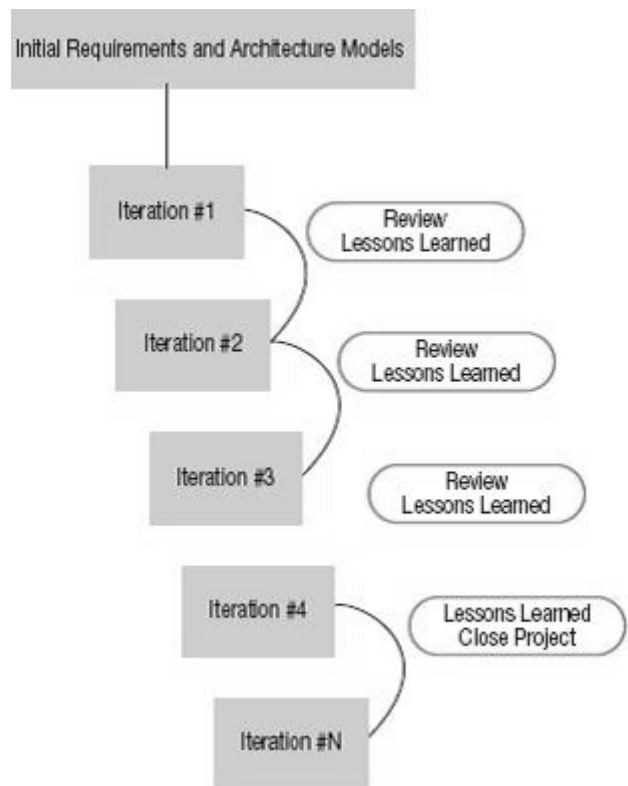
Fig. 1. Agile approach mechanics

In that way Agile approach allows to implement instant changes and corrections when new requirements appear. Agile method requires a group of people working at full capacity, in meantime client and/or user must also participate. Developers in their turn should be coordinated with each other and with the client.

Agile method of development is carried out by the small group of stakeholders with proper communication system regulated in advance. The core team is usually composed of several developers who are writing code in pairs (full quality management), client / user, the architect (s) in the field of IT, business analytic and project manager. The work is performed within a series of sessions where team writes the code, then tests the working units of the system, and then the process repeats. The level of documentation tends to a minimum, as the team basically relies on informal communication [3].

That is what differs Agile from Traditional method where significant amount of time and effort is applied to detailed planning of the whole process in advance, which is aggravated by extensive documentation of needs and requirements. Teams, practicing Agile approach, determine and set priorities for the functions which are being developed on the basis of their value in the business. Such an approach is useful in case if proposed product can be delivered to the client step by step. If this is impossible, the functions and properties can still be developed and then integrated into the original version of the system.

Effectiveness of Agile project management integration was proved on a real case of a company occupied with software development for eye tracking devices (name of the company can't be disclosed due to NDA).

1). General assessment.

After conduction of optimization measures for the development of innovational IT products, the following set of positive changes was indicated.

A survey, carried out among the developer team, showed increased level of staff satisfaction and overall motivation of working process and the end result. In this case, the level of conflict among developers has been significantly reduced, affecting the efficiency of their interaction. In contrast, positive trends were observed in the communication within and between teams. Survey also revealed a positive reaction to the introduction of changes to the software development process, the communication process takes the larger proportion, but it reduced time spent on the direct implementation of the software. Furthermore, a significant reduction in errors was observed, both conceptual and structural, for example, as the tracking «bugs» software (IssueView) shows that the level of bugs have been reduced by 35 %.

The proposed optimization has allowed effective implementation of detailed planning and the distribution of work between the executors (or groups of executors) for parallel execution considering necessary expertise.

Furthermore, the overall optimization was evaluated by means of CMMI (Capability Maturity Model Integrated) model. identifying consistency level of project management processes a company has [2].

Whereas, before optimization, the company was located in 3rd level on CMMI scale, after the optimization it shifted in between 4th and 5th level. Thus, as a result of optimization, the company achieved fundamental positive changes, described below.

Control over the processes and created products is achieved by narrowing spread process performance to acceptable quantitative limits. Significant differences in process performance can be distinguished from random differences, especially within the established product lines. Productivity of some of production process is based on a common understanding of organization of work roles and responsibilities.

Due to the fact that the production process is clearly defined, the management gets an accurate picture of the technical progress in all projects. Also, the entire organization is completely focused on the continuous improvement of the production process. Productivity of the software development organization can be characterized as a predictable, controlled, focused on continuous improvement as organization seeks to improve the productivity thereby increasing the performance of processes of their projects.

2). Quantative assessment

As the basis for quantative assessment of conducted optimization, labor intensity of each elementary process has been evaluated through comparison of two similar scale projects aimed at integration of new feature to already exisiting piece of software. These projects have different

T a b l e 1

**Expenditures of labor, required for implementation
of projects before and after optimization**

Processes	Work (hours)	
	Project A	Project B
Definition of technical requirements	80	112
Definition of project risks	40	40
Definition of product risks	50	50
Creation of initital architecture model	60	36
Creation of development plan	36	26
Feasability study	8	64
Creation of test plan	28	36
Realization of SW	896	560
Execution of test	10	8
Documents preparation	16	16
Submittion of the final product	32	32
Total (hours)	1256	980

clients and are located in close temporal proximity, so that influence of the learning curve on the development process can be eliminated. The project is implemented by developers

identical by quantity and composition. Quantative assessment of «Project A» implemented before the optimization and «Project B» implemented after the optimization is described in the Tab. 1 below:

The average salary of the project team member is 32 euro. Accordingly, the difference in labor input was:

$$(1256 - 980) \cdot 32 = 8832 \text{ euro.}$$

Based on these results it can be concluded that the optimization is effective.

In order to assess the effectiveness of the Agile approach integration into companies' project management system, consumption of time and financial resources as well as quality indicators of planning and control processes, were evaluated for the current practice of project management and the proposed model of process organization. The calculation results showed that the application of the proposed model allows organizations to save time and costs of implementation of planning and control, as well as increase the quality of projects in terms of transparency of process organization, efficiency and accuracy.

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LITNITSKIY, Ilya A. – *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: ilya.litnitskiy@gmail.com

ЛИТНИЦКИЙ Илья Алексеевич – *аспирант кафедры международного бизнеса Инженерно-экономического института Санкт-Петербургского государственного политехнического университета.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: ilya.litnitskiy@gmail.com

E.A. Milskaya

INNOVATION AS A KEY FACTOR OF COMPETITIVE ADVANTAGES

Е.А. Мильская

ИННОВАЦИИ КАК КЛЮЧЕВОЙ ФАКТОР КОНКУРЕНТНЫХ ПРЕИМУЩЕСТВ

The article analyzes the concept of innovation, offers the author's definition of the term. Innovation is proposed to be considered as a distinct competitive advantage, especially in innovative enterprises.

KEY WORDS: INNOVATION. TYPES OF INNOVATION. COMPETITIVE FACTORS OF INNOVATIVE ACTIVITY OF ENTERPRISES. THE COMPETITIVE ADVANTAGE OF INNOVATION ACTIVE ENTERPRISE.

Анализируется понятие инновации, предлагается авторское определение этого понятия. Инновацию предлагается рассматривать как неоспоримое конкурентное преимущество, особенно на инновационно-активных предприятиях.

ИННОВАЦИЯ. ВИДЫ ИННОВАЦИЙ. ФАКТОРЫ КОНКУРЕНТНОСПОСОБНОСТИ ИННОВАЦИОННОЙ ДЕЯТЕЛЬНОСТИ ПРЕДПРИЯТИЙ. КОНКУРЕНТНОЕ ПРЕИМУЩЕСТВО. ИННОВАЦИОННО-АКТИВНОЕ ПРЕДПРИЯТИЕ.

As the world experience shows, the innovation activity of enterprise may be one of the fundamental conditions for the formation of its competitive strategic perspective, retention and expansion of the market niche. Even enterprises which are successful nowadays, but not involved in innovation, sooner or later will face the difficulties because the market requires constant renovation and nothing is permanent, especially when it comes to competitiveness.

The change of the main competitive advantages which allows economic entities not only to survive, but also to develop successfully in the business environment is the key tendency of the modern economic system. This is manifested by the strengthening of the role of intangible assets, as well as the expansion of investments in intellectual capital. In fact, there is a struggle not for the possession of capital resources and material wealth, but, to be a larger extent, for the ability to develop and introduce innovation.

These tendencies in changes of usual market conditions in the external and internal environment have identified the new requirements of the management of survival and development processes. Strengthening of the role of scientific knowledge as strategic resources and the increasing influence of technological innovation as the key factors of success has led to the fact that the economic growth of the enterprises has become to be determined as the share of products and equipment which contains advanced knowledge and modern solutions.

The so-called «effective competition» is typical of the modern market of innovations and suggests that none of the competitors are in a position to influence the conditions of production and sale of products and competitors' actions do not include methods of monopolistic practices prohibited by the law (in this case, competition will be ineffective). The main types of competition in the innovation sphere can be grouped according to the following features:

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− subjects of the competition − individual and group;

− the nature of the relationship − free (perfect) competition, oligopolistic competition, monopolistic competition;

− functional purpose − intra-sectoral, inter-sectoral, and regional competition;

− action methods − price and non-price, fair and unfair competition.

However, before considering innovation as a factor of competitiveness, it is necessary to give some characteristics of the most often used innovation.

The term *innovation* and the concept of innovation as a new economic category was introduced by the Austrian scientist Joseph Schumpeter [3]. He interprets the innovation as a new combination of production factors motivated by the entrepreneurial spirit. In the Schumpeters' terminology, the «innovation» is not a synonym of the word «invention» because the entrepreneurial activity is associated with the commercial use of available funds, but not with the creation of the new ones.

The scientific-technical progress recognized worldwide as the most important factor of economic development is often associated with the concepts of the innovation process and innovation activity.

Recognized worldwide as the most important factor of economic development, the scientific and technical progress is often associated with the concepts of the innovation process and innovation activity. Special social importance of these concepts involves the responsibility of the approach for the identification of the essence of innovation, and only then finding mechanisms of innovative activity and rational organization of the process itself.

Many researchers emphasize that the desire for change, as a personal quality of those who make the strategic decisions, promotes innovation at the organizational level. The fact that the democratic and interactional style of leadership supports innovation is widely recognized [4]. The thesis about the stimulus impact of competition on innovation has become universal.

In the opinion of the author, the dual nature of innovation is very important: on the one hand, it is the process of bringing inventions to commercial success, but, on the other hand, it the

results in the process of obtaining competitive advantage.

Innovation is also the process of commercialization of the invention, the achievement of commercial success based on the production of useful product, service or good. This means that if an invention receives success in the market it becomes innovation.

Generalizing the well-known definitions and concepts, the author offers the following detailed interpretation of innovation: «Innovation is the final result of the introduction of innovations, its commercialization with the purpose of obtaining an economic, social, scientific-technical, and other types of effect in order to obtain economic, social, scientific, technical and other types of effects for new benefits for both the manufacturer and the consumer.»

This classification is an important moment in the theory of innovation. It depends on the classification criteria which were laid in its foundation. As a rule, the main classification signs are:

− product innovations (new products: a device, material, substance, etc.);

− process innovations (technology, production, management processes);

− allocative innovations (the use of different reorganization schemes, redistribution of tangible and intangible assets of the company, the responsibilities of its employees, especially managers).

One of the latest classifications of innovations which more fully reflects the needs of a modern economy is given in Tab. 1 [2].

Many innovations are identical and related. Such attributes as the degree of novelty of innovation, its role and importance, as well as the nature and time-to-market are assumed to be the most important from the presented attributes.

In the «Oslo Manual», innovations are divided into:

− product, related to changes in production;

− processing, associated with changes in technological processes;

− marketing, related to new sales markets;

− organizational, which affect the factors of the organizational, managerial, financial, and economic nature. [1].

The most important competitive sign of innovations in the market conditions should be the novelty of its consumer properties. The

Classification of innovations

Classification features	The grouping of innovations
Depth of novelty	Basic, improving, false innovations
Market entry	Innovation leaders, innovation followers
Competitiveness	Strategic (preactive), adapting (reactive)
Character	Product, technological, non-technological
Extent of modifications	New generation, new type, new kind, new version
Protectability	Inventions, industrial designs, utility models, trademarks, etc.
Terms of development and implementation	Long-term, medium-term, and short-term
Creation	Individual, joint, acquired
Costs	Large-, medium-, low-cost
Effectiveness	High-, medium-, low-effective
Degree of the risk	High-, medium-, low-risky
Financial support	Government, budget, off-budget, private, proprietary
Scope of effectiveness	Budgetary, economic, commercial, environmental, social, complex
Relation to the existing system	Replacing, rationalizing, widening, opening
Place in the production chain	On entry, in the production, on exit
Commercialization possibility	For external and / or internal market

introduction of innovations should be in accordance with demand, but not vice versa. Specialists explain that most of the failures connected with the introduction of innovations into the market arise from new knowledge, and not from needs as buyers do not need a new product, but new benefits.

Competitors are not in a hurry to follow the «pioneer» and introduce a novelty in their production when a new product appears on the market because, according to various estimates the level of failures associated with the introduction of new products on the market

ranges from 30 to 60 %. In this regard, it is accepted to allocate the strategy of a leader and a follower. There are two types of innovation processes which are behind this division: «pioneer» and «catching up», or two types of innovation: strategic (preactive) and adapting (reactive).

Adapting innovation is the innovation which the business entity implements following the competitor as a reaction to a new product that has already appeared on the market. Enterprises have to develop reactive innovations following their rivals to be presented on the market in a competitive position and to further ensure the survival and to prevent the technological lag in the production.

The strategic innovations include innovations of a pre-emptive (pre-active) nature with the purpose of obtaining the advantages of the «first mover», which, when used correctly, can lead to the leadership on the market and high incomes.

Supporting technologies are the innovations which improve the functioning of the product or service in the ways which have already been accepted by the consumers of the main market. They can be radical or gradual (incremental). The fact that they improve the quality of existing products in terms of their technical characteristics, which are important for the main consumers of the major markets generalizes them.

Disruptive innovations create an entirely new market which develops new types of goods and services and which, at the first stage of its existence, were actually worse than their predecessors in terms of their functional characteristics accepted by the majority of consumers. Products created on the basis of «disruptive» technologies are usually cheaper, simpler, smaller and easier to handle.

Speaking about disruptive technologies and investments, it should be noted that the mature companies always come to a conclusion that intensive investments in «disruptive» technology are irrational. There are three reasons for this:
− products of disruptive technologies are simpler, cheaper, and less profitable;
- usually these technologies are introduced on the new or small markets;
− consumers who generate most of the revenue do not need «disruptive» technologies. The least

profit-generating customers are more interested in these technologies.

Therefore, the market leaders, who are attentive to their customers, almost always late with investments in «disruptive» technology.

Thus, types of innovations on grounds are of significant importance in the choice of the form and methods of innovations development. The reason is that the processes of development and implementation and the further promotion for a specific innovation, the fundamentally new or just improved, will be different. Nevertheless, all types of innovations affect the competitive advantages of the enterprise.

The main features of competition in the innovation sphere which determine the necessity of its development, include:

− the factor of the company's susceptibility to the technical innovations;

− the entrepreneur must constantly search for new kinds of products and services which consumers need and meet the needs of the market;

− entrepreneurs are trying to ensure high quality products at market prices to retain customers;

− use the most effective methods of production;

− entrepreneurs quickly respond to the changing needs of consumers, as well as to all the changes in the economy.

There are several classifications of factors of the innovative enterprise competitiveness. In particular, V. Kulikov suggested two groups of factors.

1. Macroeconomic factors:

− the extent and nature of state regulation of the economy;

− monitoring of participation in the markets, the availability of related corporate groups and the existence of barriers to the market entry;

− the allocation of labor and capital;

− currency exchange rate, interest rate, and the distribution of state funds by government agencies;

− communication and infrastructure (efficiency and flexibility of communications in areas such as information exchange, trade, distribution and delivery of parts and other components, and raw materials).

2. Microeconomic factors:

− requiring changes to the competitiveness arising as a result of a shift in market demand for products with changing requirements for quality, range, etc.;

− restricting change characterized by the directed influence of competitors, arising due to the restrictions which reflect the proportion of the economy and restrictions in the enterprise (for example, because of technology), and also because of the volume of investment potential.

These factors facilitate the innovative activity of the enterprise. In addition, it is necessary to develop measures of ensuring the competitiveness of innovative products. These include:

− the efficient work of marketing specialists, experience in project management, the ability to organize work on stimulation of innovative products;

− securing access to raw materials and energy;

− provision of highly skilled personnel potential;

− modern technologies and R&D;

− transfer of innovation technologies.

Thus, one of the most acute issues of the innovation economy is the competition for the technical level improvement and the quality of the manufactured products. It should be noted that the main elements of innovation infrastructure which can cope with the tasks to increase competitiveness of the manufactured production, are the innovation active enterprises. The high quality of products ensures their advantages in the competitive struggle for the consumer and creates the prospect for further development of the production.

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MILSKAYA, Elena A. − *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: santa-2000@mail.ru

МИЛЬСКАЯ Елена Андреевна − *профессор кафедры мировой и национальной экономики Санкт-Петербургского государственного политехнического университета, доктор экономических наук, доцент.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: santa-2000@mail.ru

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A.R. Kankovskaya

NATIONAL AND REGIONAL INNOVATION SYSTEMS IN THE ECONOMIC CYCLE

А.Р. Каньковская

НАЦИОНАЛЬНЫЕ И РЕГИОНАЛЬНЫЕ ИННОВАЦИОННЫЕ СИСТЕМЫ В УСЛОВИЯХ ЭКОНОМИЧЕСКОГО ЦИКЛА

The article formulates the principles underlying the functioning of the national innovation system in the economic cycle and the priorities of the innovation at various levels of the national economy. The problem of the development of regional innovation systems as open complex systems is stated.

COMPLEX SYSTEM. LONG-TERN TECHNOLOGICAL CYCLE. NATIONAL INNOVATION SYSTEM (NIS). REGIONAL INNOVATION SYSTEM (RIS). TECHNOLOGICAL DEVELOPMENT.

Сформулированы принципы функционирования национальных инновационных систем в условиях экономического цикла и приоритеты инновационной деятельности на различных уровнях национальной экономики. Рассмотрена проблема развития региональных инновационных систем как открытых больших систем.

БОЛЬШАЯ СИСТЕМА. ДОЛГОСРОЧНЫЙ ТЕХНОЛОГИЧЕСКИЙ ЦИКЛ. НАЦИОНАЛЬНАЯ ИННОВАЦИОННАЯ СИСТЕМА (НИС). РЕГИОНАЛЬНАЯ ИННОВАЦИОННАЯ СИСТЕМА (РИС). ТЕХНОЛОГИЧЕСКОЕ РАЗВИТИЕ.

The innovative activity of all economic agents is the principal factor in the creation and maintenance of a high level of competitive advantage. But cyclical fluctuations have an influence both on the objectives of the formation and on the development of the national innovation system.

The national innovative system (NIS) of the country consists of three main components: the research and development sector (basic and applied sciences), the educational sector (the system of higher and postgraduate education), the business sector (corporations, integrated business groups, small, medium, and large businesses). The linkage between these components which determines the national model of the NIS in Russia, is a very knotty problem at the federal and regional levels in consequence of the revolutionary transformation of the economic system in the 1990s. Now the national economy consists of many elements with conflicting interests and this conflict is particularly acute in the different phases of the economic cycle.

In a recession, the main interest of the majority of the economic agents is a survival only. So they operate on the principle of compensation costs producing the goods with simplified functions and sell them at a discount. This behaviour can revive demand for their products.

The analysis of the indicators of the innovation activity of Russian enterprises showed the reduction of the share of organizations implementing technological innovations and the proportion of expenditure on technological innovation in the total value of output during the recession and the crisis of 1998 [1]. In the phase of the recovery we can see some increase in these indices.

During the recovery firms are trying to maximize profits, their investment activity primarily is aimed at solving the problems of speculation in the stock markets. Innovations are not beneficial in this phase of the economic cycle.

In 2001−2004, during the recovery of the Russian economy, a few sectors showed a significant increase in the level of innovative activity [1]: mining, leather, wood products, non-metallic mineral products, electric, electronic, and optical equipment. In other sectors, the innovation activity decreased or changed slightly. The main type of innovation activities of industrial enterprises was the purchase of machinery and equipment (63 %). In 2004, the production design was carried

out by 35.5 % of the firms, research and development by 33 %. It is below the 2001 level (39.7 and 35.6 % respectively) [1].

This statistics shows a significant reduction in the innovative activity of enterprises during the recession and an uneven growth during the recovery. Growth occurs mainly in the sectors which are in the process of the technological expansion. In other sectors, especially in these preserving outdated technological structures, the growth of innovative activity does not take place. It is necessary for businesses within the national innovation system to solve this problem.

Theoretical works on the problems of the formation and functioning of NIS do not pay attention to the factor of the cyclic recurrence. National studies do not contain the analysis of the impact of economic cycles on the functioning and development of the NIS [2-5]. In most national surveys, NIS are considered at the tactical level, and the concept and the strategy are neither investigated nor debated. Though many OECD countries already haved NIS with long history, this approach still seems quite unsubstantiated.

The basic principles of the functioning and the development are as follows [6, p. 28]:
– creation of the conditions for innovation activities of firms and research organizations;
– creation of the framework conditions for the diffusion of modern technologies;
– development of the cooperation and strategic partnership between government, research and development agencies, and industry;
– formation of the innovative clusters and networks;
– development of the procedures for financing the early stages of an innovation process;
– development of learning and retraining;
– monitoring the current status of the NIS by government agencies.

Nevertheless, there is no principle which takes into account the impact of the cyclical factors. So it is necessary to include the principle of cyclic recurrence in the group of basic principles. According to this principle the system of priorities of innovation and industrial policies is based on the forecast of the long-term economic cycles, and the support of the innovation activity of enterprises is based on the analysis and forecast of medium-and short-term economic cycles.

The national innovation system is exposed to globalization as well as other members of the world economy. This influence becomes apparent in:

– the increasing degree of integration of individual elements of national innovation systems into a single world system;
– the strengthening of the bonds 'science – production' at the global level;
– the intensification of the collaboration between the public and the private sectors in the innovation system;
– the integration of national educational systems.

Obviously, the globalization of innovation leads to more profound disparities in countries' development. Countries with effective systems of innovation increase scientific and technological cooperation, implement large-scale projects which are important both scientifically and commercially ensuring the expansion of production and creating new jobs. The economic growth rate may not be high, but this approach provides growth for the medium- and long-term perspectives. Countries with weak or underdeveloped innovation systems are not able to use innovative resources, and therefore they follow an extensive way ensuring their economic growth due to the natural resources. In such a case, the economic growth is linked to the world market conditions. An example of this is the dynamics of Russia's GDP.

In these circumstances, it becomes necessary to form and develop an innovative system of Russia and to increase its effectiveness. In recent years, the Russian innovation system has experienced a strong influence of destructive processes of diverse nature, especially the socio-political and socio-economic processes. So now, in Russia, we can see some elements of the innovation system with the destructive gaps between them. Consequently, the priority of economic growth is the formation of the innovation system, which implies the consolidation of the disparate elements and the determination of the strategic goal of the NIS.

In our view, the strategic goal of the NIS is to create and maintain a constantly high level of competitive advantage by continuously developing knowledge, the access to specific resources taking into account geopolitical, economic, and geographic factors and features of the institutional environment, the strategic controlling in the creation and the dissemination of knowledge and technology. So, the strategy of the innovative development is, on the one hand, an integral part of an overall strategy of the national economy, and, on the other hand, the backbone of the national and regional innovation systems.

According to the theory of complex systems, we can decompose the strategic goal of the NIS. We can use the following principles of decomposition:
– an area – strategies of development areas and regions are formulated as part of the national strategy;
– a sector – the overall strategic goal is decomposed to the strategic goals of industrial, educational, infrastructural and market subsystems;
– a field of science.

National innovation system includes regional innovation systems, which, unfortunately, are characterized by the same problems as the entire national system. The problem of the development of the regional innovation system and its effective 'embedding' in the national system is more important for major scientific and industrial centers with high intellectual and innovative, scientific, industrial and cultural potential.

It should be noted that the development of the NIS should involve not only the basic sciences. Industrial science is very important, too. In addition, there are weak links in the system 'science – engineering – manufacturing' in Russia. The development of links between research organizations and industry will move the core funding from the public to the private sector. If the industrial economy perceives science in terms of short-term commercial viability, large firms of the post-industrial society are well aware of the need to fund basic scientific research to participate in large cooperative projects to ensure their long-term competitiveness and sustainability.

Of course, this process should be gradual and in line with the rate of the economic development. It is necessary to take into account the business cycle when various government programs and projects of innovative development are created. We must analyze not only long-term cycles, which are associated with the change of technological structures, but also medium- and short-term ones. In our opinion, mid-cycles need special attention because now they pose the greatest threat to the world and national economies.

A special role in the NIS is played by the innovative small businesses as a market entity ensuring adaptability of the system. Small firms, which are the source of numerous scientific, technological, and organizational innovations, are experimenting widely in the creation and the development of various elements of market mechanisms, as well as in establishing links between them. The exceptional flexibility and mobility of a small business enables it to maximize the opportunities offered by the market which cannot be implemented in the medium and large businesses.

Small businesses' activities are located in close relation with other agents of the economy: large and medium-sized enterprises, public authorities, financial institutions and educational institutions. In larger cities, which are scientific, industrial, financial and cultural centers, the variety and the complexity of links between different economic actors are highest.

The extent and the form of integration of large and small firms largely depend on the industries in which firms operate. In the manufacture of high technology products, small firms are often highly specialized, giving rise to close cooperation links with big business.

Usually, regional innovation systems (RIS) are regarded as terms of the NIS. As a rule, the standard concept of innovation systems at the regional level comprises the same set of postulates that is formulated for the NIS:
– development and adoption of measures aimed at strong growth in the number of regional universities and research institutes, university technology parks (the spin-out companies) and the close linking of local firms to external sources of knowledge;
– involvement in the region of highly skilled labor force and actively promoting the growth of professional qualifications of the already existing staff;
– networking of business incubators to support small business innovation at the initial stage of the activity;
– establishing and long-term financing of a research organization which monitors, on a regular basis, the key to major regional industry clusters and technology markets;
– the establishment of effective mechanisms of interaction and long-term cooperation between regional companies, research organizations, and government agencies;
– development of formal and informal networks which form a single culture of the business environment;
– ensuring the flow of venture capital into the region.

With this approach, the regional innovation system is regarded as a smaller version of the national innovation system including, of course, certain resource limitations, in connection with which the RIS pay more attention to a selection of priority sectors which can give a rise to well-functioning cluster.

This view of the place of regional innovation systems in the NIS is fundamentally flawed. The national innovation system is not simply the sum of smaller regional components. It is a great system consisting of a sub regional innovation system. In turn, the regional innovation system itself is an open complex system, which is fully characterized by the features common to all complex systems.

Regional innovation systems combine elements in different ways: industry science dominates in one system, higher school — in another; some regions need to upgrade skills and retain highly skilled professionals and others must involve staff from other regions in any scenario. Some regions develop relatively apart, others are actively involved in cross-border cooperation. Therefore, management at the national level should take this into account the structural and content diversity as accurately as possible, so it is need a transition from pattern management to complex systems management.

The analysis of the major theories of long-term technological cycles gives us a possibility to produce a new enlarged and more complete classification of technological cycles which best reflects the technological development of the world.

Technological development involves the evolution of technology, which, in turn, implies a certain chronology of the transition from one technological system to the other ones. The main feature of this classification is that it carries an attempt to review technological development since the beginning of mankind. Another feature of this classification is that the duration of a technological system means a period of time from the first developments of the technology to the mass application of human activity and, consequently, the obsolescence of the technologies that make up the core of every technological cycle.

As the historical sources give different data on the appearance of inventions and discoveries characterizing fundamental technological shifts the estimation of the periods of technological cycles will always be very rough [7, 8]. The technological cycles have very fuzzy boundaries; they overlay each other and even cross each other. That is why the duration of the technological cycles is very approximate.

Our calculation of the duration of the technological cycles [9] shows that their dynamics tends to decrease. However the reduction of the duration of the technological structures is observed up to 1980-90s, and then we see an increase in the duration (the 16th technological cycle during 1990 and 2100). Forecast duration of further technological cycles (Tab. 1) is realized by the application package of statistical programs SPSS.

Forecasts estimated duration of the technological cycles

Number of the technological cycles	17	18	19	20	21
Forecasts estimated duration of the technological cycles	132	156	179	202	226

It should be noted that the first fifteen of the sixteen cycles involve on empirical technologies. The fundamental technology is built on already established scientific and technological base. They are associated with the identification of the fundamental laws of nature which tend to increase product life cycle, as well as create the possibility of constructing diverse classes and systems and their possible use in various industries. A striking example to support this statement is one of the latest trends in the development of advanced science, namely, nanotechnology.

The results obtained in the course of the study allow us to formulate the basic concept of the effective development of national and regional innovation systems.

The way to the fundamental technological cycle requires special attention to the formation of the directions and priorities for basic scientific research.

In the transition to a fundamental technological cycle it is necessary to build on a systematic basis and to strengthen links between basic science and high education by providing a single target vector studies (taking into account the difference of objective functions and differences in sources of funding).

The increase of the duration of the technological cycles is dual, therefore. On the one hand, a sufficient time period for the formation and development of a scientific school is formed, and a long-term sustainable development of the national economy is provided. On the other hand, the economic return from the currently ongoing prospective basic research becomes a matter of the distant future.

The effective development of the national innovation system requires minimizing the proportion of relict technological structures in the

economy. At present, institutions of the NIS ignore the existence of such structures because they focus on finding and developing innovations, while old technologies are still being used in a number of industries. Therefore, one of the actual tasks of the NIS and its subsystems (regional and sectoral) is the identification of relict technologies and industries to transfer them to a new, advanced level. The identification of the elements of primitive cycles forms a group of priority areas for scientific research within the national innovation system and its subsystems.

The overall strategic objective of the NIS is the creation and ongoing maintenance of the high level of competitive advantages by continuously developing knowledge and an access to specific resources. However, the cyclical nature of economic development requires linking the strategic objectives with the tactical purpose of the NIS, which is a sustainability of the functioning of NIS agents at different stages of the economic cycle. It is clear that, being left to themselves, these agents will solve the problem of survival in the recession, and, during the upturn, their objective to expand the activities in the short term. The strategic development is possible only in the segment of big business.

As a result, we can offer some directions of state innovation policy in maintaining the functioning and development of the NIS (Tab. 2).

T a b l e 2

Recommended directions of state policy on the functioning and development of NIS and RIS in various stages of the economic cycle

Subjects NIS	Phase of the cycle	
	Recession	Recovery
Science		
Fundamental	Investment to the priority research areas; Formulation of the priorities for the medium and long term; Maintenance of the other branches of science at the level of preservation of the existing potential	Active development of priority research areas; Funding for breakthrough projects
Industrial	Increased state involvement in venture capital financing; Formation of state order for innovative goods and services at the level of preservation of the existing potential; Insurance against risks of innovation; Co-financing of training programs for industry research	Search and usage of reserves of organizational resources in the 'Science − Technology − Production'; Increase the state order for innovative products and services; Insurance against risks of innovation
Education		
High	Promotion of research through grants and competitions	Funding for training in specialties relevant to the medium and long term; Stimulation of research through grants and competitions; Inclusion of students' innovation work into the state educational standards
Postgraduate	Promotion of training in the field of the real sector	Strengthening control over the quality of educational services
Business		
Large	Insurance against risks of innovation	Involvement of the big business in the development priorities of the economy
Small	Maintaining clusters of small innovative companies around the major subjects of the NIS and RIS; Increase of the state involvement in venture financing and creation of opportunities for small business to access to these resources Formation of state order for innovative goods and services at the level of preservation of the existing potential	Creation of clusters of small innovative companies around the major subjects of the NIS and RIS; Increase the state order for innovative goods and services

It is not a complete system of recommendations but only an example to show the way in the state innovation policy in different stages of the economic cycle. The analysis of the NIS as a complex system ensures the effectiveness of the functioning and development of national and regional systems.

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KANKOVSKAYA, Alina R. − *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: kankowska_alina@mail.ru

КАНЬКОВСКАЯ Алина Рональдовна − *доцент кафедры мировой и региональной экономики Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, кандидат экономических наук, доцент.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: kankowska_alina@mail.ru

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D.G. Rodionov, A.I. Sedov

INNOVATIVE INFRASTRUCTURE
AS ELEMENT ENSURING COMPETITIVENESS IN THE REGION
(CASE STUDY: THE REPUBLIC OF MORDOVIA)

Д.Г. Родионов, А.И. Седов

ИННОВАЦИОННАЯ ИНФРАСТРУКТУРА КАК ЭЛЕМЕНТ
ОБЕСПЕЧЕНИЯ КОНКУРЕНТОСПОСОБНОСТИ РЕГИОНА
(НА ПРИМЕРЕ РЕСПУБЛИКИ МОРДОВИЯ)

The article studies the impact of innovative infrastructure onto the region's competitiveness. Competitiveness factors and conditions for efficient performance of an innovative infrastructure are addressed in the case study of the Republic of Mordovia.

COMPETITIVENESS. INNOVATIVE INFRASTRUCTURE. INNOVATION POTENTIAL. INNOVATION DEVELOPMENT.

Рассматривается влияние инновационной инфраструктуры на конкурентоспособность региона, а также факторы конкурентоспособности и условия эффективного функционирования инновационной инфраструктуры на примере Республики Мордовия.

КОНКУРЕНТОСПОСОБНОСТЬ. ИННОВАЦИОННАЯ ИНФРАСТРУКТУРА. ИННОВАЦИОННЫЙ ПОТЕНЦИАЛ. ИННОВАЦИОННОЕ РАЗВИТИЕ.

The fact that Russia has joined the World Trade Organization makes provision of nation competitiveness an especially important task. Currently, Russian economy is mixed (the elements of the advanced, sixth mix are now appearing in a number of industries; however, the fourth and, in some industries, fifth mix prevail), and unequally developed, which brings specific features when solving this problem.

There are a lot of approaches to define the concept of *competitiveness*. On the whole, one can define competitiveness of a certain object (product, service) or business system (company, region, national economy) as its capability to compete with other similar objects or systems in the market. In this aspect, a national economy's competitiveness is characterized by the competitiveness of regional economies. The latter ones act as structural elements of the national economy. In its turn, competitiveness of a region's economy depends on competitiveness of territorial economic systems, both industrial and inter-industrial ones (clusters) [1, p. 9].

When analyzing competitiveness, one has to consider the industrial structure of an economy.

According to major classifications, basic sectors of economy include agriculture, raw materials industry, processing industry and information technology sector, i. e. all industries producing goods that can be potentially traded in the global market, which is why they frequently work in the conditions of real competitiveness. Supporting sectors are market service industries, including ones which ensure distribution of goods (wholesaling and retailing), support production (business services) or produce such goods and services that can only be sold in the local market (construction, real estate, hospitality, restaurants). Infrastructure sectors primarily comprise non-market services and production, particularly public administration, education, health care, transport and communications.

The analysis of the Russian economy growth by industrial sector groups within the period of 2003—2009 shows that the sectors with higher competitiveness grew more quickly (Fig. 1).

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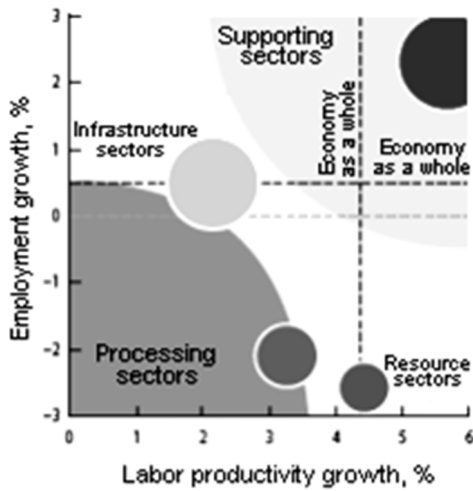
Fig. 1. Dynamics of employment and labor
productivities by industrial sector groups, 2003–2009
(average annual growth rates, %).

Processing sectors form the basic industrial group
in the economy of Russia. Source: [2].

From the perspective of the strategic management approach, provision of competitiveness, in the long term run, can be seen as one of the major goals on which the development strategy of any economic entity is based.

Global economic organizations, such as World Bank, World Economic Forum, estimate the competitiveness of a country on the multitude of criteria, distinguishing between 12 components of a national economy's competitiveness [3] (Fig. 2).

In addition, competitiveness of a country implies the multitude of institutions, politics and factors which define the productivity level of the country.

A country's competitiveness is evaluated as a result of interaction of the aforementioned factors, specific features of economic and political environment, organizational capabilities and efficiency of the economy's and its business entities' functioning mechanism. Global competitiveness index is calculated on the result of the competitiveness factors' evaluation.

According to the assessment of Russia's economy development parameters, it took 63rd place among 139 national economies that were assessed in 2010-2011. On the average scale, Russia falls behind both OECD countries (on the 7 score scale, the global competitiveness index of Russia is 4.2 whereas that of OECD countries is 4.9) and BRICS countries (4.4). In comparison with the previous year the results of Russia did not change. Before the crises, the country's results had improved considerably (51 place in the rating of 2008–2009), but in the post-crisis period the situation has worsened again. Russia still belongs in the group of countries whose economy is based on efficiency factors, but it is more like an outsider rather than a leader in this group.
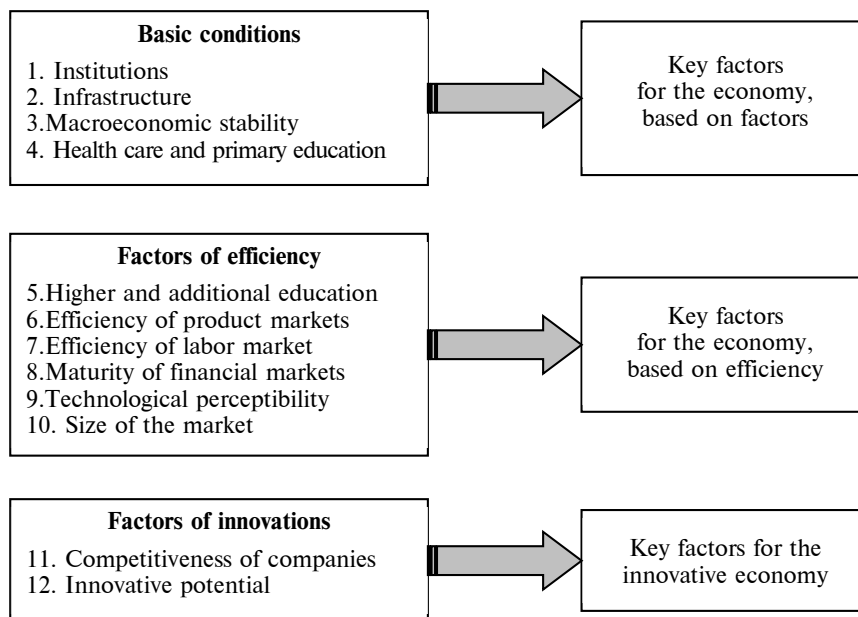
Fig. 2. Twelve components of a national economy's competitiveness

One of the major strengths of Russian economy is the fact that it is rich in many natural resources: oil, gas, coal, precious metals and agricultural lands, forests and water resources. Russia is the biggest exporter of mineral fuel and oil products (in 2009 Russia's share was 10.6% of the global market). The country also owns 8.4% world's water resources, 8.1% farm land and 23% forest cover.

Abundance in natural resources is, probably, one of the key reasons why the regions of Russia are developed unequally. Regional specific features include the mixture of natural, economic, social, culture-historical and institutional conditions which exist in a region and make it different from other regions. From the economic standpoint, the specifics of the region is not so much about its relative independence as an economic entity but the way for special distribution of macro and microeconomic parameters (average and maximum costs of factors of production, prices, welfare, services, incomes, savings, employment, etc.) [1].

To increase the competitiveness level it is necessary to expand competitive advantages of definite regions, taking into account their specific features. The condition of regional economy, socio-economic situation in the regions define, to a large extent, the position of the country as a whole.

A region's general competitiveness can be determined on the basis of the notion which A.Z. Seleznoyv suggested [4, p.30]: competitiveness of a region is the position (which is dependent on economic, social, political and other factors) of the region and some of its manufactures in domestic and foreign markets which is reflected through indexes (indicators) that adequately characterize such a condition and its dynamics. Since competitiveness characterizes capabilities of a region to compete successfully with other regions in terms of resources, investments, product markets, the general approach is based on the system of individual potentials. Thus, according to the methods of the rating agency *Expert − RA*, the investment rating of a region (which is, in our opinion, an important characteristic of competitiveness − the higher the investment rating is, the easier it is for the region to invest resources for development) comprises the investment potential and the level of the related investment risk [5]. The potential shows the share of the region in the Russian market, whereas the risk characterizes the scale of problems that investors may encounter in it. Each of these synthetic parameters, in their turn, is described with the system of individual measures (table). Every individual potential or risk is characterized with a specific group of indexes.

Region's Investment Attractiveness Components

Parameter	Individual Measures	Impact on Competitiveness
Investment potential	Labor potential	Strengthens positions in the labor resource market
	Financial potential	Allows acquiring absent competitive positions
	Production potential	Strengthens positions in product market
	Consumer potential	Strengthens positions in domestic market
	Institutional potential	Allows creating tools to reach competitiveness
	Infrastructure potential	Allows creating infrastructure to reach competitiveness
	Natural resources potential	Strengthens positions in the resource market
	Tourist potential	Creates specific advantages in domestic and foreign market
	Innovation potential	Creates steady competitive advantages
Investment risk	Financial risk	Risk of financial provision when creating competitive advantages
	Social risk	Social strain risk
	Management risk	Inefficient management risk
	Economic risk	Economic inefficiency risk
	Environmental risk	Risk of adverse ecological situation
	Criminal risk	Risk to competitive advantage creation, risk of uncontrollability

Since steady competitiveness can be based on a broad multitude of competitive advantages [2], it is important to develop different individual potentials. However, innovation potential is top priority, as it is a basis for a number of competitive economic industries. Due to dynamic development of innovative production it is possible to build up competitive advantages in the regions without considerable resource-based or labor potential.

In this case, a region is seen as a place where innovation active companies are concentrated. Therefore, it is essential to strengthen interaction between companies, universities, research centers, small and big businesses located in the region in order to build up long-term competitive advantages on the basis of regional intellectual resources.

The problem of assessment of Russian regions' innovation potential has been studies by different authors. Thus, the paper [6] studies the innovative potential of the regions. The authors of the project *Innovation Development Strategies − Innovative Russia − 2020* [6] also point out successful innovation-active subjects of the Russian Federation (regions) and refer to them St. Petersburg, Novosibirskaya Oblast, Tomskaya Oblast, the Republics of Tatarstan and Mordovia.

Innovation potential of the regions cannot be developed if key elements of innovative infrastructure are not built up. These key elements include technological transfer centers, technology parks, innovative technological centers and venture capital firms. Innovative infrastructure is the basis for innovation potential to develop, which enables to boost other potentials of regional competitiveness: human resources, financial, production and investment potentials (Fig. 3).

Today, the most developed − from the standpoint of innovation potential − Russian regions have all essential elements of the innovative infrastructure. Thus, since 2002, 13 offices of technology commercialization have been created in all universities and research institutes in Tomskaya Oblast. A design technological business incubator has been set up under Tomsky Polytechnic University, where more than 86% of companies implement projects directly related with development and introduction of new technologies. In Kaluzhskaya Oblast four innovative business incubators operate and they function effectively, which means that tax revenues flowing into the region's budget from the companies located in the business incubators fully cover the costs paid from the Oblast's budget for setting up such structures [7].

The problem related to the assessment of performance of the regional innovative infrastructure is rather new for this country. Earlier, major efforts − both at the federal and regional level − were directed on creation of different elements to support innovation activities. As a result, the key elements of the regional innovative infrastructure have been created in Russian regions. However, as a whole, the performance of these tools remains low in the country.

When assessing the performance of a region's innovative infrastructure the multidimensionality of this notion has to be taken into account. An innovative infrastructure has to meets the needs of different stakeholders:

regional government agencies;

region's businesses;

innovative infrastructure organizations, etc.
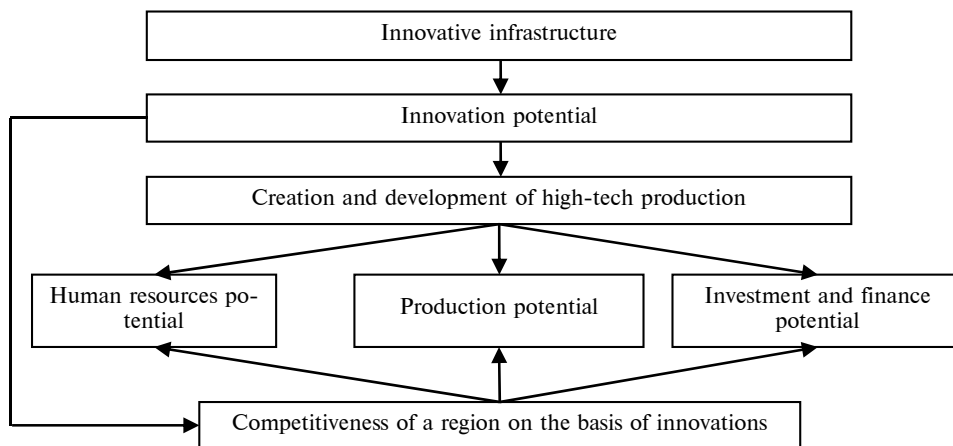
Fig. 3. Innovative infrastructure in the formation of region's competitiveness

Correspondingly, innovative infrastructure efficiency, $E_{R\&D}$ can be measured as:

$$E_{R\&D} = f(E_{\text{org.}}; E_{\text{business}}; E_{\text{II}}),$$

where E_{org} — organizational efficiency, characterizing the impact the infrastructure organizations make on the region's innovation development indexes; E_{business} — economic efficiency (profitability) of innovation-active businesses in the region; E_{II} — economic efficiency of the innovative infrastructure organization in the region.

The first index is dynamic and can be measured by the dynamics of the innovation activities in a region versus other comparable regions. The other two indexes can be measured by the profitability indexes of companies and innovative infrastructure organizations.

It is worth mentioning that there is no satisfactory statistics which permits analyzing and comparing indexes of innovative infrastructure development between each other. Research has been carried out in the USA and European Union [8], as for Russia, no consolidated research has evr been done.

Moreover, there is no entrenched opinion about what is the right way to define how efficiently certain elements of an innovative infrastructure function — technology parks and business incubators [9]. This can be explained by diversification of their forms, missions, lines of business and functions. In addition, research [9] says it is impossible to develop unified approaches to assess how efficient these elements of an innovative infrastructure are because of different missions they strive for.

The aforementioned makes it justifiable to use a benchmarking approach when assessing how efficiently a regional innovative infrastructure functions. Benchmarking becomes the most important stage in innovation diagnostics, which is a process when goods and business practices of a company are compared to those of competitors or leading companies in other sectors in order to search for means to increase quality of goods and efficiency of a company. When it comes to technology parks and business incubators, we can say that with benchmarking it is possible to find ways to excel their activities, which will result in their stronger role in the regional system of innovation generation, support and maintenance.

Applying benchmarking approach and analysis of practices in the best innovative regions we can say that some factors are crucial for innovative development, such as: presence of universities in the region which perform as knowledge generators and labor suppliers for innovation active business; interest of the region's companies in innovation development and investments in innovation; government support and intensive chain interaction between stakeholders involved in innovative activities [10].

We have to say that creation of an innovative infrastructure in regions which do not have considerable natural resource or production potential is important not only for their innovation development, but also for their competitiveness as a whole.

The Republic of Mordovia is one of such regions in Russia. The region does not have rich natural resource reserves and its strategic production sectors are considerably less developed comparing to the neighboring subordinate entities of the Federation. In the rating of investment attractiveness of 2012, the region takes 67th position by investment potential and 63rd position by investment risk, belonging among the group of regions with insignificant potential and moderate risk. However, positions of the region are much better by innovation and infrastructure potential (43rd and 38th places correspondingly). Mordovia was one of the ten innovative regions of Russia until 2012.

The strategy of socio-economic development of the Republic of Mordovia up to 2025 defines, as the major development goal of the Republic of Mordovia, increased competitiveness of the region due to innovation sector of economy and improved quality of life of its population [10].

Today, the major lines of development for the economy of Mordovia are to boost innovative activities of companies, increase production (primarily — high tech products), saturate the market with up-to-date competitive products, improve research and development potential of the companies, create export-oriented and import-substituting productions, strengthen material and technical facilities in all sectors of the economic complex. They also work to form elements of the innovative infrastructure: a business incubator for small businesses has been built up, a venture capital

fund has been set up on the principle of private and public partnership, a guarantee fund for small business support has been created, a decision has been made by the Russian Federation Government to found in Mordovia a technology park in the field of high technology, a number of consulting organizations have been set up.

Even though scientific and innovative activities are activated, the republic still lacks consistency in the subjects of innovative activities, efficient interaction between innovative process stakeholders, information and communication technology is used poorly when implementing innovations, there is lack or inconsistency in the elements of the public system which support research and development and innovative activities at the regional level. So, as to improve the situation in this field an effective innovative infrastructure has to be created in the region.

Currently, the innovative infrastructure of the region is mostly concentrated in Saransk and it is built on the basis of the National Research University named after N.P. Ogaryov and a high technology park, which is now being created. The most important element of the Technology park is meant to be Innovation and Industrial Complex, which is built on the basis of the Research Institute of Light-Emissive Device named after A.N. Lodyguin and which include companies involved in projects related to development of materials and components of electronics and element basis for information and communication technology.

This complex is designed to boost the development of innovative and industrial clusters of the republic and federal significance. They include: electronic device production on the basis of silicone carbide and gallium arsenide, optronics, energy-efficient devices, among them the ones on the basis of bright LEDs.

However, the construction work in the technology park has not been finished yet and the efficiency of this project can be assessed only in its future perspective.

As of December 2012, the region lacks innovative companies with dynamic development [10][1]. A considerable part of projects in the

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[1] None of the companies of the region is in the rating of 100 innovation active middle companies

republic is oriented on the neighboring regions, which are more developed from the industrial standpoint, such as Nizhegorodskaya Oblast, the Republic of Tatarstan.

Apart from the aforementioned elements of the innovative infrastructure, the region also has 12 innovation and technology centers, a transfer technology centre, a regional venture capital fund.

In order to improve efficiency of the innovative infrastructure and provide innovation development in the region it is essential to focus efforts on the elements which are still missing and which should guarantee:

support and provision of funding for the innovative projects, located in the "poison valley" (projects at an early development stage, which require investing in the amount between 2 and 25 million rubles). According to the calculations made by the agency *Expert − RA*, the availability of funding which regional innovation programs provide for innovative companies (including regional venture capital funds) was between 2% and 20%, which is much lower of the similar index in Europe and the USA (between 45% and 60%) [11];

competition support for the already existing innovation companies, which is designed to increase efficiency of RIS. Currently, such subsidies are distributed proportionally between all companies which apply, i. e. distribution of subsidies does not have economic feasibility. As for funding of the innovative infrastructure elements that include technology parks and business incubators (built at higher institutions of the technology commercialization centre and, as a rule, financed from the funds of the federal budget);

The business incubator at the National Research University named after N.P. Ogaryov, in Mordovia, mostly include companies which has been set up in accordance with law 217-FZ. Their number, due to objective obstacles which are related to registration of such companies, is not big and there is no multiplication effect. It is necessary to improve openness of the regional innovative infrastructure elements and to create comprehensive system for research, support and training of entrepreneurs in the innovation field. This system must not be limited to start-ups or development of small innovation business, but

must embrace, as well, search for innovation inside businesses, favorable environment for generation of innovation in the existing companies.

So, the increased efficiency of the innovative infrastructure is going to favor the innovation development of the region. For such regions as the Republic of Mordovia, where innovation potential is pulling off other competitiveness components, this line of activities becomes a considerable reserve to increase competitiveness.

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RODIONOV, Dmitry G. − *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: rodion_dm@mail.ru

РОДИОНОВ Дмитрий Григорьевич − *заведующий кафедрой кафедры финансов и денежного обращения Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, доктор экономических наук, профессор.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: rodion_dm@mail.ru

SEDOV, Alexander I. − *Minister of the Industry, Science and New Technologies of Republic of Mordovia* (*Russia*).
430005, Kommunisticheskaja str. 33-2. g. Saransk. Republic of Mordovia. Russia. E-mail: minprom@e-mordovia.ru

СЕДОВ Александр Иванович − *заместитель Председателя Правительства, Министр промышленности, науки и новых технологий Республики Мордовия.*
430005, Россия, Республика Мордовия, г. Саранск, ул. Коммунистическая, д. 33-2. E-mail: min prom@e-mordovia.ru

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D.A. Garanin, N.S. Lukashevich

THE EVALUATION OF INVESTMENT ATTRACTIVENESS OF THE PROJECT USING THE GENERALIZED INDICATOR AND REDUCING THE DEGREE OF SUBJECTIVITY

Д.А. Гаранин, Н.С. Лукашевич

ОЦЕНКА ИНВЕСТИЦИОННОЙ ПРИВЛЕКАТЕЛЬНОСТИ ПРОЕКТОВ С ИСПОЛЬЗОВАНИЕМ ОБОБЩЕННОГО ПОКАЗАТЕЛЯ И СНИЖЕНИЕМ УРОВНЯ СУБЪЕКТИВНОСТИ

In general, investment decision is an evaluation of the proposed alternatives for the investor using a set of indicators. It seems to be appropriate to use a method of the potential distribution of probabilities when investors know only the data of relevant characteristics of the investment projects. The application of the method is presented and it is shown that the quantitative estimates calculated by this method are relative and strongly depend on the choice of the base project.

GENERALIZED INDICATOR. BAYESIAN CRITERION. SHANNON ENTROPY. SUBJECTIVITY.

Принятие инвестиционного решения в общем случае представляет собой оценку предлагаемых инвестору альтернатив по совокупности показателей. Представляется целесообразным использовать метод потенциального распределения вероятностей в условиях, когда инвестору известны лишь данные о соответствующих частных характеристиках ИП. Представлена апробация метода, и показано, что количественные оценки, рассчитанные по этому методу, относительны и в сильной степени зависят от выбора базового проекта.

СВОДНЫЙ ПОКАЗАТЕЛЬ. КРИТЕРИЙ БАЙЕСА. ЭНТРОПИЯ ШЕННОНА. СУБЪЕКТИВНОСТЬ.

Investment decision is generally an evaluation of the alternatives proposed for the investor on the basis of the indicators and the selection of the projects according to the existing conditions (constraints). If possible, the multi-criteria problem usually reduces to a one-criterion issue by introducing a generalized criterion to simplify the problem [5]. In our case, this criterion could be the generalized index of the investment project attractiveness.

For the convolution of partial indicators related to a particular investment project, it seems reasonable to use the method of the potential distribution of probability. An information situation exploiting this method is characterized by the fact that investors know only the data on the corresponding private characteristics of investment projects. In this case, it seems appropriate to put forward a hypothesis of a linear convolution of some partial dimensionless parameters [5].

There is a sufficient number of different methods for determining the weights of such convolutions. They are all based on a particular behavior model of the social and economic systems, which is usually postulated informally. Meanwhile, a greater objectivity is typical of the models built using the principle of maximum uncertainty. One possible approach to evaluate these weights, which is based on this principle, is the method the potential distribution of probability. The content of this situation may be represented by the following scheme.

Let consider n investment projects which, in their purpose and contents, are competitors in terms of investing funds. Each of these projects is associated with a set of characteristics that define its investment attractiveness.

Let such characteristics be m. Define x_{ij} ($i = \overline{1, n}$, $j = \overline{1, m}$) as particular indicators of comparable projects. Initial data in this case are conveniently situated in a matrix

$$X = \begin{bmatrix} x_{11} & x_{21} & x_{m1} \\ x_{12} & x_{22} & x_{m2} \\ x_{1n} & x_{2n} & x_{mn} \end{bmatrix}.$$

Weight of the *j*-th characteristic in the distribution of funds to achieve the desired level of investment project efficiency is generally unknown. It is required to assess the weight of each characteristic in the distribution of resources taking into account the objectively existing uncertainties.

The principle of a potential distribution postulates an application of the Bayesian criterion as a comprehensive indicator for measuring the attractiveness of the project. It has the following form

$$b_i = \sum_{j=1}^{m} p_j r_{ij}, \qquad (1)$$

where r_{ij} − dimensionless parameters, $r_{ij} = x_{ij} / x_{\ni j}$, if an increase in x_{ij} leads to growth of b and $r_{ij} = x_{\ni j} / x_{ij}$; if the increase in x_{ij} leads to the reduction of b; $x_{\ni j}$ − characteristics of the standard, which is considered as one of the projects.

Then the weighting factors p_j, $(j = \overline{1, m})$, reflecting a pattern of environment behavior are found by maximizing the Shannon entropy [1, 3]

$$H = -\sum_{j=1}^{m} p_j \ln p_j \rightarrow \max \qquad (2)$$

under the constraints

$$\sum_{j=1}^{m} p_j = 1, \quad \prod_{j=1}^{m} \overline{r}_j^{\,p_j} = \text{const.} \qquad (3)$$

It can be shown that the expression for estimating weights in this case has the form

$$p_j = \left(\sum_{i=1}^{n} r_{ij} \right)^{-1} \left[\sum_{j=1}^{m} \left(\sum_{i=1}^{n} r_{ij} \right)^{-1} \right]^{-1}. \qquad (4)$$

Constraints (3) postulate the normalization and constancy of the geometric mean. Physically, this means that the relative increase in the weight of the *j*-th characteristic is in proportion to the relative increment of the level of the same characteristic among the totality of the considered projects, and the proportionality coefficient depends on the level achieved.

Thus, by calculating with expression (4) the significance coefficients, it is possible not only to rank the private indicators on their contribution, but also to choose the most attractive project from the offered alternatives. The efficiency of the method is demonstrated in the following example. Initial data for five specific indicators of five alternative projects are shown in Tab. 1.

Characteristics of alternative investment projects

Projects characteristics	Projects				
	1	2	3	4	5
1. Net Present Value (NPV), mln. rub.	1	1.3	0.7	2.6	1.1
2. Profitability Index (PI)	1.2	1.5	1.3	1.7	1
3. Internal Rate of Return (IRR), %	15.5	14.2	17.5	13	17
4. Return on investment (ROI), %	45	30	65	35	50
5. Payback period, years	3	4	5	3	6

Reduced matrix of initial data, calculated by expressions (2), where the standard accepted is project 1, is as follows:

$$R = \begin{bmatrix} 1 & 1.3 & 0.7 & 2.6 & 1.1 \\ 1 & 1.25 & 1.08 & 1.42 & 0.83 \\ 1 & 0.92 & 1.13 & 0.84 & 1.1 \\ 1 & 0.67 & 1.44 & 0.78 & 1.1 \\ 1 & 0.75 & 0.6 & 1 & 0.5 \end{bmatrix}. \qquad (5)$$

Then the matrix of calculated by expressions (1-4) integrated indicators of investment attractiveness of alternative projects equals

$$B = \begin{bmatrix} 1 & 0.94 & 0.98 & 1.24 & 0.9 \end{bmatrix}. \qquad (6)$$

The weighting coefficients for particular projects characteristics calculated by the expression (4) are summarized in Tab. 2.

Importance (significance) of the characteristics

Projects characteristics	Coefficients
1. Net Present Value (NPV), mln rub.	0.16
2. Profitability Index (PI)	0.18
3. Internal Rate of Return (IRR), %	0.20
4. Return on investment (ROI), %	0.20
5. Payback period, years	0.26

Analyzing the results of the calculations, we can conclude that the most attractive for the investor is project 4, because it has the highest generalized index.

Emphasis on the subjective evaluations of the importance of project characteristics

Another conclusion that can be drawn on the basis of the initial data and the calculations is that the payback period is the defining characteristic of these projects is, and has the highest weighting factor. However, it makes sense to take into account the opinions and experience of qualified experts in the evaluation of the project characteristics importance. For this purpose, it is advisable to take into account the subjective opinion of experts in the formation of the matrix (5).

Typically, these problems are solved by estimates formation (usually in points) for all characteristics and then assigned weighting coefficients for characteristics in order to convolute them further into a generalized index. However, in this case, the problem, which is shown on the stage of grading, is to formalize the intuitive approach. The method based on the minimization of participation of experts' opinion should be recognized as a more objective method. This approach requires the expert to place a number of preferences for project characteristics, and weights are calculated using the principle of maximum uncertainty. It can be shown, that under these conditions, the most objective scale is Fishburn estimates [3, 6]

$$\hat{p}_j = \frac{2(m - l + 1)}{m(m + 1)}, \quad j = \overline{1, m}, \tag{7}$$

where n − number of estimated characteristics; j − rank in the scale of priorities for the j-th characteristic.

In other words, it suffice to place the data in order of importance (significance, impact, etc.) and to determine the weights by the expression (7). Then the results in Tab. 2 should be recalculated according to the subjective factor of the first order (the importance of the project characteristics). Continuing the example, we can assume that, in the opinion of experts, the prioritization of the relevant characteristics of the projects and the weights look like as shown in Tab. 3.

T a b l e 3

Subjective priority of characteristics

Projects characteristics	Priority	Coefficients
1. Net Present Value (NPV), mln rub.	4	0.13
2. Profitability Index (PI)	3	0.20
3. Internal Rate of Return (IRR), %	5	0.07
4. Return on investment (ROI), %	1	0.33
5. Payback period, years	2	0.27

Then weighting factors for characteristics of the projects taking into consideration a subjective factor can be calculated by the expression

$$Q_j = \gamma P_{\ni j} + (1 - \gamma)P_{\pi j}, \quad j = \overline{1, m}, \tag{8}$$

where γ − the degree of trust to experts; $P_{\ni j}$ − expert (subjective) assessment of the j-th weighting factor; $P_{\pi j}$ − potential (objective) assessment of the j-th weighting factor; n − number of estimated characteristics.

The results of this recalculation with a 50 % level of confidence in expert opinions are summarized in Tab. 4. The analysis of the results indicates the sensitivity of the method to both an objective and a subjective factor (see Tab. 2, 4).

Changing γ from no-confidence level (0 %) to absolute confidence level (100 %), we see the convergence of the results to the limits either for the purely objective or for the purely subjective assessment.

T a b l e 4

Generalized evaluation of the characteristics importance

Projects characteristics	Coefficients
1. Net Present Value (NPV), mln rub.	0.14
2. Profitability Index (PI)	0.19
3. Internal Rate of Return (IRR), %	0.13
4. Return on investment (ROI), %	0.27
5. Payback period, years	0.27

**Emphasis on the experts' opinions
in the evaluation of alternative investment projects**

So far we have considered a problem of the subjective opinions of experts in assessing the significance of the projects characteristics. The second scale of the original Tab. 1 includes a list of projects. So, expert opinion must be formalized by taking into account the preferences among investment projects. According to the experts, projects are ranked in the order of preferences, and then with an expression similar to (7), weights reflecting the quantitative measure of preference are estimated (taking into account the subjective factor of the second order). With the problem being solved, let us assume that the evaluation by experts allowed to place the projects in the order of preferences, presented in Tab. 5. From the calculation results, summarized in Tab. 5, it is seen that the subjective evaluation given by the experts does not agree with the more objective and potential estimates. Thus, the generalized evaluation of investment attractiveness, calculated by the expression similar to (8), takes into account both of these factors.

Table 5

**Expert opinion in the evaluation
of projects preference**

Parameters	Projects				
	1	2	3	4	5
Project priority	2	1	4	5	3
Assessment of the «weight» of preferences	0.27	0.33	0.13	0.07	0.2
«Potential assessment» (6)	1	0.94	0.98	1.24	0.9
Generalized assessment of investment attractiveness	0.64	0.64	0.56	0.66	0.55

Thus, the most preferred investment project is project 4.

Investigation of the effect of choice standard

We have shown above that formalizing information situation of potential distribution of probability involves the formation of Bayesian criterion (1), to assess the weights of which we introduce the dimensionless parameters r_{ij}. It uses the concept of a «standard», and each of the projects can be considered as such. In fact, it is necessary to consider the following feature of this method.

Let us apply the abstract matrix X that contains m specific indicators (characteristics) of some n comparable projects in Tab. 6.

Table 6

Initial data for investigation

Characteristics (j)	Projects (i)				
	1	2	3	4	5
1	11	34	24	67	76
2	23	23	54	46	34
3	21	12	34	45	56
4	23	32	23	32	23
5	43	56	12	11	44

To go to the dimensionless matrix of indicators, we use the expression $r_{ij} = x_{ij} / x_{6j}$ in formula (1).

The following Tab. 7 presents input data in case project 1 is selected as a standard (basic project).

Table 7

Input data (project 1 − basic one)

Characteristics (j)	Projects (i)				
	1	2	3	4	5
1	1	3.09	2.18	6.09	6.90
2	1	1.00	2.34	2.00	1.47
3	1	0.57	1.61	2.14	2.66
4	1	1.39	1.00	1.39	1.00
5	1	1.30	0.27	0.25	1.02

The use of the expression (4) when selecting project 1 as the basic one (standard) gives the following values of weights

$$P^{(1)} = \begin{bmatrix} 0.07 & 0.17 & 0.17 & 0.23 & 0.36 \end{bmatrix}^T.$$

Similarly, the weights are calculated when selecting project 2, 3, ...: as a standard.

$$P^{(2)} = \begin{bmatrix} 0.17 & 0.14 & 0.08 & 0.25 & 0.36 \end{bmatrix}^T;$$

$$P^{(3)} = \begin{bmatrix} 0.13 & 0.35 & 0.24 & 0.20 & 0.08 \end{bmatrix}^T;$$

$$P^{(4)} = \begin{bmatrix} 0.28 & 0.22 & 0.23 & 0.21 & 0.06 \end{bmatrix}^T;$$

$$P^{(5)} = \begin{bmatrix} 0.27 & 0.14 & 0.25 & 0.13 & 0.21 \end{bmatrix}^T.$$

Analyzing the results, it must be admitted that the choice of the project as the base one affects the weighting factors of their characteristics. In other words, the weight of the private indicator in the complex characteristic of the project is highly dependent on the choice of the base object for comparison. Since the weighting factors are only for internal operations, their use for other purposes ignoring this method is incorrect.

Let us consider the effect of the base project selection on a generalized indicator (1). To do this, using the above-mentioned weight P_j, we calculate the value of the indicator (1) for the different cases of base project selection:

$$b^{(1)} = \begin{bmatrix} 1.00 & 1.27 & 1.17 & 1.56 & 1.79 \end{bmatrix};$$

$$b^{(2)} = \begin{bmatrix} 0.79 & 1.00 & 0.92 & 1.22 & 1.41 \end{bmatrix};$$

$$b^{(3)} = \begin{bmatrix} 0.86 & 1.09 & 1.00 & 1.33 & 1.53 \end{bmatrix};$$

$$b^{(4)} = \begin{bmatrix} 0.64 & 0.82 & 0.75 & 1.00 & 1.15 \end{bmatrix};$$

$$b^{(5)} = \begin{bmatrix} 0.56 & 0.71 & 0.65 & 0.87 & 1.00 \end{bmatrix}.$$

The comparison $b^{(i)}$, $i = \overline{1, n}$ shows that the selection of the base project also strongly affects the absolute values of the generalized indicator. Therefore, values can be used only for comparison on a «better or worse» principle in the formation of a number of preferences for the projects under consideration. Thus, it is easy to see that, in all cases, when selecting the basic project, a number of preferences remains identical: 5, 4, 2, 3, 1, despite the fact that the absolute values vary significantly in case the basic project changes.

Thus, the potential distribution of probability can be successfully used for the qualitative comparison of a number of projects in the form of preferences. The quantitative evaluation of both weights and generalized indicators calculated by this method is relative and strongly depends on the choice of the base project.

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LUKASHEVICH, Nikita S. − *Saint-Petersburg State Polytechnical University.*

195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: lukashevich@kafedrapik.ru

ЛУКАШЕВИЧ Никита Сергеевич − *доцент кафедры предпринимательства и коммерции Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, кандидат экономических наук, доцент.*

195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: lukashevich@kafedrapik.ru

GARANIN, Dmitriy A. − *Saint-Petersburg State Polytechnical University.*

195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: garanin@kafedrapik.ru

ГАРАНИН Дмитрий Анатольевич − *доцент кафедры предпринимательства и коммерции Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, кандидат экономических наук, доцент.*

195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: garanin@kafedrapik.ru

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A.A. Mirolubov, Ju.A.S. Mäkiö

MOBILE TECHNOLOGY IN SUPPORTING
E-BUSINESS — CHANCES AND CHALLENGES

А.А. Миролюбов, Ю.А.С. Мякио

МОБИЛЬНЫЕ ТЕХНОЛОГИИ ДЛЯ ПОДДЕРЖКИ
ЭЛЕКТРОННОГО БИЗНЕСА — ВОЗМОЖНОСТИ И ВЫЗОВЫ

Paper discusses the chances and challenges of contemporary e-business mobilization process. Mobile applications are characterized as an applications running in various mobile devices. In the business context, mobile applications usually have an over Internet into back-office systems. Because of the lack of the computing power and slow wireless connections, the calculations of the presented data is done on the back-end and the presentation is done on the mobile device. Paper explains that correct choice of mobile apps is a promising approach to improve the efficiency of business processes and to reduce operative expenses in organizations.

MOBILE TECHNOLOGY. E-BUSINES. MOBILE CUSTOMER APPLICATIONS. MOBILE BUSINESS APPLICATIONS. FRONT-END DEVICES. COMPUTATION POWER. PORTABILITY

Обсуждаются возможности и вызовы современного процесса мобилизации в электронном бизнесе. Мобильные приложения представляют собой программные приложения функционирующие в различных мобильных устройствах. В контексте современного бизнеса, мобильные приложения, соединяются через Интернет с традиционными бэк-офисными приложениями. Однако вследствие ограничений по вычислительной мощности и низкой скорости беспроводной связи, все необходимые расчеты с данными выполняются на сервере и представляются на мобильном устройстве. В статье показано, что правильный выбор мобильных приложений является условием повышения эффективности бизнес-процессов и сокращения оперативных затрат в условиях организации.

МОБИЛЬНЫЕ ТЕХНОЛОГИИ. ЭЛЕКТРОННЫЙ БИЗНЕС. МОБИЛЬНЫЕ ПРИЛОЖЕНИЯ ПОЛЬЗОВАТЕЛЬСКОГО КЛАССА. МОБИЛЬНЫЕ ПРИЛОЖЕНИЯ ДЛЯ БИЗНЕСА. УСТРОЙСТВА КОНЕЧНОГО ПОЛЬЗОВАНИЯ. ВЫЧИСЛИТЕЛЬНАЯ МОЩНОСТЬ. ПОРТАТИВНОСТЬ.

Introduction. In recent years the development of mobile communication technologies and devices have improved and dramatically changed the way people communicate in private and in the business. The new mobile technology based possibilities of communication have opened new ways to exchange information at anytime and anywhere. Especially this can be seen in the business where knowledge and information are understood increasingly as production factors enabling the sink of process costs and the improvement of business processes. A real-time access into the knowledge and information are preconditions for improved processes and for more efficient use of the work schedule.

The possibility to communicate by means of electronic communication devices, causes the development of new or improvement of existing technologies and vice versa. At the same time to the improvement of the technical possibilities, companies are facing the challenges of their useful application in all fields of the everyday business. The use of mobile phones is not anymore limited to the communication and interaction between peoples. E-mail, SMS and instant messaging have become a standard communication medium. The

recent improvements of mobile communication devices and communication technologies have enabled the mobilization of classical IT systems in business. The number of remote and mobile working employees is increasing as they more and more work remotely or they are required to be accessible outside of the office times.

The globalization of the business is understood as one of the deciding factors a corporation needs to utilize to survive in the market. The changes caused and enabled by the mobile technology may improve the efficiency of the whole economy. From a single company the question is not anymore, whether they should utilize mobile technology in their business but for which purposes and where the mobile technology shall be utilized.

Not with standing technical possibilities of the mobile technology, its limitations narrow its application area. Therefore, companies are facing the question of the profitable use of the mobile technology in their everyday business. New changes are raising new challenges. The meaningful and beneficial use of mobile technology requires careful analysis and realistic planning considering all its drawbacks, limits on the one hand and possibilities on the other hand.

This work focuses the chances and challenges of the use of mobile technologies in business. In the following sections the mobile technology and identify some typical characteristics and challenges are discussed. After that a closer insight into the e-Business in respect of mobilization is

delivered. Additionally some critical factors for the use of mobile application in business are presented and discussed. By means of two examples the mobilization benefits of e-Business are demonstrated.

Mobile technology

Faster access to information is today in the business more important than ever before. Founded decisions may be made only based on valid and up-to-date information. The place where the information is saved does not play a role. The quality of the information and the accessibility are more important. The information access is enabled by a front-end device.

Fig. 1 depicts the development of communication devices since 1960s till today. The considered period of time is subdivided into three generations. For each generation the technology development, enterprise demand, vendor response, and features are considered. During the first period the technology developed was based on the voice-only mobile-communication. This technology was because of high costs and missing infrastructure not wide spread. For the enterprises the technology was not yet secure and enough and the performance was too low. At the end of this era the first digital cellular phone was published. The second generation from 1990s-2000s was based on the use of the cellular phones and its new features in the communication. Communication devices in this generation supported already e-mail and calendaring functions and possessed already some
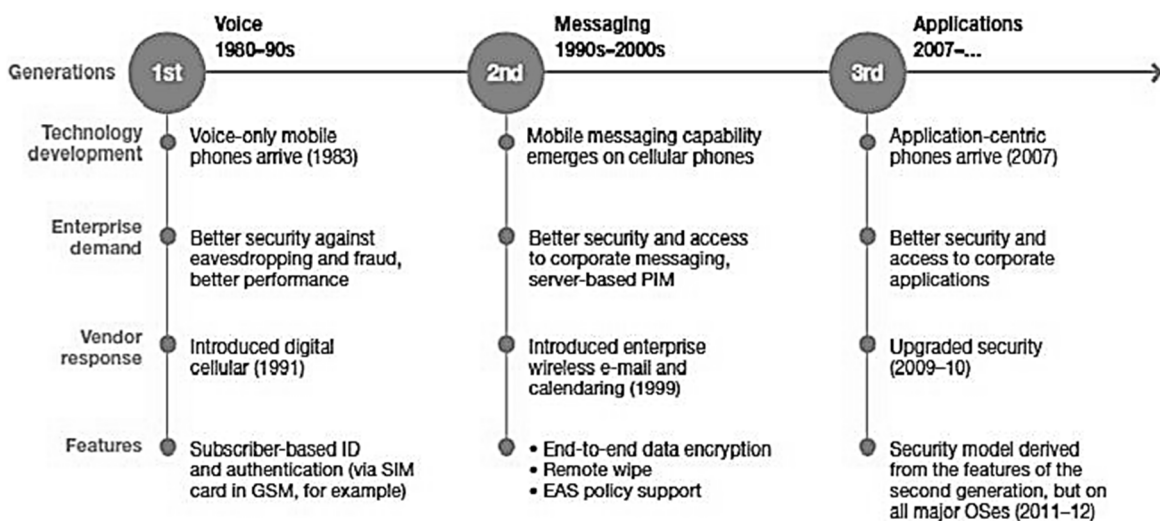

Fig. 1. Development of communication devices according to [1]

implemented security standards. The 3rd generation beginning at the end of the first decade of 2000 brought a novel application centric phones with integrated touch screen and camera, high performance processors and large memory. The 3rd generation devices are the precondition for the mobile business.

The number and diversity of various front-end devices that are used in e-Business applications is continuously increasing. To be applied to the e-Business, the use of various front-end devices should be profitable and the devices should fulfill the various needs of business, like adaptability and usability in business processes as well as various user habits. The fulfillment of various kinds of needs requires the knowledge about the challenges and their solutions as well as about the mobile devices and their limitations.

First we present various typical front-end devices and discuss their properties. After that we are given a closer look into the similarities and common characteristics of e-Business applications and compare the fulfillment of the needs of e-Business application by front-end devices. After that we will consider challenges from the hardware, software, and organizational points of views. We are focusing on mobile devices and on solutions for specific problems arising from the use of mobile devices in e-Business.

Mobile devices may be classified in multiple ways, for example by purpose of use, by used technique or supported technologies, or by user interfaces. In this work front-end devices are classified by the device class.

The class laptop

Laptop computers, also known as notebooks, are portable computers that you can take with you and use in different environments. They include a screen, keyboard, and a track pad or trackball, which serves as the mouse. As laptops are meant to be used on the go, they have a battery allowing them to operate up to 12 h without being plugged into a power outlet. Laptops also include a power adapter that allows them to use power from an outlet and recharges the battery. Because of the portability of laptop computers, the hardware components used in laptops are designed to use less electric power than those in PCs. Laptops are more expensive than PCs with an equivalent computational power. Laptops are capable to access wireless

into a network and onto the Internet via WLAN or UMTS.

The most significant difference between a PC and laptop is the smaller screen size of laptops and lower resolution. Laptop computers are further classified according to the screen size. Subnotebook are laptops with screen size between 11»and 15». Netbooks are laptops with screen size smaller than 12». The borders between these sub-classes are not exact.

The class mobile phone

A mobile phone is first of all a telephone that may be used location-independently. Beyond the telephone functionality, modern mobile phones have additional features such like MP3-player, camera, SMS and MMS messaging. A shorten keyboard, «T9» − text on nine keys, is used for textual input, i. e. One and the same key is used to input multiple characters. The computation and graphic power of mobile phones is low and the use of the Internet is limited. The screen diagonal is only a couple of cm long and the screen has a low resolution. For example, the resolution of Nokia E52 is 240px x 320px, whereby it is one of the highest resolutions in its class.

The class smart phone

A smart phone combines a mobile phone with a PDA (Personal Digital Assistant). A smart phone provides a number of various functionalities. A smart phone has in most cases a multipoint-touch screen and a virtual keyboard. Commonly a smart phone has a screen that is usually nearby as large as the device itself. In most smart phones there are only one or few physical buttons. The computational power of smart phones is larger than in mobile phones. Typically, modern smart phones have a high resolution display up to 768x1280 pixel and screen size up to 4.5 inches. The functionality of a Smartphone can easily be widened by so called mobile apps that are software applications designed to run on smart phones, tablet computers and other mobile devices.

The class tablet computer

A tablet computer (or tablet) is a small computer similar to laptop designed primarily for the mobile use. Tablets are operated by touch screen whereby the user's finger functions as a mouse and cursor. Tablets use a lightly modified

operation system versions like Windows or Linux. Additional hardware, like keyboard, and the Internet connection may be adapted via wireless connection. Tab. 1 sums up the various front-end devices discussed above. The classification is done according to the device type.

Challenges and solutions with hardware

This section deals with the challenges bounded with the hardware of front-end devices as well as with their solutions.

The first challenge is the different screen sizes of front-end devices. Screen sizes vary between 3.5" of smart phones to 14−15" in laptop PCs to over 20» in desktop PCs. Consequently, the characteristics of the various front-end devices must be taken into account during the design of the user interface. Additionally, the usability of the application has to be carefully designed because of differences of front-end devices.

As an example, Fig. 2 illustrates the screenshot of the Lufthansa portal. The site is optimized for mobile devices. However, the mobile version is limited to the most essential functionalities. The scroll function is restricted to the horizontal direction and supports them visually through the half visible «Miles & More» button. Even more significant is the difference between a desktop PC a mobile phone, because of the display size of only 1.5−4.5 inches diagonal. It is therefore necessary to adjust the screen content for the device.

The limitation of the screen size is difficult to correct for devices using the traditional technology. Current research work is done on roll able displays. These displays may improve the difficulties of today. A further approach is to integrate a small projector into a mobile device. The projection can be done onto any ground and functions analog to a touch screen. For example, the current time may be projected onto the hand of the user. By using a projection as a screen would eliminate the limitations given by the screen size.

In order to support users, it is important to adapt the monitor content on the devices. For web pages and web portals the adaption may be done by using special style sheets. However, it is important to note whether a Web view of 1:1 is needed for the mobile device. In complex cases it may be better to write special Apps (small applications for mobile devices), because by doing so all functionalities of the mobile device may be used. The drawback in apps is the heterogeneity and missing compatibility of various mobile platforms. In some cases code generators and cross-compilers may be used for the development of apps. For example, the cross-compiler developed by the Cross-Compiling Project XML VM generates from the byte code of an Android-App (Java) an iOS-App (Objective-C). Additionally, the XML VM supports .NET, Ruby and Java script. The support for further languages is planned.

Table 1

Classification of mobile devices

Device type / Challenge	Screen-diagonal, inch	Computation-power, GHz	Network-function	Data input	Talk time, h	Internal memory, Gb
Mobile phone	ca. 2.4	< 0.6	GSM UMTS WLAN	Keyboard (T9)	6−8	≤ 16
Smart phone	3−4.5	> 0.5	GSM UMTS WLAN	Qwerty keyboard, virtual keyboard	6−14	32
Tablet (Slate, Convertible)	7−10, 11−15	1, 2×1.4	WLAN UMTS GSM LAN	Qwerty-keyboard, virtual keyboard	10−16, 2−6	64, 120
Netbook	10−12	1.2	LAN WLAN GSM UMTS	Qwerty-keyboard	2−11	160
Laptop	**13−18**	**2×2 GHz**	**LAN WLAN GSM UMTS**	**Qwerty-keyboard**	**1.5−9**	**250**
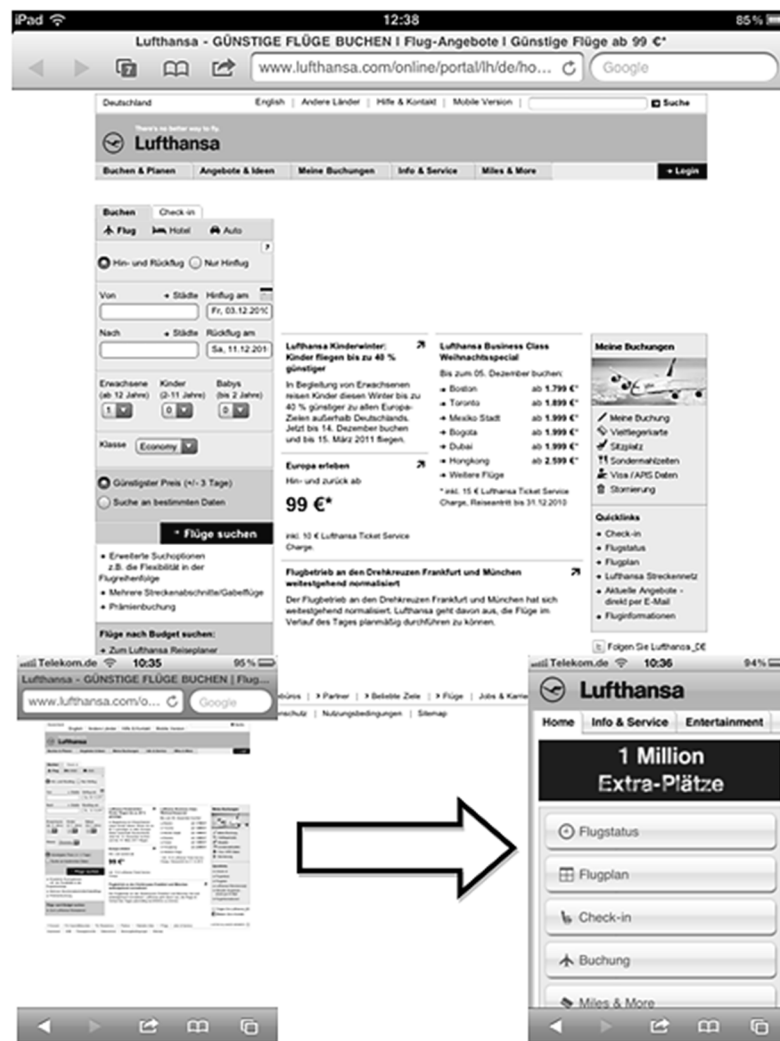
Fig. 2. Adaption of the Lufthansa portal for mobile devices

Another possibility is the slicing − tree based web page transformation. In the first step, only a thumbnail of the web page is displayed. This thumbnail is linked to various fields. The thumbnail is used to navigate through the content page displayed which is processed in a tree structure. The advantage here is that no zooming or scrolling is necessary. The drawback is that this mechanism requires an additional proxy server to perform the processing of the Web sites.

A further challenge is the not uniform and relatively low computing power of mobile devices. Therefore, computationally intensive applications on mobile devices are currently not practicable. This could be improved by virtualization of applications. In the case of virtualization calculations would not run on the device that is

used for the data presentation only. The computation is parameterized by the mobile device. The calculation results will be shown on the screen of the mobile device.

The differences in the performance of the underlying network may hinder the broad use of mobile solutions it the business. In Tab. 1, the transfer speeds are listed. The mobile providers in Germany support almost everywhere the slower GSM standard, GPRS and EDGE. A transmission rate of up to 236.8 kBit/s downstream (from the network to the mobile device) is possible. UMTS and HSPA (High Speed Packet Access, Update for UMTS) is mostly available in urban areas and offers transfer rates of up to 14.4 Mbit/s HSPA (Release 6). Without HSPA release 6 only 384 kBit / s transfer rate is possible. There are other UMTS

T a b l e   2

Comparison: transmission rates

	GSM	GPRS	EDGE	UMTS	HSPA Rel. 5&6
Transmission method	Leitungs-vermittelnd	Packet-oriented	Packet oriented	Packet oriented	Packet oriented
Transmission rate (Theoretical)	9.6 kBit/s	171.2 kBit/s	Downlink: 236.8 kBit/s Uplink: 118.4 kBit/s	Downlink: 384 kBit/s Uplink: 64 kBit/s	HSDPA: 3.6 MBit/s HSUPA: 1.44 MBit/s
Transmission rate (in the practice)	~9 kBit/S	~40 kBit/s	Downlink: ~170 kBit/s Uplink: ~95 kBit/s	Downlink: 360 kBit/s	
Always-On	No	Yes	Yes	Yes	Yes
Availability	Since 1992	Since 1999	Since 2006	Since 2004	Since 2007

releases providing even higher rates. However, the providers have refrained, as it requires large investments in infrastructure, and a successor to UMTS is already known. The successor of the UMTS is the LTE (Long Term Evolution). LTE enables transfer rates up to 1 GBit/s. This speed is theoretical because, depending on the WLAN standard, IEEE-transmission speeds of 2 MBit/s to 100 MBit/s for mobile devices are currently possible. Because of the in the practice significantly lower transfer rate it is important to know in advance how much data is transmitted and whether this is possible with the underlying infrastructure.

Challenges and solutions with Software

In respect of the software, the highest relevance is in the appearance of Web pages in different browsers and devices. The challenge may be met already by desktop PCs or laptops when presenting one and the same site in different browsers. The problem here is that the browser, the HTML tags represents different. Even more difficult is it if the Flash or JavaScript is disabled in the browser but they are used on a web site. Here it is difficult to find a solution. One way is to define corporate wide guidelines. The aim of the HTML5 standard is to ease this problem. This standard is currently in development by the W3C and is expected in 2012. Currently the browser vendors are trying to implement the new standard. By HTML5 in combination with CSS 3, interactive Web applications are created that are very similar to a native application. The HTML5 standard will likely ease the creation of cross-platform websites.

Another challenge is the portability of applications and platforms. The adoption of applications for other platforms is on the current state of the technic in most cases challenging. One approach here is the so called multi-channel development focusing the diversity of end devices.

Multi-channel development is based on an extensive middleware that substitutes real devices and thus limits the use of device specific functions. Therefore the platform optimizations for typical user experience are not focused. An alternative is Mobile AJAX (Asynchronous JavaScript and XML). AJAX allows the reduction of the transferred amount of data to the mobile device. The advantage of AJAX is that not the entire page must be reloaded, but that individual side parts are updated asynchronously. However, the AJAX engine requires more processing power, so battery life is claimed. The Xfce-engine is a lightweight alternative to mobile AJAX with some functional limitations for example, regarding the selection of tags. The Xfce-engine requires fewer resources and is accordingly well suited for mobile devices.

Organizational Challenges & Solutions

The use of private devices makes it difficult to get an overview of devices that are used in an organization. The devices differ in terms of security and the application area. In some cases the use of private devices may be allowed. However, for security reasons the use of private devices may also be forbidden. Thus, a company should clearly define which devices are for what purpose supported. For example, the e-mail functionality for private devices may be allowed. Because of the high costs, the technical support would be available for few device types only. Equally important question is what happens in case of loss or theft of a device. For this case mechanisms to delete the data in the device remotely should be enabled. As the number of different devices is large and the capability of a company to support many different kinds of devices is limited, it is essential for a company to establish clear rules on what devices are supported and how to proceed with the devices.
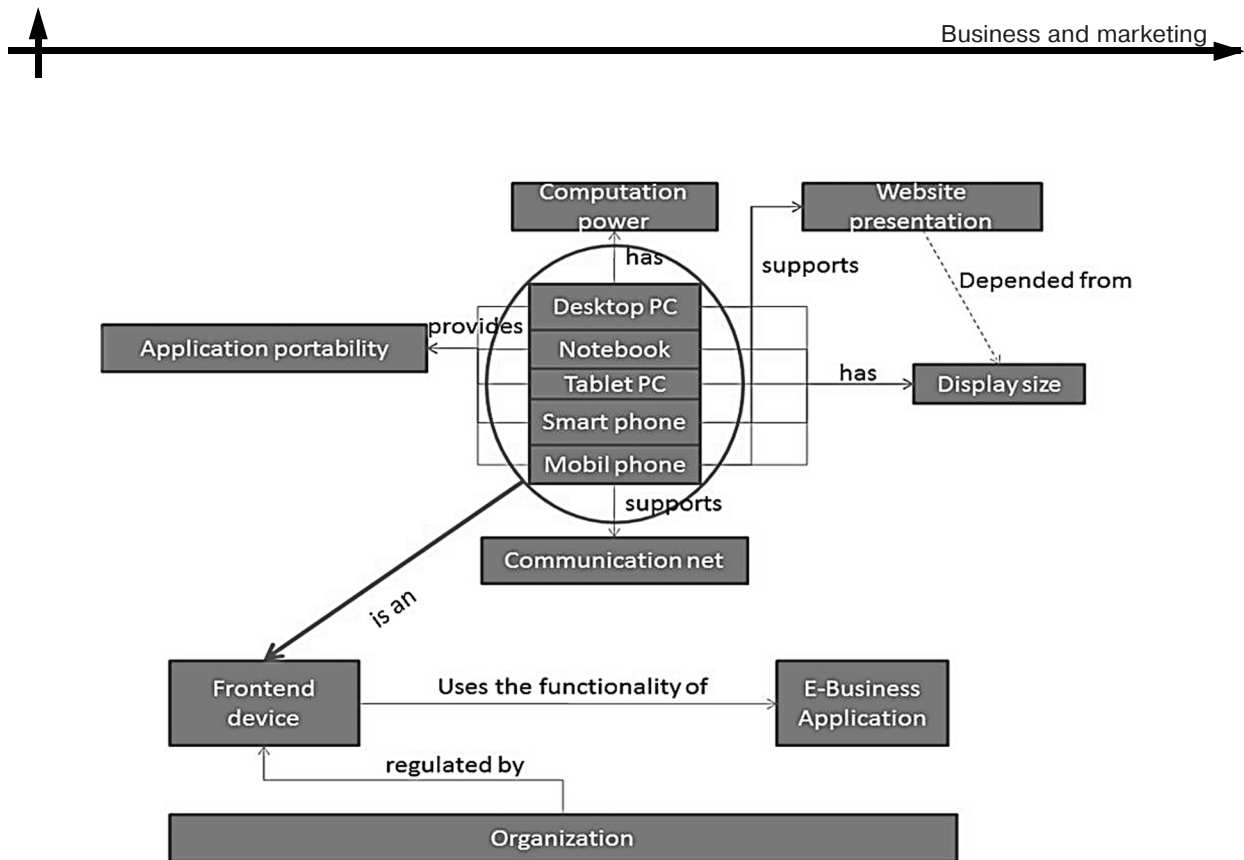
Fig. 3. Relationships of the requirements

Fig. 3 sums up challenges related to front-end devices are placed directly in a relationship.

From the business perspective it is important to define policies and rules for the selection of front-end devices that are supported. The most promising approach to solute the challenges seem to be the HTML5 standard, as it stresses the adoption of web applications to multiple platforms and covers a wide range of functions necessary for e-business applications.

E-Business Applications

E-Business is the integrated application of information and communication technologies (ICT) in support of all the activities of business and execution of automatized business processes of a company. This means that any software program that is used in a company for the process execution having interfaces for data exchange is an e-Business application.

Initially, all e-Business applications provide in most cases some kind of graphical user interface (GUI). Typically the GUI contains control elements (input fields, buttons, check boxes, ...) allowing the application control. Also interfaces between applications are possible. These interfaces are configurable and in one or in other way controllable by the user. Typically e-Business applications allow and enable a data and information exchange (reading and writing). The following section discusses the use of mobile devices in e-Business.

Business applications

Business applications are mobile applications used in the business context and which are developed for smart phones. The programming of business apps may be a challenging task because of the very specific mobile environment where they are supposed to be used. Thus, the specific situation has to be taken into account, when designing and developing of business apps.

According to Julian Von der Neyen [2], mobile applications may be subdivided into two categories. The first category consists of so-called «Mobile Customer Applications» (MCA) focusing the communication and interaction between a company and its clients using mobile devices. MCAs are used in order to improve the communication by personalization and by delivering the required information faster to the customer. The second category, called «Mobile Enterprise (Business) Applications» (MBA), focuses the simplification of company's internal

Increasing need of mobility	High dynamic of the market
Flexible organizations need mobile employees Shorter processing times becomes as a critical success factor The use of private devices require a novel approach for mobile devices The consolidation of the IT leads to standardized solutions	The computing power and the functionality of mobile end devices are increasing by sinking costs «Battle» of platforms at the system level and focus on the services and applications Increasing qualityand reliability of mobile networks by lower operational costs Cloud Computing opens chances for new offers

New Generation of mobile solutions

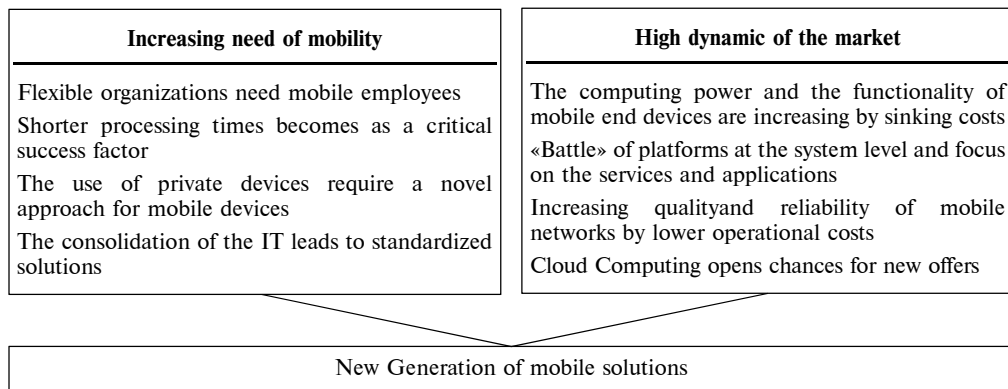Fig. 4. Driving factors of Enterprise Mobility according to [3]

business processes. MBAs improve business processes for example by providing employees an access to the data from anywhere at any time. MBAs may thus make the execution of business processes more efficient and increase the productivity of the employees.

As business apps are per definition used in the business context, they have to be capable to support existing business processes. Therefore, the application of mobile apps means total or partial mobilization of business processes requiring occasionally their redesign and reorganization. Simultaneously the environment for their meaningful application needs to be created. This in turn leads to investments for a working mobile ecosystem that supports the mobilization of business processes. On the one hand business apps are the precondition for the mobilization of business processes and for an effective use of production resources. On the other hand business processes need to be modeled and defined in such a way that they may be implemented for mobile devices.

As business apps are used in mobile devices, their limitations and possibilities have to be carefully taken into account during the planning and implementation. Depending on the used mobile device, the main limitations are given by the limited screen size of the mobile device, the low network capacity, the reduced computing power compared with typical personal computers, and limited memory resources of the mobile devices. Never the less, the pros of mobile apps are often bigger than their cons or the challenges that are coupled with them. Having an Internet connection, they enable the supply of just in time personalized information for employees independently of the localization, time or other physical restrictions. For instance, outdoor stuff, when making an on-site visit by a customer, may get from anywhere and anytime an access to the relevant information.

Criteria for the Integration and Use of Business Apps

Mobile apps are used basically in order to increase the efficiency of business processes. The business process is defined as «a specific ordering of work activities across time and place, with a beginning, an end, and clearly identified inputs and outputs» [4]. Work activities are carried out by «business process actors» that are employees, customers, or systems.

It is note worthy that not every business process and not every business environment may be successfully supported by mobile devices. The success depends on multiple factors that are to be considered and taken into account when planning the application of mobile apps in the business. Facing the question about a successful and economically meaningful application of business apps, turns to the question about the suitability of the process, of the business environment, and of the employees involved. A company considering and planning the application of mobile apps to support their business processes shall consider the critical criteria for their integration and use in business.

For the successful implementation of business apps (i.e. mobilization of business processes) depends on the environment where they are planned to be implemented. The environment consists of factors like information technology (IT), organization, and stakeholders.

Prior to the mobilization of business processes, the organization shall investigate the currently used IT in respect of data security, range and availability of the wireless connections, mobile end devices, and their capability of being integrated into the planned or existing infrastructure. Besides the infrastructure also the variety of supported mobile devices shall be first analyzed and defined. As in the market there are a number of different kinds of mobile devices available that are not compatible with each other and possible not compatible with the existing IT environment, the organization shall determine the types of various kinds of mobile devices that will be supported by the environment. To minimize operating costs, the number of various systems shall be kept as small as possible. The lack of standards and the rapidly developing mobile technology complicate the planning at the technical level. At the business level the dynamic nature of the telecommunications market makes the business mobilization difficult [5].

If the organization is not prepared for the introduction of mobile apps, the introduction will most probably be not successful. Especially the top management shall know where and for what reason mobile apps are introduced in the company. Thus, for the introduction of mobile business in an organization the participation of the top management is one of the critical factors. Bearing this in mind Basole states that «leadership needs to ensure that the mobile strategy fits their way of doing business rather than changing their ways of doing business to fit the strategy» [6].

The most significant factor for the mobilization of business processes are their mobilization abilities. The mobilization abilities may be determined by process characteristics. If a process may be executed independently from the time, location, or some fixed context, it has a high potential to be mobilized.

The benefits of the mobilization may be considered from several points of views, as stated by [7]. According to the authors «the benefits of mobile technology are related to the opportunity costs of not being able to coordinate during the time when actors are difficult to locate». Business processes are a lot of about coordinating single tasks in order to reach some result. For the coordination various mechanisms and systems

are available. The advantage of the mobile technology compared with an alternative one may be measured by comparing the benefits of the mobile technology with an alternative technology.

Examples for Use of Mobile Applications

This section presents shortly two case studies about the use of Mobile apps. The first case study is about the use of a mobile app in the after-sales service of one big German company in automotive industry (case **A**). The second case study presents the use of mobile apps in an ordering system for computer industry (case B). Case B is still under development. Thus in that case only the first results are presented.

The goals of the case **A** were many folds. The company wanted to make a feasibility study about the development and usage of mobile apps. From the technical point of view the goal was to compare different development approaches and platforms in order to define companywide guidelines for the development of hybrid mobile apps for three different end platforms: iPhone, Blackberry and Android. Hybrid mobile apps are combinations of native code and usual web code, like HTML. From the business point of view the major goal was to study the usability and the benefits of mobile apps in the after sales.

During the case study could be demonstrated that the use of mobile apps could increase the productivity in the after sales about 20 % − 30 %. The app allowed the employees to access directly to back office systems of the company. This allow them to read and write in the real time the data relative to the case they were working on. The paper work could be eliminated totally. Thus, the failure rate caused by the transfer from paper slides to the IT system disappeared. The client's satisfaction degree could be increased significantly after the introduction of the system. The clients could get informed about their case in the real time. So they got the feeling that somebody really takes care of them. No need for the staff education in the usage of the app was reported. This is because of the intuitive usability of the application and because the application basically had the same functionality as the traditional application on their working place.

In the future, it is planned to provide an access also for the clients so that they get

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informed about their case remotely. Therefore the IT environment needs to be analyzed more in detail respective security and bandwidth. In the first step the access will be given to a group of preselected clients. Based on the collected experiences, the application may be widened for entire clients.

In the case **B** a company (let call it **C**) selling costly IT products to business clients enlarges its selling software with mobile components. The clients should get an access for mobile devices. Additionally the C wants to widen the functionality of the selling software by an authorization process component that checks the maximum available budget of the purchasing agent. Prior to the introduction of the mobile solution, the authorization process takes approximately 37 hours. This is caused by the timely double checking that is implemented in the process that takes 19.5 hours. For security reasons the authorization has a validity of a short time. Because of expired authorization C loosed orders that could have taken place if the process had been faster. The new mobilized solution shall additionally enhance to the satisfaction degree of the clients by delivering

them a possibility any time and any place to follow the state of their orders.

Prior to the development of the mobile app, the business case was analyzed, benchmarks to measure to change have been developed, and both functional and non-functional requirements of the app ware collected.

Approximately the average value of each order in the considered time period of one year was 1136.65 Euro. The total value of the orders was over 16254 orders more than 18 mln. Euro. About 6 % of the total number of orders was processed through the authorization process, total cost was about 1 mln. Euro. As a rule an order will be cancelled, when will not be responded within 96 hours. During the considered period of time more than 600 orders with a total value of almost 700.000 Euro were cancelled.

After the implementation and first experiences from the practice the results seem to be promising. The processing time of the orders could significantly be shortened. As the testing phase is not yet ended, it is too early to say, in which amount the order cancellation rate is reduced.

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MIROLUBOV, Andrei A. — *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: amirolubov@yandex.ru

МИРОЛЮБОВ Андрей Анатольевич — *доцент кафедры международного бизнеса Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, кандидат экономических наук.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: amirolubov@yandex.ru

MÄKIÖ, Juho A.S. — *Emden Leer University of Applied Science.*
26723, Constantiaplatz. 4. Emden. Germany. E-mail: juarsa@web.de

МЯКИО Юхо Арви Сантери — *профессор Университета Прикладных наук Эмден Лир, доктор наук (информатика).*
26723, Германия, Эмден, Константияплац, д. 4. E-mail: juarsa@web.de

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V.A. Dubolazov, S.V. Salkutsan

MARKETING AND MANAGEMENT

В.А. Дуболазов, С.В. Салкуцан

МАРКЕТИНГ И УПРАВЛЕНИЕ

The concepts of marketing and marketing management are presented. The aims and the functions of marketing are described. The definition of management is analyzed and the place of marketing plan in the management process is shown. Author provides a classification of marketing plan. The economic and mathematical model for the choice of actions to be included in marketing plan is offered.

MARKETING. MARKETING MANAGEMENT. MARKETING PLAN. MODEL FOR THE CHOICE OF ACTIONS.

Рассмотрены понятия маркетинга и управления маркетингом. Описаны цели и функции маркетинга. Проанализировано понятие управления и показано место плана маркетинга в процессе управления. Приведена классификация плана маркетинга. Составлена экономико-математическая модель выбора мероприятий для включения в план маркетинга.

МАРКЕТИНГ. УПРАВЛЕНИЕ МАРКЕТИНГОМ. ПЛАН МАРКЕТИНГА. МОДЕЛЬ ВЫБОРА МЕРОПРИЯТИЙ.

In our opinion today we observe a variety (or even a confusion) of definitions for such terms as marketing, marketing management, market-driven management, management of marketing as well as for their objects, subjects, objectives, functions, etc. This article aims to provide our definitions for the above terms.

Marketing means activities related to market, sales and satisfaction of customer needs. A twofold, intertwined approach is a key to marketing:

1. On one hand, it is about a thorough and comprehensive study of the market, its demand, preferences and needs. The study is used to set up production based on these requirements and to steer manufacturing in terms of quantity, quality and delivery dates.

2. On the other hand, it is about an active influence on the market and demand and about shaping customer needs and preferences.

Marketing shall be viewed as a function − indeed a major functional subsystem − of a business management system (along with production management, logistics, financial management, personnel management, quality management, etc.).

Marketing as a crucial functional subsystem of business management aims at aligning company's capabilities and external requirements to ensure company's effective performance.

Main marketing functions include market research (demand, competition, consumers, prices, etc.), new product development and launch, service development, pricing, distribution management, marketing communications, sales, etc.

Nowadays marketing is becoming a key function in business management and may be considered the business foundation as it coordinates all activities related to goods and services, namely, R&D, manufacturing, financing, inventory management, etc. [2].

Marketing evolution has revolutionized business management (systems of operational management like MRP II, DRP, Just in Time, etc. were designed and implemented), logistics (delivery of materials and parts in small lots), stock reduction, distributed inventories, developments in the supply chain theory, etc.). Manufacturing has also experienced significant changes, e. g., the implementation of flexible computerized manufacturing systems (FCMS).

It is our opinion that market-driven management and marketing management are synonyms which came into the Russian language through translation.

Marketing Management means customer-focused management of a company. This is a major trend in the modern business management concept. It is driven by satisfying customer need when it comes to product, quantity, quality and delivery dates all the way down to a specific order level.

Management of Marketing means management of all company's marketing activities per se (essentially, management of marketing events).

We believe it is necessary to touch upon the definition of management as it has been discussed for many years. Management is a voluntary action of the management actor towards management subjects, processes and participants to set a certain direction and to achieve desired results.

Usually the maximum number of management steps identified is setting of objectives, organization, norm setting, planning, accountability, control, review, regulation and motivation. Many companies have long-term settings for such stages as objectives, organization and motivation. Norm setting is frequently included into planning. Therefore, only such management functions as planning, accountability, control, review and regulation are often considered. Frequently the stage of plan/performance monitoring is identified and includes accountability, control and review. Thus the minimum number of management steps is planning, monitoring and regulation.

Marketing objectives shall be SMART that is specific, measurable, agreed, realistic and time-bound.

We shall highlight that marketing objectives shall be focused at achieving company's overall objectives. That means maximized profit, enhanced sale markets, product release (launch), increased company's value, reduced costs, improved competitive edge, etc. [3].

It makes sense to tie up marketing-specific goals to the system of Key Performance Indicators (KPI) [4−6]. It will facilitate planning, performance monitoring and building of a personnel incentive system. It is important to ensure that achieving of set indicators meets marketing-specific and overall company objectives. Possible KPIs are detailed in Tab. 1.

Achieving of company's objectives shall be a result of objectives achieved by every department and each employee. Personnel Incentive System (remuneration, bonuses and nonfinancial incentives) shall steer every employee towards resolving priority tasks in attainment of company's objectives.

However, the following mistakes shall be avoided in development of company's incentive system: unachievable objectives; incoherent indicators as planned by different departments or by a department and its staff; unnecessarily complicated or multiple indicators (it is recommended to set 3 to 5 indicators for an employee and 7 to 8 indicators for a department head), no indicators for company/department/ employee development; lack of a simple method to calculate indicators, etc.

Table 1

Key Performance Indicators in Marketing Management

Indicator Group	Indicator
General Indicators (Strategic Level)	Market Share
	Share of Marketing Costs
	Brand Value
	Level of Product Distribution in the Market
Product Assessment Indicators	Index of Product Competitiveness
	Product Share in Sales
	Share of New Products
	Product Market Launch Time
	Share of Costs for Product Creation
Distribution Assessment Indicators	Share of Costs for Distribution Channels
	Number of Visitors to the Point of Sale
	Average Purchase
	Number of Customers
	Number of Purchases
	Awareness about the Point of Sale (Point of Purchase)
Customer Assessment Indicators	Share of Repeat Purchases
	Rate of Customer Retention
	Share of New Customers
Assessment Indicators for Relations	Number of Company's Partners
	Share of Company's New Partners
	Number of Point of Contacts with Customers
Assessment Indicators for Marketing Communications	Assessment of Unaided Awareness
	Assessment of Aided Awareness
	Number of Phone Calls
	Number of Web-Site Visits
	Number of Advertising Exposures

The incentive system for departments and employees (therein including marketing experts) shall be underpinned by links clear to and understood by employees between their planned indicators and remuneration (bonuses); bonus must be set for indicators that are in direct control of the employee; bonus shall be substantial.

Company's marketing starts with developing marketing organizational structure and distribution of marketing functions among marketing departments (employees). Traditionally marketing department is a part of the organizational chart. Marketing management structures can be function-based (marketing research, advertising, etc.), product-based (the structure matches product types and facilitates brand-management) or area-based (North-West, Siberia, Far East, etc.).

At many companies some marketing functions are performed by other company departments (market data collection and analysis, product development, promotion of R&D outcomes). Lately a number of papers have been published stating that a separate Marketing Department is not needed if marketing functions can be performed across other departments. This proposal requires further investigation.

A horizontal interaction between marketing and other company departments is a key operational issue. In terms of company's organizational chart, Marketing Department shall be directly reporting to company's manager to ensure its independence of other departments and an objective assessment of company's capabilities while developing its marketing policy. In daily operations Marketing Department shall interact with Chief Engineer, Chief Process Engineer, Planning and Economics, Finance, Sales, Product Development and Planning, Logistics, etc.

Currently, Russian companies practice different approaches to planning. For some companies Marketing Plans are just slightly wider than Sales Plans. For others Marketing Plan serves a basis for the integrated Company's Plan to achieve its mission. Unpredictable market conditions made companies pay more attention to planning. Nowadays some companies review and update their Marketing Plans several times a year.

Marketing Plan is an instrument to plan and to implement company's market activities. It provides for an ongoing accountability, control, review and regulation meant for a better adjustment of company's capabilities to market requirements. Judging by its objectives, Marketing Plan plays a coordination role in the Corporate Plan.

Marketing Plan Types based on classification attributes are given in Tab. 2.

Several principles can be advised in managing of marketing activities:

1. Integrated approach to management. Company's plan is a set of interrelated plans wherein a marketing plan is one of the plans.

2. A variety of company types, their objectives and goals, and products/services result in a variety of companies' approaches to marketing planning.

3. Multiple-option and situation-based planning.

4. Dynamic and continuous planning and planning updates that influence company's operations.

Planning must abide by the following principles:

1) Marketing Plan shall match market trends and laws. This principle ensures high adaptability to market changes and an option to diversify, restructure and innovate in market actions;

Table 2

Marketing Plan Types

Classification Attributes	Plan Types			
Planning Level	Strategic		Tactic	
Management Level	Corporate	Business	Functional	Operational
Formalization Degree	Formalized	Situational	Continuous	Nonformalized
Planning Horizon	Long-Term		Medium-Term	Short-Term
Managed Subject	Product	Market	Price	Promotion	Staff
Development Methods	Centralized		Decentralized	Mixed
User	Company's Internal Needs		Private Use	External Investors

2) Coordination with resources requires to agree space and time planning with the availability of internal and external resources;

3) Incentives;

4) Partnership principle provides for a maximal consideration of interests of all market plan stakeholders along with the culture of market interaction and corporate responsibility for marketing planning outcomes;

5) Control and coordination of marketing planning and implementation tactics.

The choice of marketing events is the least clearly detailed subject in domestic and foreign papers. Most managers make choices guided by marketing event costs and budget restrictions. We propose using methods of mathematical modeling in economics.

The Event Choice Model assumes that achieving a subgoal is required for attaining overall company's goals. Subgoals may require delivering several events some of which have more than one decision alternative (for more details see [3]).

Cost minimizing and KPI maximizing can serve an optimality criterion for the task (Tab. 1). Multi-criteria decisions are also possible [1, 7].

The general model can be described as follows:

− minimizing of spent resources

$$\sum_{s=1}^{S}\sum_{n=1}^{N}\sum_{m=1}^{M}X_{mn}g_{mns} \Rightarrow \min;$$

− maximizing of target values

$$\sum_{k=1}^{K}\sum_{n=1}^{N}\sum_{m=1}^{M}X_{mn}c_{mnk} \Rightarrow \max;$$

− multi-criteria model.

where X_{mn} is Boolean variable for the feasibility of m event in achieving n detailed goal; g_{mns} is a need for s resource type to deliver m event in achieving n detailed; c_{mnk} is an expected economic effect of k type having delivered m event for achieving n detailed goal.

The constraints are:

$$\sum_{m=1}^{M}X_{mn} = 1,$$

$$X_{mn} = \begin{cases}1, \\ 0\end{cases}, m=1,...,M; \ n=1,...,N,$$

where X_{mn} is Boolean variable for the feasibility of m event in achieving n detailed goal.

The constraint is valid if only one event is possible per one goal, i. e., alternative solutions are incompatible. Then the total number of events shall not exceed the number of detailed goals:

$$\sum_{n=1}^{N}\sum_{m=1}^{M}X_{mn} \leq N.$$

A lesser value is possible under limited resources or at achieving required target values in the marketing plan with the optimized model.

Resource constraints in the model are recorded separately for each s resource type:

$$\sum_{n=1}^{N}\sum_{m=1}^{M}X_{mn}g_{mns} \leq G_{s},$$

where g_{mns} is a need for s resource type to deliver m event in achieving n detailed goal; G_s is an available volume of s resource type.

Constraints which consider marketing plan target values (economic and social) are recorded separately for each effect as follows:

$$\sum_{n=1}^{N}\sum_{m=1}^{M}X_{mn}c_{mnk} \geq C_{k};$$

where c_{mnk} is an expected economic effect of k type having delivered m event for achieving n detailed goal; C_k is a target value of k type economic effect.

A condition that considers the incompatibility of two events:

$$x_i + x_j \leq 1.$$

A condition that considers a mandatory compatibility of two events:

$$x_i - x_j = 0.$$

Similarly, conditions for three or more events can be recorded.

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DUBOLAZOV, Victor A. − *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: info@kafedrapik.ru

ДУБОЛАЗОВ Виктор Андреевич − *заведующий кафедрой предпринимательства и коммерции Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, доктор экономических наук, профессор.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: info@kafedrapik.ru

SALKUTSAN, Sergey V. − *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: salkutsan@kafedrapik.ru

САЛКУЦАН Сергей Владимирович − *старший преподаватель кафедры предпринимательства и коммерции Инженерно-экономического института Санкт-Петербургского государственного политехнического университета.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: salkutsan@kafedrapik.ru

UDK 330.341.2

R.V. Okorokov, A.A. Timofeeva

PRINCIPLES AND METHODS OF INTELLECTUAL PROPERTY OBJECTS' COMMERCIALIZATION

Р.В. Окороков, А.А. Тимофеева

ПРИНЦИПЫ И МЕТОДЫ КОММЕРЦИАЛИЗАЦИИ ОБЪЕКТОВ ИНТЕЛЛЕКТУАЛЬНОЙ СОБСТВЕННОСТИ

It is shown that the formation of innovative economy in our country and increase of requirements to the quality and competitiveness of production of domestic enterprises stipulate the development of principles and methods of the process of intellectual property objects' commercialization and active implementation of the results of intellectual activity in economic operations.

INTELLECTUAL PROPERTY. INTELLECTUAL ASSETS. INTELLECTUAL CAPITAL. OBJECTS OF INTELLECTUAL PROPERTY. COMMERCIALIZATION OF OBJECTS OF INTELLECTUAL PROPERTY. INNOVATIVE ECONOMY.

Показано, что становление инновационной экономики в нашей стране и повышение требований к качеству и конкурентоспособности продукции отечественных предприятий обусловливают разработку принципов и методов процесса коммерциализации объектов интеллектуальной собственности и активное внедрение результатов интеллектуальной деятельности в практику хозяйствования.

ИНТЕЛЛЕКТУАЛЬНАЯ СОБСТВЕННОСТЬ. ИНТЕЛЛЕКТУАЛЬНЫЕ АКТИВЫ. ИНТЕЛЛЕКТУАЛЬНЫЙ КАПИТАЛ. ОБЪЕКТЫ ИНТЕЛЛЕКТУАЛЬНОЙ СОБСТВЕННОСТИ. КОММЕРЦИАЛИЗАЦИЯ ОБЪЕКТОВ ИНТЕЛЛЕКТУАЛЬНОЙ СОБСТВЕННОСТИ. ИННОВАЦИОННАЯ ЭКОНОМИКА.

As a result of innovative activity of enterprises the new ideas, information and knowledge, new advanced products, new production and management technologies are born leading to increase of productivity of social activities. These innovations can have concrete material and immaterial forms intending for commercial and non-commercial realization.

For protection of innovations their founders get on them the copyright in the form of rules, norms and regulating acts owing to such legal concept as «Intellectual Property». According to materials of the Convention that has founded the World Intellectual Property Organization (WIPO) in 1967 with the Russian Federation as a member, the intellectual property (IP) is understood as the conditional (virtual) collective term including the rights relating to results of the intellectual activity in production, scientific, literary and art spheres [1].

According to modern views, IP is the right of some persons (owners) established by legal laws on the results of intellectual activity of the same or other persons [2].

IP, unlike other types of property, has the following specific features:

− its object is the creations of human reason, his intelligence, and the subject − the information and new knowledge as its intrinsic form presented on the material carrier in some form;

− it possesses a sign of priority and can be deposited;

− concerning IP the rights of the owner (the non-property rights) and the exclusive copyright (rights to use) can be allocated;

− some specific restrictions (duration of action of the copyright and patents in time) extend on it.

The results of intellectual activity to which the legal protection is provided become the

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objects of intellectual property. The protection of the objects of copyright and the adjacent rights comes from the moment of their creation, and the objects of industrial property − from the moment of their registration and obtaining the security document [2].

The Objects of Intellectual Property (OIP) carry out the following main functions in the course of their use [3]:

− saturation of the goods made on their basis by the special consumer characteristics;

− maintenance the competitive advantage of an enterprise in the market;

− monopolizations of the effective creative decisions used in business;

− excess profit obtaining by means of monopolization of the new ideas and knowledge of business;

− business socialization by the possibility of solution of the society social problems or its separate groups;

− formation of the special creative culture of the personnel of enterprises;

− rise of the national wealth of countries by realization of the specified functions.

The need of estimation of the cost of OIP is defined by the essential growth of their specific weight as a part of assets of the enterprises in the conditions of new technological way of information (innovative) economy.

The object of an assessment of IP is the set of the rights to its elements having territorial, temporary and valid character not violating the rights of the third parties.

The subject of an assessment of IP is the direct result of creative activity of the person such as scientific and technical achievements in the form of production and administrative technologies, design elaborations, business and production secrets, professional knowledge and experience.

In other words, the assessment of OIP is a process of determination of the potential cost of volume of the rights to concrete results of the intellectual activity possession of which provides to the owner the certain benefits of direct and indirect economic character [3].

The purposes of an assessment of OIP are as follows [3]:

− purchase/sale of the rights on the objects of intellectual property;

− compulsory licensing and damage assessment from the violation of the rights of the owner of the object of intellectual property;

− introduction of the objects of intellectual property as a contribution to the authorized capital;

− definition of a share of intellectual property in investments;

− purchase/sale of the enterprise, enterprise restructuring;

− revaluation of intangible assets of the enterprise;

− minimization of the taxes paid by the enterprise;

− crediting on the security;

− insurance of the intellectual property; donation and inheritance of the rights on the objects of intellectual property.

The assessment of IP is made according to the international standards of the property assessment and standards of the Russian society of appraisers.

According to the «Methodical recommendations on determination of the market cost of intellectual property» (Section 2), the basic principles of determination of its cost are as follows [4]: principle of usefulness; principle of demand and supply; principle of replacement; principle of expectation; principle of change; principle of external influence; principle of the most effective use; principle of uniqueness of an object; risks of development; other factors.

Many factors have impact on the market cost of IP of the enterprises including the reliability of legal protection, the patent purity, the technical and economic importance and industrial readiness of object; the expenses on creation and patenting (registration) of the object of industrial property; the expenses on maintenance of the security documents in force; the expenses on utilization of object; the expenses on insurance of the risks connected with an object; the expenses on resolution of conflicts on estimated object; the expenses connected with a need of payment of taxes and fees; the expected receipts of royalties on this object of industrial property; the expected receipts in the form of compensation (penal) payments at confirmation of the fact of violation of exclusive rights of the owner of object of industrial property; the period of validity of the security document (the patent, the certificate) at the time of its cost assessment or period of validity of the license contract; period of use of an object; the average rates of a royalty for this type of objects of legal protection.

The procedure of an assessment of IP includes some stages as follows [5]:

1) OIP examination;

2) examination of the security documents;

3) examination of the intellectual property rights;

4) carrying out the estimated calculations: the choice of assessment methods; the collection and analysis of information necessary for object assessment; the cost calculation for the chosen methods; the coordination of the calculations received by various methods; writing of the assessment report.

The distinctive feature of OIP is their suitability for the consumption and use (for satisfaction of production, household and cultural people's requirements, education, commercial activity, etc.), so they possess a certain consumer cost. Under market conditions, with the demand and possibility of realization, it also has the market price.

The results of intellectual activity can be for sale or used as a contribution to the authorized capital, etc. providing to the owner the possibility of commercial benefit.

However for IP market formation the objective cost assessment of the enterprise's OIP or the product use rights is necessary for the purpose of the effective realization of results of intellectual activity.

At the same time, the considerable part of enterprise's OIP is not considered or not estimated completely now (for example, the intellectual and business personnel qualities — educational and professional level, creativity, etc.). There are no approved and practical particular techniques of an assessment of the specific OIP types.

The sphere of an assessment of the intellectual capital (OIP are part of it) is insufficiently studied. However in the modern economy based on knowledge and innovations where the intellectual property, intangible assets and the intellectual capital become the new competitive dominants, their market assessment is the extremely essential.

Not only the assessment of IP market cost and the commercialization of exclusive rights, but also all aspects of derivation of IP use benefits are of great importance by involvement of the intellectual assets or IP in commercial and economic circulation.

The problems listed above cause the necessity of specification of the essence and features of the considered concepts.

First of all, it is necessary to emphasize that such concepts as «Intellectual Capital», «Intellectual Assets», «Intellectual Property» are incorporated, i. e., one concept is a component of another.

According to the International Financial Reporting Standards (IFRS), the resources controlled by the organization as a result of last period events from which it expects economic benefits in the future, represent the organization assets.

More than 100 terms characterizing the asset separate types are in use in the economic theory and practice connected with the assets [3].

The three main asset types are detached — material, non-material and financial assets.

The intangible assets are understood as the property of the organization that doesn't have a material form, but taking part in economic activity and generating profit. The exclusive rights to using patents, licenses, trademarks, know-how, etc. are of great importance as a form of intangible assets.

The intellectual capital that is identified, fixed and available inside the enterprise, represents the intellectual assets.

The intellectual capital includes all the knowledge of the enterprise [6]: knowledge and skills of employees; processes, ideas, R&D, projects, inventions, used technologies, software, doing business methods; infrastructure providing use, transfer and storage of all above-mentioned.

The approximate structure of the intellectual capital and types of enterprise's intellectual assets are presented in the Tab. 1.

Table 1

Structure of the enterprise's intellectual capital [5]

Capital structure	Intellectual asset types
Human capital	Educational and professional level of workers, skills, competences, ability to innovations, know-how and experience, ability to team work, motivation, training ability, loyalty, professional certification (recognition, initiative), psychological compatibility, etc.
Organizational (structural) capital	Philosophy and management concepts, administrative processes, organizational and financial structures, information system, organizational culture, decision-making systems; objects of intellectual property; patents, trademarks, service marks, copyright, other exclusive rights, etc.
Client (relational) capital	Loyalty of consumers, list of orders, communications and contacts, agreements, brands, ratings, suppliers, distribution channels, business partnership, alliances and cooperation, license agreements, franchise agreements, administrative resource, etc.

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Dozens of methods and models of the market cost assessment of the intellectual capital at the enterprise level are developed nowadays.

The essence and the comparative analysis some of these methods and models are described in detail in [7].

Each of the analyzed methods and models, as can be seen from the Tab. 2, has certain advantages and disadvantages that must be taken into account in the assessment of intellectual capital.

The OIP commercialization is understood as a process of involvement of the results of intellectual activity into economic circulation with the purpose to earn income.

The efficiency of this process comes on to the market. It depends on many factors, first of all, as far as the nature of demand for a specific result of intellectual activity will be considered and the market demand for such result will be revealed by the statement and implementation of the objectives of commercialization.

The main principles of IP commercialization should be considered as follows [6]:
− client-oriented approach;
− comprehensiveness;
− flexibility and adaptability;
− concentration of the efforts and resources;
− program-target approach;
− orientation towards the practical result (growth of the newly added value).

The analysis of the existing methodological approaches to IP commercialization shows that this process should be carried out step by step.

Table 2

Comparative analysis of the intellectual capital assessment methods [7]

Title	Main advantages	Main shortcomings
Market-to-Book Ratio and Tobin's Q	Simplicity; Reliable initial data; Convenience of use in panel studies	The majority of external factors is neglected; Conceptual contradictions; Need for developed financial market
Technology Broker	Instrumental-practical orientation; Empirical testing	Controversial move to quantitative results; Considerable degree of subjectivity of procedure
Scandia Navigator	First taxonomy of the intellectual capital; Inclusion of the clients capital in model; Fundamental latitude	Internal contradiction of a number of indicators; Dependence of indicators; Complexity of model
EVA Model	Simplicity of methodical principles	Aggregate assessment of the intellectual capital; Negative empirical results
Intangible Asset Monitor	Strategic orientation; Empirical testing	Subjectivity of the choice of indicators; Considerable linking to the organizational culture
Knowledge Capital Earnings	Empirical support; Similarity to the traditional method of goodwill assessment	Fundamental weakness of the main assumptions; Subjectivity of a significant number of initial data
Value Chain Scoreboard	Accounting of the stages of innovative cycle; Unique non-financial indicators	Conceptual essence of the model; Lack of empirical support
Value Added Intellectual Coefficient	Standardized evaluation of the efficiency of intellectual capital; Reliable initial data	Conflicting empirical results; Weakness of the structural capital assessment
Citation-Weighted Patents	Vast empirical support	Only one aspect of the intellectual capital is evaluated
Value Explorer Method	Strategic orientation; Instrumental methodology	Subjective transition from qualitative assessments to quantitative indicators; Insufficiently developed diagnostic part
Real Options Model	Nonlinear model; Accounting of the strategic flexibility of intellectual capital	Complex mathematical technique; Lack of the developed methodology for the intellectual capital assessment

At the first stage the analysis of internal and external environment is carried out; the development of strategy of IP commercialization; marketing, patent research; building plans for commercialization; search of partners and investors, suppliers and consumers of the intellectual product.

The important role belongs to the subsequent stage – the dynamic assessment of commercial potential of the results of intellectual activity. The following important stages are the choice of a basic form of an economic circulation and settlement of the property relations with the results of intellectual activity.

The implementation of the subsequent stage – the intellectual capital assessment and all its components – predetermines the further steps on commercialization.

The final stage consists of the recommendation development and strategy correction of IP commercialization.

With the OIP commercialization the acquisition of income should be taken into account both from their internal and external use [7].

The external use of OIP (intellectual assets) requires the involvement such forms as the contribution of intellectual assets to the authorized capital of other enterprises, franchising of intellectual assets, leasing of intellectual assets, the transfer of rights to the intellectual assets of the licensing contracts, the sale of intellectual assets.

The internal use of OIP involves their participation in the internal business processes of the enterprise with reception of the income in the form of indirect result of increase of business efficiency as a whole.

To a large extent the success of OIP commercialization depends also on the formation of an effective legal system of their protection and use (system of specialized laws of the Russian Federation, legal acts of the international law, etc.)

The most important element of the system of legal protection of OIP is the patent law which regulates property, as well as the related non-property relations arising in connection with creation of objects of patent rights (inventions, useful models, industrial samples, etc.).

The patent, not being the object of IP, provides the formal protection document certifying the priority of an invention or other object, the authorship on it and the exclusive rights to use the object during its validity period (for example, for a patent for an invention in 20 years, for an industrial design – 10 years) [6].

Thus, the formation of market economy in the Russian Federation and increase of requirements to the quality and competitiveness of production of the industrial enterprises cause the necessity of development of the principles, methods and instruments of the process of commercialization of the objects of intellectual property and active OIP introduction in practice of business activity.

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OKOROKOV, Roman V. — *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: roman_okorokov@mail.ru

ОКОРОКОВ Роман Васильевич — *профессор кафедры международных экономических отношений Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, доктор экономических наук.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: roman_okorokov@mail.ru

TIMOFEEVA, Anna A. — *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: anna_ti@mail.ru

ТИМОФЕЕВА Анна Анатольевна — *доцент кафедры международных экономических отношений Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, кандидат экономических наук.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: anna_ti@mail.ru

UDK 338.001.36

E.A. Jakovleva

ECONOMIC MARGIN MODELS AS BASIC METHODS OF THE ECONOMIC EFFICIENCY OF RUSSIAN COMPANIES[2]

Е.А. Яковлева

ПРИМЕНЕНИЕ МОДЕЛИ ЭКОНОМИЧЕСКОЙ МАРЖИ ДЛЯ АНАЛИЗА ЭКОНОМИЧЕСКОЙ ЭФФЕКТИВНОСТИ ДЕЯТЕЛЬНОСТИ РОССИЙСКОЙ КОМПАНИИ[3]

The greatest goal of management is to use assets of a company most efficiently and to increase its market value (capitalization, profits) through the introduction of controlling mechanisms which help the company adapt itself to the changes of external environment, ensure the company's economic growth, lead to successful application of advanced technologies, and result both in the increased quality of products and crucial competitive advantages.

ECONOMIC EFFICIENCY. VALUE BASED METHOD (VBM). COMPANY'S ASSETS. ECONOMIC ADDED VALUE. PROFITABILITY.

Раскрыта основная цель управления активами предприятия — это увеличение рыночной стоимости предприятия (прирост экономической прибыли и капитализации) на основе внедрения механизма управления стоимостью.

ЭКОНОМИЧЕСКАЯ ЭФФЕКТИВНОСТЬ. СТОИМОСТНОЙ ПОДХОД. АКТИВЫ КОМПАНИИ. ЭКОНОМИЧЕСКАЯ ДОБАВЛЕННАЯ СТОИМОСТЬ. РЕНТАБЕЛЬНОСТЬ

1. Introduction

The suggested approach is based on the major principle of the market value of a company: transformation of operating results into financial ones. The object of the study is efficient management of a company's assets. Our goal is to define approaches and ways which affect a company's market value and factors which has to be taken into account, namely, to define the value based method (VBM) principle model and its elements; to define methods for analyzing economic efficiency of a company; to give an example to discuss.

EVA® is a modified version of residual income or economic profit, where the modifications consist of accounting adjustments designed to convert accounting income and accounting capital to economic income and economic capital. Many authors (e.g. Stewart (1991); Young and O'Bryne (2001); Stephens and Bartunek, 1997; Milunovich and Tsuei, 1996; Jackson, 1996; Mayfield, 1997; O'Bryne, 1996; Biddle, Bowen, and Wallace, 1997 and 1999; Martin and Petty, 2000; Feltham et al., 2004; D.J. Obrycki, R. Resendes 2000. Holler, 2009) described EVA® to prove a company's value. EVA® is estimated by major firms, e.g. Goldman Sachs, First Boston, and Stern Stewart (Weaver, 2003), Delloitte to name just a few.

2. Economic efficiency and management of company's available assets

Economic efficiency of a company's asset management is determined by many factors. However, an innovation company introduces changes in approaches and methods which are used to evaluate efficiency, puts forward specific requirements, and defines the parameters not reflected in traditional approaches. So, the market value of a company is part of the overall

assessment of economic efficiency, distinctive and determining factor which leads to the development of innovation process and changes dramatically all internal and external conditions. The analysis of the asset value is based on the principles and approaches of the economic cost-benefit analysis. It includes models and criteria for investment analysis, analysis of a company's present value (discounted cash flows), and uncertainty and risks analysis (methods of mathematical economics, economic theory of options concept of margin). There are restrictions on the practical application of the VBM concept for the adapted management methodology and mechanisms to form market value of a company available for a company management in the process of innovative activities and environmental uncertainty. In order to manage the market value of enterprises, it is necessary to identify new methods and criteria for assessing the efficiency of asset allocation (for example, the economic value added (EVA), the discounted cash flows model (DCF)). Tab. 1 provides a comparative analysis of the two main approaches to VBM.

Table 1

Comparison of evaluation methods: DCF model and EVA

Collation	EVA	DCF
Cash flow	Only part of future cash flows «added» to a company's market value	Overall cash flow projections within a long period of time
To identify the current market value of a company and to monitor its change	Close links between current and long-term indicators	Evaluation is made at any time given, but monitoring is not
To view all previously generated assets	All the invested assets are taken into account	Past activities are not considered

As you can see in Tab. 1, the DCF method ignores information concerning existing assets and a significant amount of cash flows which are not included in projections and is reflected as the so-called extended value (according to the principle of residual income). The EVA method is less susceptible to this effect because it is based on the assessment of real investment, economic profits, and cost of capital. These are just part of cash flows, which increases future economic benefits. The key feature of the method is a combination of new requirements for EVA evaluation and standard financial reporting which needs correction of the corresponding figures in accounting reports, including capital, to reflect the typical character, repeatable operations and to avoid speculative effects.

Tab. 2 shows that according to the EVA model investing in innovation to create the additional market value of the enterprises within a specified period shall be the ratio ROI > WACC (where ROI-return on invested capital), which is a measure of performance. Similar terms IRR > WACC (or NPV > 0) must be observed for DCF.

3. Models of optimal control over investments in company assets

3.1. *Main components of a company's market value, their relationship*

One of the most important theoretical problems is to develop models of the company's value management. The approaches which exist, in fact, are not «managerial» because they do not define ways to influence the value of a business and do not indicate the factors which should be used to increase it. A commercial appraisal of a company's value is based on retrospective indicators and profiles used for projections. However, there is no accumulated statistics in innovation process. That is because all the parameters related to the market, business,

Table 2

Criteria to evaluate the efficiency of a company's market value management

Methods	Creating value	Stabilizing value (equilibrium)	Damaging (lost) value
DCF	IRR > WACC, MIRR > WACC, ROI > WACC	IRR = WACC, MIRR = WACC, ROI = WACC	IRR < WACC, MIRR < WACC, ROI < WACC
EVA	EVA > 0, CFROI > k_m	EVA = 0, CFROI = k_m	EVA < 0, CFROI < k_m

technology, management, product life-cycles are new and have both unknown characteristics and unknown impact of their implementation, in addition to the so-called «multiplicative» effects on innovation. The effectiveness of innovative solutions is confirmed only when the effect is multiplicative in nature. This is because the innovation cycle is of long duration (up to 55 years). Therefore, current (discounted) value of future economic benefits will be slow and insufficient to demonstrate the commercial viability of investments in innovative projects. Moreover, the parameters of innovation development and multiplicative effects are probabilistic in nature, i. e. increased market value of assets is a mathematical expectation. Consequently, it must be seen as a random process and appropriate management methods should be used (economic margin, optional approach). Key principles of the factors contributing to a company's market value, which provides increased economic value, are as follows: appropriate right goals, i. e. corporate strategy aimed at maximizing the value for each level of management; differentiation of corporate strategy which is used to identify features differentiating a company from its industry competitors so that additional value will be created; allocation of resources through optimized financial flows to create additional value; compromise between shareholders and consumers, i. e. search for new opportunities which would increase the financial result not only for shareholders, but which would also create value for their customers.

3.2. *The ways of optimizing the invested capital of a company*

The indicator of economic value added (EVA®) [8] is used as a performance indicator of a company engaged in innovation so as to measure its value, which can be defined by the following formula:

$$EVA = IC(ROI - WACC), \qquad (1)$$

where IC − invested capital; ROI − return on invested capital; WACC − weighted average cost of capital.

A more profound analysis of the EVA measure can be used to explain the regularities of the economic value formation and factors affecting this indicator. In terms of the economic theory, return on invested capital has the property of marginal revenue: $ROI(IC) = -\dfrac{dY(IC)}{dIC}$, where $Y(IC)$ − income derived from invested capital.

Given this assumption, the formula for EVA in each period of time can be transformed into an expression:

$$EVA(IC) = IC(ROI(IC) - WACC).$$

This approach allows optimizing the value of a company engaged in innovation, considering the corresponding optimization model:

$$EVA(IC) \to \max. \qquad (2)$$

The optimal value of the invested capital is determined by the condition $\dfrac{dEVA(IC)}{dIC} = 0$, which, after algebraic manipulations, becomes:

$$ROI(IC)\left(\frac{dROI(IC)}{dIC}\frac{IC}{ROI(IC)} + 1\right) = WACC. \quad (*)$$

From the above formula, the terms of optimization can be determined by the value of the invested capital that achieves maximum value EVA(IC). It is achieved when the condition remains maximum:

$$\frac{d^2EVA(IC)}{dIC^2} = \left[\left(\frac{dROI(IC)}{dIC}\right)^2 + \right.$$
$$\left. + ROI(IC)\frac{d^2ROI(IC)}{dIC^2} + \frac{dROI(IC)}{dIC}\right] < 0. \quad (**)(3)$$

It has a negative value. The optimality condition takes the form: ROI(IC)(E(IC) + 1) = = WACC. So, the above analysis lets us conclude as follows. In case the capital investment is made by an operating company, return, obviously, must be greater than the average cost to raise capital, which is to be satisfied $\dfrac{WACC}{ROI(IC)} \le 1$. Based on the optimality conditions, this provision can only be achieved in case the negative character on the coefficient of elasticity E (IC) in absolute value is less than unit, i. e. in the inelastic range of the marginal return on investment that meets the conditions of a perfect competitive market where the marginal return on investment tends to have

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a fixed value. We can write a principled optimization model. For a fixed elasticity and a certain value of invested capital, ROI and WACC of its involvement are inversely related, so that an increase (decrease) in one of the variables will require an increase (decrease) in the other. With increased investment capital, the cost of capital is committed to the market interest rate. This result is quite understandable since represents the profit earned as a function of invested capital, as well as the assumption of diminishing marginal returns on investment, according to neo-classical concepts.

In reality, a company usually has more than one investment project (investment program). In this case, the optimal investment program for any number of projects (the case of two projects) should meet the following requirements:

$$\mathrm{ROI}_1(\mathrm{IC}_1)w_1 + \mathrm{ROI}_2(\mathrm{IC}_2)w_2 \to \max. \quad (4)$$

Provided $\mathrm{IC}_1 + \mathrm{IC}_2 = \mathrm{IC}$. If we consider that $w_1 = \dfrac{\mathrm{IC}_1}{\mathrm{IC}}, w_2 = \dfrac{\mathrm{IC}_2}{\mathrm{IC}}$, we obtain with the same restriction $\mathrm{ROI}_1(\mathrm{IC}_1)\mathrm{IC}_1 + \mathrm{ROI}_2(\mathrm{IC}_2)\mathrm{IC}_2 \to \max$.

Solving the problem of the Lagrange method, we obtain:

$$\begin{aligned} L = &\mathrm{ROI}_1(\mathrm{IC}_1)\mathrm{IC}_1 + \mathrm{ROI}_2(\mathrm{IC}_2)\mathrm{IC}_2 + \\ &+ \lambda(\mathrm{IC} - \mathrm{IC}_1 - \mathrm{IC}_2) \to \max. \end{aligned} \quad (5)$$

There is a condition for optimization after transformations:

$$\begin{aligned} \mathrm{ROI}_1(\mathrm{IC}_1)&\left(\frac{\partial \mathrm{ROI}_1(\mathrm{IC}_1)}{\partial \mathrm{IC}_1}\frac{\mathrm{IC}_1}{\mathrm{ROI}_1(\mathrm{IC}_1)}+1\right) = \\ = \mathrm{ROI}_2(\mathrm{IC}_2)&\left(\frac{\partial \mathrm{ROI}_2(\mathrm{IC}_2)}{\partial \mathrm{IC}_2}\frac{\mathrm{IC}_2}{\mathrm{ROI}_2(\mathrm{IC}_2)}+1\right). \end{aligned} \quad (6)$$

Or, considering that the first terms in the right and left brackets of the equation are the elasticity of the marginal return on the invested capital value:

$$\begin{aligned} \mathrm{ROI}_1(\mathrm{IC}_1)&(E(\mathrm{IC}_1)+1) = \\ = \mathrm{ROI}_2(\mathrm{IC}_2)&(E(\mathrm{IC}_2)+1) = \lambda. \end{aligned} \quad (7)$$

If we interpret the argument as a possible cost of capital (or required return on investment), then in a perfect market $E(\mathrm{IC}_1) = E(\mathrm{IC}_2) = 0$ and the optimal investment program should include only those projects which yield equal opportunity costs of capital. However, real market elasticity of marginal return on invested capital is not necessarily zero and compensates, to some extent, for a project with lower returns.

3.3. *Use of economic value added (EVA) for capital optimization*

The principle capital optimization model, according to economic value added, is the following:

$$\begin{cases} \mathrm{ROI}_1(\mathrm{IC}_1)\mathrm{IC}_1 + \mathrm{ROI}_2(\mathrm{IC}_2)\mathrm{IC}_2 \to \max \\ \mathrm{EVA}(\mathrm{IC}) = \mathrm{IC}(\mathrm{ROI} - \mathrm{WACC}) \\ w_1 = \dfrac{\mathrm{IC}_1}{\mathrm{IC}}, \ w_2 = \dfrac{\mathrm{IC}_2}{\mathrm{IC}}, \ \mathrm{IC}_1 + \mathrm{IC}_2 = \mathrm{IC} \\ E(\mathrm{IC}) = \dfrac{d\mathrm{ROI}(\mathrm{IC})}{d\mathrm{IC}}, \ \dfrac{d\mathrm{EVA}(\mathrm{IC})}{d\mathrm{IC}} = 0 \\ \mathrm{or} \ \dfrac{\mathrm{WACC}}{\mathrm{ROI}(\mathrm{IC})} \le 1. \end{cases} \quad (8)$$

where $Y(\mathrm{IC})$ — income from invested capital; $E(\mathrm{IC})$ — coefficient of elasticity.

The model (8) is used for choosing an innovative program. Expression in the formula (8) uses Lagrange method. Optimization condition is seen in formulas (6) and (7), where λ is the opportunity cost of capital (the required return on investment). The criterion of investment in a company's innovation program will increase (decrease) the company's market value:

$$\Delta V_m - \mathrm{PVI}_m =$$

$$\frac{p_m \sum_{i=1}^{N}\left(P_i X_i\left(1 - \dfrac{1}{k_{im}}\right)\right)}{\mathrm{WACC}(1 + \mathrm{WACC})^{T_m - 1}} - \mathrm{PVI}_m > 0, \quad (9)$$

where ΔV_m is gains of the company through m-alternative development increase (decrease) the company's market value; PVI_m — present value of investment in the company's innovation program according to m-alternative development; pm-probability of successful completion of an innovative program according to m-alternative development; P_i, X_i — price and volume i — the kind of productive resource to busy production; $k_i = q_{i1} / q_{i0}$ efficiency gains from the sale of

m-the company's innovation program on the level of effectiveness of i-type of productive resource; q_i − evel of effectiveness of i-the type of resource, $i = 1$ ч N; T_m − time implementation of m-technology in the production system; WACC − weighted average cost of capital.

3.4. *Using economic margin (EM) for capital optimization*

The economic margin [6] is based on the principle of economic profit, expressed in terms of cash flow. The method combines the advantages of EVA and CFROI (return on investment based on cash flow) and takes into account cost of capital, inflation, amendments to life cycle stages, presence of balance-sheet accounts. EM is a value indicator of those businesses whose value is above or below the price of the stock market.

EM is based on four factors (economic profit, competition, growth, cost of capital). EM models the effect of competition on the gradual loss of excess profits (in contrast to the principle of residual income). Unlike the EVA, EM takes into account the depreciation and includes the cost of capital invested in the capital expenditure. Unlike in the case of CFROI, only equity financing is

taken into account (the cost of borrowing to calculate economic feasibility is not considered). However, the EM method is based on the total amount of the asset. Condition assessment of economic effectiveness is $\Delta \text{EM} > 0$.

$$\text{EM} = \frac{\text{OCF} - \text{CC}}{\text{GIC}};$$

$$\text{OCF} = \text{NI} + \text{Am} + \text{ATIntEx} + \text{REx} +$$
$$+ \text{RDEx} \pm n \text{Re c};$$

$$\text{CC} = f(r_e, \text{ROE, CAMP});$$

$$\text{GIC} = \text{TA} +^{Acc} \text{Am} +$$
$$+ Infl +^{Cap} \text{REx} +^{Cap} \text{RDEx} - n\text{DebtCL},$$

(10)

where EM − economic margin in %; OCF − operational cash flow, CC-impact at capital; GIC − gross invested capital; NI − net income; ^{Acc}Am and Am − is the accumulated annual amortization and depreciation; RDEx and ^{Cap}RDEx annual and cumulative development expenses and R&D; REx and ^{Cap}REx − annual and cumulative rental payments; ATIntEx = $(1 − T)$Int − costs of interest after tax; n Re c − change of off-balance sheet accounts; Infl − adjustment for inflation; nDebtCL − payables.

Definition of investment efficiency in the assets of two projects

Indicators	m_0	m_1	m_2	Total ($m_0 + m_1 + m_2$)
NOPAT, million dollars.	7 433	15 669	13 093	36 195
IC, m.d.	73 541	93 371	92 081	258 993
Gross cash flow (GCF), m.d.	6 486	26 576	30 306	63 368
Salvage value (SV), m.d.	1 856	3 136	3 676	8 668
Gross Invested Capital (incl. inflation)(GIC), m.d.	4 672	86 760	67 116	158 548
Operating cash flow (OCF), m.d.	891	28 751	29 229	58 871
WACC, %.	10.12	10.12	10.12	10.12
ROI, %	10.11	16.78	14.22	13.98
EVA = NOPAT − WACC · IC, m. d.	−9.3	6 220.2	3 774.4	9 985.3
EVA = (ROIC − WACC) · IC, m.d.	−9.3	6 220.2	3 774.4	9 985.3
$\text{CFROI} = \dfrac{\text{GCF} + \text{SV}}{\text{GIC}}$, in %	1.786	0.342	0.506	0.454
Economic Margin (EM = (OCF − WACC · GIC) / GIC), %	8.94	23.02	33.43	27.01
$\dfrac{\text{WACC}}{\text{ROI}} \leq 1$	1.001	0.603	0.712	0.724
$E(\text{IC}) = \dfrac{d\text{ROI}}{d\text{IC}}$		0.603	0.544	0.393

As you may see (Tab. 3), the base state of a company (m_0) is characterized by negative economic added value. The company considers choosing two innovative projects (m_1 and m_2). It is important to emphasize that the elasticity coefficient of 0.393 shows how much profit is brought by additional investment in the company. Please, note that elasticity decreases.

4. Conclusion

Today, it is not quite correct to see risk only as a negative factor in asset management. Since risk can be considered as a possible additional competitive advantage, it is directly linked to the concept of real option in practice. Assessment and management of the added value is getting more and more importance. To optimize asset management of a company at the time of investing, one has to create conditions which help to increase the company's value, and include the following activities:

1. Improved operating activities due to the production factors, intangible assets, new technologies, innovation as a whole.

2. Choice of investments with ROI higher than costs to attract the capital required for their implementation.

3. Improved asset management, e. g. through selling or eliminating non-core, secondary, unprofitable assets, decreased periods of accounts receivable turnover, stocks (so-called «disinvestment»); management of institutional factors of development.

4. Improved management of the capital structure.

Methods and models which can simulate risks, uncertainties, respond to a changed external environment and internal factors over time have the priority significance in the effective asset management. Thus, the authors have identified the following benefits of VBM according to the principle of value maximization towards the problem of a company's asset management:

− improved development strategy of a company and its subsidiaries on the basis of the principle of consistent maximizing of the company's market value to achieve common objectives at all levels of management;

− substantial improvement of the quality and effectiveness of managerial decisions based on clear priorities in management, optimal combination of long-term and short-term objectives, provision of flexibility when implementing innovative programs;

− improvement of corporate transparency, promotion of innovations and their success, creation of conditions for sustainability of a company while assets are restructured (mergers, acquisitions) and prevention of hostile takeover and undervaluation of shares.

The authors find it necessary to point out flaws in the concept of value. Firstly, it is underestimation of negative factors, which contributes to the destruction of a company's market value (excessive diversification, poor distribution of resources, underestimation of risk). Secondly, it is the lack of information on the relationship between the parameters and methods of economic efficiency evaluation for Russian companies, which delays the development of this approach in Russia. Thirdly, these are institutional issues (diversity of terminology in the financial reports (NOPAT or EBIT ($1 - T$), FCF, OCF, FCFE etc.).

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YAKOVLEVA, Elena A. — *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: helen812@pochta.ru

ЯКОВЛЕВА Елена Анатольевна — *профессор кафедры финансов и денежного обращения Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, доктор экономических наук, профессор.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: helen812@pochta.ru

UDK 658

A.V. Babkin

METHODS OF EVALUATING THE ECONOMIC POTENTIAL OF THE INDUSTRIAL ENTERPRISE*

А.В. Бабкин

МЕТОДЫ ОЦЕНКИ ЭКОНОМИЧЕСКОГО ПОТЕНЦИАЛА ПРОМЫШЛЕННОГО ПРЕДПРИЯТИЯ**

In article the contents and economic essence of the concept "economic potential" in relation to the industrial enterprise is considered. The analysis of methods of an assessment of economic capacity of the industrial enterprise on the basis of which classification of used methods is executed is carried out. The developed classification and the executed characteristic of methods will allow the researcher to carry out a reasonable choice of methods of an assessment of economic capacity of the enterprise depending on features of a solved task and influencing external and internal factors.

METHODS. ECONOMIC POTENTIAL. INDUSTRIAL ENTERPRISE.

Рассмотрены содержание и экономическая сущность понятия «экономический потенциал» применительно к промышленному предприятию. Проведен анализ методов оценки экономического потенциала промышленного предприятия, на основе которого выполнена классификация используемых методов. Разработанная классификация и выполненная характеристика методов позволят исследователю осуществить обоснованный выбор методов оценки экономического потенциала предприятия в зависимости от особенностей решаемой задачи и воздействующих внешний и внутренних факторов.

МЕТОДЫ. ЭКОНОМИЧЕСКИЙ ПОТЕНЦИАЛ. ПРОМЫШЛЕННОЕ ПРЕДПРИЯТИЕ.

Introduction. In the conditions of modern economy the enterprises need to estimate, develop and maintain their competitive advantages. Only the competitive enterprise can survive in the modern market. Stable development of the enterprise in the future depends on its ability to analyze, predict, quickly and adequately to react to changing environmental conditions, to keep and gain new competitive advantages in fight in the markets.

Now the deep analysis and an extensive discussion of the questions connected with economic development, interaction of the innovative and competitive relations will be, certainly, useful to adoption of strategic decisions at level of branches, and also enterprises.

The sphere of innovative activity remains one of the key spheres in the Russian economy since knowledge of the innovative mechanism, its levers, the incentives, carrying-out channels, has overwhelming value for development of market processes. It is very important to penetrate into essence and specifics of the innovative processes proceeding on laws of the market, and to use in economic policy competitive incentives for innovative development of the separate enterprises.

Transition of the industrial enterprises to innovative development demands development and improvement of the corresponding methods of management. The assessment of its economic potential can become one of the directions of improvement of activity of the enterprise. For the correct assessment of the current situation and search of competitive advantages the industrial enterprise needs to analyze available economic potential and to reveal reserves of increase of efficiency of its use. The quantitative assessment of its components is necessary for an objective assessment of economic potential. However many methodical issues of this important problem aren't resolved yet. For example, so far there is no consensus on essence and the maintenance of economic potential, criteria and indicators of an

assessment of economic potential aren't proved, the main requirements for system of estimated indicators aren't developed, there is no scientific and reasonable classification of the factors determining the economic potential.

The knowledge of level of economic capacity of the enterprise will allow the management to understand, what role from the point of view of innovations is played by the enterprise in the segment of the market, whether is the enterprise the leader of innovative development of research and production branch or lags behind the general tendencies of development of innovations, whether the enterprise is capable to provide itself with innovations in the future for successful competitive fight.

The concept of economic potential of the industrial enterprise

Economic potential and possibilities of its development are the integral component of successful functioning of the modern industrial enterprise. Therefore so important correctly and sensibly to estimate the rational sizes of economic potential which effectively functioning enterprise has to have. The key moment of the solution of this task is accurate definition of the concept of economic potential and its structure.

The practical importance of development of this problem induces many scientists to devote it detailed researches. Nevertheless, still neither in domestic, nor in foreign literature it isn't developed the unified and accurate views concerning treatment of economic capacity of the scientific and production enterprise, its components, criteria of its assessment and techniques of exact definition.

The analysis of the literature devoted to the concept of economic capacity of the scientific and production enterprise shows a divergence of views of economists on this question.

The best general determination of economic potential of the enterprise is offered by the author/1/, determining economic potential as «... set of different types of resources, including the material, financial, intellectual, scientific and technical and other resources necessary for implementation of innovative activity». Such understanding schematically and simply treats this difficult category, without opening all potential opportunities and reserves of economic capacity of the scientific and production enterprise.

The similar position in treatment of this definition is taken by authors [2, 3]. These authors

note that implementation of innovative activity requires existence of economic capacity of the enterprise which is characterized as set of various resources, including:
− intellectual (technological documentation, patents, licenses, business plans on development of innovations, the innovative program of the enterprise);
− material (skilled and instrument base, processing equipment, resource of the areas);
− financial (own, loan, investment, federal, grant);
− personnel (leading innovator; the personnel interested in innovations; partner and personal contact of employees with scientific research institute and higher education institutions; experience of carrying out scientific researches; experience of project management);
− infrastructure (own divisions of research and development, department of the chief technologist, department of marketing for new products, patent and legal department, information department, department of competitive investigation);
− other resources necessary for implementation of innovative activity of the enterprise.

Broader determination of economic potential of the enterprise offer authors [4, 5]. They specify that strong in economic and innovative sense it is considered the enterprise possessing fully scientific and technological potential, including:
− qualified scientific personnel;
− material support which significantly influences the level of scientific and technical decisions, and also terms of creation and development of innovations. It includes scientific tools, equipment, devices, and also the level of its novelty in technological sense, existence of skilled and experimental base;
− information and methodical providing which reflects experience of researches and development, existing scientific and technical reserve, and also degree of information about developments in these areas;
− organizational support which forms an orientation of scientific and technical activity, and also is responsible for communication with other divisions of the enterprise.

The treatment of economic capacity of the scientific and production enterprise as measure of readiness of the enterprise to carry out the innovative task is logical and adequate. For this purpose, it is not enough to have one type of resources for the enterprise, the necessary moment is ability to use them with the greatest

effect, and also to open and use hidden reserves. In the conditions of limited financing of expensive research and production development this aspect gains especially essential value. Therefore the most detailed assessment of economic capacity of the scientific and production enterprise which is presented in works [6, 7] is more justified. These authors include in the economic potential of the enterprise not only the estimated or already mobilized resources of the enterprise, but also its organizational mechanism (organizational structure, etc.) for achievement of goal in the field of the knowledge-intensive technological processes, new types of products or their modification, and also new services. Thus, according to these authors, innovative activity includes also market researches of sales markets of the goods, the competitive environment, and a complex of administrative and organizational and economic actions which lead to innovations.

The author [8] adheres to the similar point of view. The author understands economic potential as:

a) products being at different stages of development or production expansion;

b) opportunities of financial, technological, scientific and technical and personnel to create, make and improve production;

c) abilities to organize development, production, sale of the goods, fully conforming to the present and future requirements of buyers, timely replacement of products, not being leaders of sales.

As appears from this approach, the author estimates the economic potential of the enterprise in a context of all life cycle of an innovation that undoubtedly is correct and raises a practical and rational orientation of conceptual definition, pulling together it with needs and inquiries of dynamically changing life.

Works [9–11] are devoted to studying information component of economic capacity of the enterprise in the conditions of global informatization of society and formation of «information economy».

The concept «potential» occurs from the Latin word «potentia», and means force, power, opportunity, the ability existing in the hidden look and capable to be shown under certain conditions. Proceeding from linguistic treatment, potential can be determined as the ability of a matter to pass from opportunity to reality, from one condition to another (for example, from old to new). Based on such philological approach to

treatment of economic capacity of the enterprise in [12] author treat it as a measure of unity reached which can be used with a definite purpose, and possible, i. e. achievable under certain conditions.

Works of foreign scientists, such as D. Bell, P. Druker, D. Clark, G. Mensh, R. Porter, B. Santo, R. Solou, B. Tviss, R. Foster, Y. Shumpeter, represent interesting, comprehensive, deep, competent, and always devoted to researches of innovative economy with practical orientation.

Ambiguity of treatments of definition and the characteristic of economic capacity of the enterprise is explained by complexity, identity of the most innovative activity different objects and the directions.

The most rational are represented to concretize the economic category «economic potential of the enterprise» so that to fill it with the concrete functional contents for practical application regarding an assessment of economic potential. The assessment of economic capacity of the scientific and production enterprise is the integrated system characteristic, the economic capacity of the scientific and production enterprise can be measured and estimated only by a complex assessment of an innovative susceptibility, innovative activity and competitiveness of the enterprise.

Based on the data provided above, the category «economic potential of the industrial enterprise» is offered to be considered as ability of system to transform the actual order of things in a new condition for the purpose of satisfaction of existing or again arising requirements (the subject is innovator, consumer, market, etc.). The most important moment of the presented concept of economic capacity of the scientific and production enterprise is that its effective use does possible transition from the hidden opportunity to obvious reality, i. e. of one condition in another (namely, from traditional to new). Thus, it is proposed to focus attention on situation that the economic capacity of the scientific and production enterprise is some kind of characteristic of ability of system to change, improve, progress.

Methods of evaluating the economic potential of the industrial enterprise

The carried-out analysis showed that now the assessment of economic capacity of the industrial enterprise can be carried out with application of the qualitative, quantitative, logical and combined

methods of the decision. In the generalized look all methods can be classified: statistical, methods of research of operations, expert, on the basis of the combinatory approximation, special.

Let's consider these methods and give them the short characteristic.

1. **Statistical methods** are based on processing statistical data, and quality of administrative decisions considerably depends on ways of processing statistical data. Therefore it is important not only to derive the maximum benefit from available reporting data and reference materials, but also to present results of the analysis of objective information in the most convenient view.

The mathematical statistics is engaged in methods and rules of processing and the analysis of statistical data from area of economy, equipment, physics, finance and other activities. For the accounting of specifics of activity there are various branches of statistics: economic, demographic, statistics of finance, etc. The mathematical statistics penetrates them and is the integral component of universal mathematical methods of information processing.

The mathematical statistics solves three main problems. The solution of the first task assumes obtaining the main statistical characteristics: the arithmetic average being statistical analog of a population mean, statistical dispersion and average quadratic deviation. Indicators of average value are very widely used in the economic analysis. Examples of indicators of average value: average salary of the main production workers, average time between equipment repairs, the average size of expenses of money on service and repair of unit of military equipment, etc.

The second problem which is solved by mathematical statistics, is the definition of laws of distribution of random variables. For the analysis of economic processes it isn't indifferent, which of the random variable submits to what law. Possibility of using the device of probability theory depends on it, it also influences on practical recommendations.

The third problem of mathematical statistics consists in an assessment of confidential intervals, i. e. in an assessment of that range to which the random variable with a certain degree of reliability gets.

It is connected with that in practice data processing is not made on all population, only on the selection, thus received values of statistical characteristics are random variables and are located in some range.

An important role in the solution of this task is played by the theory of a selective method which makes recommendations about the volume of the minimum selection for rather reliable assessment of characteristics of the law of distribution of a random variable. Application of a selective method allows to reduce considerably time for receiving estimates of average value of an economic indicator, and also a share of defective documents or details in the general set of the objects which are to be surveyed.

2. **Methods of research of operations** include problems of definition of optimum alternative (a problem of optimization), consisting in a choice of such conditions under which the chosen criterion reaches extreme value.

The formulation of any problem of optimization and finding of its decision is consolidated to performance of the following actions: problem definition; criterion choice; formation of criterion function; formulation of restrictions of a task; creation of optimizing mathematical model; definition like task as mathematical object; development or choice of a method of obtaining the optimum decision; finding of the decision by the chosen method.

Many optimizing tasks can be reduced to standard methods of the decision which are studied in the theory of research of operations. The main mathematical methods or classes of algorithms of their decision are presented below.

Mathematical programming is the area of the theory of research of the operations, devoted to the theory and methods of the solution of multidimensional extreme tasks with restrictions, i. e. tasks on an extremum of function of many variables with restrictions on area of change of these variables. The purpose of mathematical programming is creation where it is possible, analytical methods of definition of the decision, and in the absence of such methods − creation of effective computing algorithms of obtaining the approximate decision.

The general problem of mathematical programming is formulated as follows. It is required to find n of variables x_1, x_2, ..., x_n which satisfy m to the equations or inequalities

$$q_i(x_1, x_2, \ldots, x_n) \le (=, \ge)b_i, \ (i = \overline{1, m}) \quad (1)$$

also maximize or minimize function

$$Z = f(x_1, x_2, \ldots, x_n). \quad (2)$$

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The condition (1) is called restrictions, and function (2) − criterion function. Set of variables (vector) $X(x_1, x_2, ..., x_n)$ is called the decision or the plan of a problem of mathematical programming. The plan $X(x_1, x_2, ..., x_n)$ meeting conditions (1) and a maximum delivering to function (2) or minimum is called optimum. Volumes of restrictions of b_i, functions $q_i(x_1, x_2, ..., x_n)$ and $f(x_1, x_2, ..., x_n)$ are also set, are initial statements of the problem. The form of these conditions, and also some other circumstances define belonging of a task to appropriate section of problems of mathematical programming.

It is possible to allocate the following main methods: mathematical programming (linear, nonlinear, discrete, dynamic, stochastic), theories of mass service, differential equations, theories of counts, theories of games, casual processes.

Let's consider the essence of solved tasks and give short characteristic of these methods.

Linear programming − criterion function (2) is linear, and the set on which the extremum of criterion function is looked for, is set by system of linear equalities or inequalities (1). Among methods of mathematical programming algorithms of linear programming (a simplex a method and others) are most developed and effective.

Nonlinear programming − nonlinear criterion function (2) or at the same time criterion function (2) and restrictions (1). In practice it is widely applied two main methods of nonlinear programming: method of the given gradient (Jacobi's method) and method of multipliers Lagrange. Jacobi's method represents generalization a simplex method of linear programming. The method of multipliers Lagrange is applied in tasks both with restrictions in the form of inequalities, and in the form of equalities and is logical continuation of the first method. On the basis of this method the method of penal functions is developed.

Integer programming deals with tasks in which on variables the discretization condition is imposed. Methods of the solution of problems of integer programming can be classified as methods of cutting off and combinatory methods. The first of them are connected with that circumstance that entered additional restrictions cut (exclude) some areas of a polyhedron of admissible decisions in which there are no points with integer coordinates.

At the heart of combinatory methods the idea of search of all admissible integer decisions lies.

The main method is the method of branches and borders and also the method of the cutting planes.

Dynamic programming represents the special mathematical method of optimization adapted for the solution of multistep tasks, and such steps can have the natural nature: for example: planning of economic activity for a certain period, and in other tasks they are entered artificially: for example, enterprise development which can be broken conditionally into stages, each of which occupies any time span With use of this method it is possible to consolidate the solution of a complex challenge to sequence of simpler, i. e. to carry out decomposition.

Stochastic programming studies the theory and methods of the solution of conditionally extreme tasks at incomplete information on parameters of a statement of the problem, that is are focused on the solution of tasks in which all or separate parameters are described by means of random variables.

The main objective of the *theory of mass service* (*theory of turns*) is finding of such organization of systems at which losses from expectation of service or from idle time of channels of service will be minimum. The theory of mass service uses mainly the probability theory device.

The theory of the games is the mathematical theory of conflict situations, i. e. situations in which interests of two or more parties pursuing the various aims face. Task of this theory is development of recommendations about a rational line of action of participants of the conflict. Games in which one of opponents is the nature, and other − people, the name of static games, and the theory of such games − the theory of static decisions received.

The theory of counts is the area of the discrete mathematics which feature is geometrical approach to object studying. It is applied in the analysis of reliability of communication networks, electronic schemes, switching networks when there is a task about finding of the quantitative not being crossed chains connecting various tops of counts. Methods of the theory of counts are applied at the solution of transport tasks on transportations, finding of optimum solutions of a task on appointments, to allocation of «bottlenecks» when planning and ROC management, by drawing up optimum routes of deliveries of freights and others.

The theory of schedules studies methods of the solution of problems of optimum streamlining and coordination of performance of some actions in time. Problems of creation of optimum schedules (planned schedules, schedules) are solved with its help of performance final (or repeating) complexes of operations. Thus problems of frequencies are formulated as a problem of optimization of process of service of a final set of requirements in system (in difference from the theory of mass service where infinite flows of requirements), containing limited resources are considered generally.

Expert methods are based on use of knowledge of experts about object and generalizations of their opinions. Such methods in a bigger measure are applicable at standard forecasting, in particular in the analysis of spasmodic developments. Distinguish individual and collective expert methods. The main methods are: the method of Delfi, method of a tree is more whole, a method of generation of ideas, a script writing method, and as a method of the analysis of hierarchies.

At the heart of all types of expert methods judgments of experts concerning prospects of development of object are put. These methods are based on mobilization of professional experience and intuition. Usually to expert methods resort when the objects which aren't giving in to mathematical formalization for which it is difficult to develop adequate model are analyzed.

Methods of individual expert estimates are based on the statement of opinions by experts independently from each other. Collective methods with use of groups of experts demand the organization of procedures of meetings, ensuring independence of judgments and organizationally is more difficultly feasible, than individual.

Use of expert methods expediently at the solution of problems of the special class, being characterized existence of one of two conditions:

1. The task can't be solved by any other existing way.

2. Others, except expert, ways are less exact or more labor-consuming.

Both practical and theoretical researches testify that expert judgments at observance of the correct methodology of their receiving comprise rather reliable information which use allows making quite reasonable decisions. To increase reliability and reliability of expert information it is possible by formation representative on the number of expert group, a task of rigid requirements to «quality» of experts and processing of received expert information.

Depending on volume and quality of initial information, special methods as examination and methods of the information processing received from experts, sharing on two rather independent groups − individual and group methods of estimation, are developed.

Main advantages of methods of individual expert estimation: «interviews», analytical reports, the scenario, consist in their efficiency, opportunity fully to use individual abilities of the expert, lack of pressure of authoritative judgments, low costs of examination. The main lack of these methods is high degree of subjectivity of received estimates because of limitation of knowledge of one expert [2].

Methods of group expert estimation: questioning, «commissions», collective generation of ideas, are based on the principle of identification of collective opinion. The main advantage of these methods over the individual consists in possibility of the versatile analysis of a problem of a choice. Besides, collective responsibility often allows experts to make more risky decisions on the questions raised before them, and the estimates received from group, contain a «required» assessment, than at individual examination more often. Shortcomings of these methods are complexity of the procedure of obtaining information and the organization of the expert poll, connected with need of collecting rather representative group of experts, complexity of receiving group opinion of experts from individual opinions, possibility of rendering pressure of authoritative judgment in group.

The specified shortcomings can be significantly weakened by application of various options of a combination of the considered procedures and the scientific organization of examination.

Considering all this, and also some other factors, during researches as a method of expert estimation was explained the combined method consisting in collective discussion of the purposes and problems of examination in rather small groups of experts with the subsequent individual poll of experts in questions of in advance prepared questionnaire.

Expert methods are most effective for drawing up medium-term and long-term forecasts, at

research of difficult objects, and also in case of the insignificant volume of retrospective data about research volume. The lack of information at the initial stage of definition of expenses results in need of a formulation of a task for a general view and assumes an assessment of the created alternatives of possible decisions at each subsequent lower level of forecasting. Such algorithm of finding of the decision is realized by various methods, such as the method of a tree is more whole, a method of generation of ideas, a method of Delfy, and as a script writing method. Let's give them the short characteristic.

1. *The method of a tree of the purposes* is used in standard forecasting.

The essence of this method consists in consecutive splitting of the purposes into local goals and finding problem solutions. Each of ways of achievement of a common goal at this level can be considered as the purpose provided with means (ways) more of the lowest level, coordinating the separate purposes to actions which need to be undertaken in the present. Generally as «a tree of the purposes» understand the hierarchical structure reflecting relationships between elements − the purposes. "The tree" reflects the relations between tops − stages of achievement of some purpose. «The tree", which tops are ranged, i. e. are expressed by quantitative estimates of their importance, is widely used for a quantitative assessment of a priority of the various directions of development. As a result of a partition of the purposes on a local goal the tree of the purposes representing coherent focused columns which tops answer the purpose, and edges − to communications between them is created, and the top of the top level (a tree root) represents the general purpose.

Interdependence of the purposes of one level consider by means of coefficients of mutual usefulness. They are defined by experts and for convenience take place in the table. Construction of «tree of the purposes» usually demands forecasting of development of object and its elements of a script writing of achievement of the formulated purpose, etc. Each of these expected tasks often decides method of expert evaluations. Advantage of a method is in its presentation, and allowing to consider a question somehow deeply.

2. *Method of generation ideas.* In standard forecasting the great value has formation of alternatives of development of object. Creation of

alternatives demands creative activity and in power only to specialists and experts. Most effectively this process proceeds during the group examination organized by certain rules.

The method of generation of ideas is based on activation of intellectual activity. The method has some versions one of which is the so-called method of «brainstorming». The method purpose − receiving a large number of original ideas for a short period,

The main feature of a method consists that the period of free creative generating of ideas, offers and the hypotheses relating to development any of problems, is accurately separated from a stage of their critical evaluation, and the assessment is made in such form that doesn't connect, and stimulates further creative discussion of cases in point.

3. *The method of Delfy* is one of the most widespread methods of formation of a group assessment of experts at the forecasting, received the name from the Greek city of Delfy and his wise men who was famous in the ancient time for predictions of the future. The method represents a number of consistently carried out procedures directed on formation of group (collective) opinion on problems with insufficient information.

The procedures used in a method of Delfy include three main elements: anonymity, adjustable feedback and statistical processing of answers.

Anonymity of poll is way of weakening of influence of certain authoritative experts. It is reached by application of special questionnaires (questionnaires) or other ways of individual poll, for example, communication of experts with the computer. Adjustable feedback allows reducing noise which are understood as influence of the individual and group interests which haven't been connected with solved problems. Besides, introduction of feedback brings an element of objectivity and estimates are more reliable.

Adjustable feedback is carried out at the expense of carrying out several rounds of poll, results of each of which are processed by means of statistical methods and told to experts.

4. *The method of a script writing* is based on a complex image of development of object in the form of the descriptive document which carries the name «future scenario».

Any scenario answers two types of questions: how step by step there can be this or that hypothetical situation; what alternatives at all

operating factors at this stage to prevent process exist to change or facilitate its course.

The description is usually made in obviously expressed temporary coordinates. However for scientific and technical and military forecasts introduction of obvious dependence on time isn't always obligatory. In the scenario in advance prepared forecasts and materials on development of object of forecasting are used. Development of the scenario forces the researcher to be engaged in details and processes which it could miss if it was limited to abstract reasons.

5. *The method of the analysis of hierarchies* (the author of a method − the American mathematician T.Saati) is systematic procedure for hierarchical representation of the elements defining an essence of a problem of a choice. The method consists in problem decomposition on more and more simple components of part (creation of hierarchy) and further processing of sequence of judgments of the decision-maker (expert group) in pair comparisons, or use of quantitative values of indicators. Relative extent (intensity) of interaction of elements in hierarchy can be as a result expressed. These judgments then are expressed in numbers.

The solution is process of stage-by-stage establishment of priorities.

Result of application of a method is receiving the generalized indicators of a priority of considered alternatives.

The method of the analysis of hierarchies advantages:

− it allows to consider diverse information when receiving the generalized assessment;

− it considers extent of influence of a concrete indicator on the generalized assessment;

− it allows to estimate both quantitative, and quality indicators.

The method of the analysis of hierarchies shortcomings:

− the quantity of indicators at each level of hierarchies shouldn't exceed nine;

− the existence of a subjective component at an assessment of weight of indicators (involvement of experts).

Special methods

Methods of minimization of risk are based that the concept of risk taking into account the maintenance of a task, includes quantitative characteristics (threat type, damage, parameters) which can be used for formation of a matrix of system estimates and application of the corresponding strategy of decision-making.

Imitating modeling

The term «imitating modeling» means that we deal with such mathematical models by means of which the result can't be calculated or predicted in advance therefore experiment (imitation) is necessary for a prediction of behavior of real system on model at the set basic data.

Imitation represents a numerical method of carrying out on the computer of experiments with the mathematical models describing behavior of object (enterprise) during the set or formed period of time. The behavior and their interaction in imitating models are most often described by a set of the algorithms realized in some language of modeling. All these descriptions represent program which needs to be debugged and tested in the beginning, and then to use for statement of tasks on the computer. Therefore as imitation process on the computer are understood both model designing, and its test, and model application for studying of some phenomenon or a problem.

Methods with application of indistinct sets

For situations which can be characterized only it is rather inexact, the new way of consideration − methods of so-called indistinct (indistinct) sets was entered into practice. This concept was offered in the mid-sixties by L. Zade; since then in this direction many researches which have made an essential contribution to a problem are executed, and, the main thing, is tested many interesting applications. Methods of indistinct sets proceed from those reasons that the creative human thinking considerably proceeds within concepts indistinct and not described strictly quantitatively; to such thinking there can't correspond completely models of classical mathematics with their unambiguous on-off logic. Thus, in methods of indistinct sets try as it is possible to apply more widely the experienced mathematical approaches and first of all mathematical symbolics, accepting at the same time an illegibility of estimates and decisions as important reflection of really existing situation. It allows to connect severity of classical mathematics and, therefore, exact knowledge, on the one hand, with uncertainty and a polysemy of situations, including emotionally painted processes of knowledge of the real world, with another. The

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successful solution of the task set thus allows to enter and rationally to use such concepts, as indistinct regularities, ratios, algorithms. Researches in the field of the «indistinct» analysis are now even in the course of intensive development; it belongs both to bases, and to opportunities of application of the analysis.

Thus, the contents and economic essence of the concept «economic potential» in relation to the industrial enterprise was considered. The analysis of methods of evaluating the economic capacity of the industrial enterprise was performed, on the basis of which classification of used methods was carried out. The developed classification and the executed characteristic of methods will allow the researcher to carry out a reasonable choice of methods of evaluating economic capacity of the enterprise depending on features of a solved task and influencing external and internal factors.

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BABKIN, Alexander V. — Saint-Petersburg State Polytechnical University.
195251, Politekhnicheskaya Str. 29. St. Petersburg. Russia. E-mail: al-vas@mail.ru

БАБКИН Александр Васильевич — *профессор кафедры экономики и менеджмента в машиностроении Санкт-Петербургского государственного политехнического университета, доктор экономических наук, профессор.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: babkin@nic.spbstu.ru

UDK 330.322.01

I.A. Rudskaya

METHODS TO EVALUATE UNCERTAINTY OF INVESTMENT PROCESS IN INNOVATIVE ORGANIZATIONS

И.А. Рудская

МЕТОДЫ ОЦЕНКИ НЕОПРЕДЕЛЕННОСТИ ИНВЕСТИЦИОННОГО ПРОЦЕССА В ИННОВАЦИОННЫХ ОРГАНИЗАЦИЯХ

The article is dedicated to the potential of expert methods when being used to evaluate environment uncertainty of investment processes in organizations involved in innovative activities.

UNCERTAINTY ASSESSMENT. INVESTMENTS. PROCESS. INNOVATIVE ORGANIZATIONS.

Посвящена возможностям использования экспертных методов оценки неопределенности внешней среды при осуществлении инвестиционных процессов в организациях, деятельность которых носит инновационный характер.

ОЦЕНКА НЕОПРЕДЕЛЕННОСТИ. ИНВЕСТИЦИИ. ПРОЦЕСС. ИННОВАЦИОННЫЕ ОРГАНИЗАЦИИ.

Today, the Russian economic system sees some negative trends, primarily related with constant modifications of legal, administrative and financial environment, caused both by the necessity to redirect the economic development (to modernize) the country and by the world's financial crises effects. This results in the growth of entropy in the business environment of economic agents which primarily affects investment processes in a negative way. Uncertainty of the investment environment leads to lower activity of its participants with the trend being more visible in case the investment recuperation period gets longer. This circumstance imposes certain requirements on strategic plans. Certain methods to raise investment and options to finance venture companies are needed, as well as different approaches to apply the mother corporation's potential and different strategies to stand down business. For innovative organizations the uncertainty of investment processes, related with the environmental uncertainty, produces increased risks with consequent decrease in activity in this business. That's why examination of ways to expand tooling backup to take decisions in the sphere of investments into innovative activities seems important both from theoretical and practical standpoint [1].

Russian government has declared the policy of modernization and innovative character for the economy development. However, practical implementation of the policy is rather contradictory, since measures proposed often do not meet the consistency requirements. Objectives to modernize Russian economic system are to be reached under the effects of the world financial crisis, which has resulted in budget deficit [2]. According to the statistics of the National Association of Innovations and Information Technology Development (NAIITD) the investments into innovations decreased by 70—80 % in 2009. Big corporations reduced their investment up to 90 %, business angels up to 60 % and venture funds up to 45 %. So, in effect, private investments have been decreased considerably.

At the same time the state financial support cannot be considered sufficient. Statistics say that funding of the innovative activities, even though the policy of modernization and innovations in the economy of Russia has been proclaimed, grew only by 0.1 % in 2011.

Today we can mention two public investment funds meant to form financial resources for Russian innovative organizations. They are Russian Venture Company (RVC) and Rosinfocominvest fund. The latter, despite being set up as early as 2006, started its activities in 2009 due to different red tape barriers. As for RVC, we can speak with confidence about it being low-effective.

Investment processes in innovative enterprises can be ensured by means of different financial sources (vehicles), which should include: funds, allocated for the development of the innovative sphere in terms of special purpose federal programs, including the ones which are to activate modernization processes; grants, provided by the federal and the regional governmental executive bodies; funding by venture funds; funding by governmental investment funds and non-governmental organizations; funding by private investors, including foreign ones; innovative enterprise's own funds: retained profits and depreciation fund[3].

An effective investment mechanism can be built in case interests of the agent with ownership function dominate, i. e., in this case, those of the investing company, and the criterion of the accommodated decision can be defined as follows: 'To provide capacities for production use of the invested capital in terms of the national legislation within unlimited time interval'. This criterion, being fixed on the federal level, can result in dramatic decrease in the investors' anxious expectations and reduce instability forecast by them. This refers to the legal component of the foreign investments attraction mechanism, which is being developed in terms of certain policy. The directions of such policy can have different vectors, for example:

− policy of foreign investments and trade restriction up to their absolute embargo in most industries;

− policy of foreign capital restriction in a national company, implying strict tax regime for foreign investors, limitation of profit export, complicated procedure for investment capital return;

− policy of foreign investments stimulation (tax and duty exemption, insurance of foreign investors' risks, etc.).

One can draw a conclusion from the analysis performed that the investment process in Russia can become sustainable only provided that the legal treatment of this process is based on the dominance of the ownership function and, correspondingly, on the dominance of the specific interest of the ownership agent (investor) over the specific interests of the regulatory agents, which are understood here as representatives of federal and territorial administrative bodies. This conclusion put a condition on forming the foreign investments attraction mechanism on the federal microeconomic level, since legislative regulation of

the ownership issues is in the competence of the federal regulatory bodies. All the afore-mentioned implies that the law should apply to domestic and foreign investors without discrimination, since domestic investors, alike foreign ones, are owners of their production resources, including capitals [4].

One of the procedures which allows revealing possible inconsistencies in the definition of the criterion for setting up the accomodated regime of foreign investments and mechanism of their attraction is multidimensional expertise. With its help it is possible to compare some items under several characteristics. It is suggested that the results of this expertise should be used to increase effectiveness of the investment process on the level of the constituent agent of the federation and also in order to improve the strategic planning processes for the participants (partners) [5]. According to the general scheme of this procedure, first, each expert should identify significant, in his opinion, characteristic of the effectively operating mechanism of investment resources attraction, excluding those aspects that are within the competence of the federal centre. Thus, the expert should give his own variants of answer to the question: «What are the principles or lines of business of an innovative organisation that can be accepted as the basis for an effectively operating mechanism of investments attraction?».

Below there are factors that can be accepted as a basis for a list of necessary qualities to be made by each expert individually:

− anty-cycling development;

− increased fast growth;

− prolonged demand;

− benefits of mass production;

− differences in the operational activities (low production costs);

− resource access;

− competitive advantages.

The list of these factors was proposed by the authors on the basis of the qualitative analysis of the characteristics of the modern investment processes in Russia, which have been detected on the basis of statistical and analytical surveys.

The choice of an accommodated strategic interest of the investing company and innovative organization is the first stage of the expertise. The second stage is to choose forms and methods to attract investments, which should include:

− formation and implementation of strategic investment programs of an innovative organisation;

− granting guarantees and incentives to the investors in accordance with the federal and regional programs of innovative activities support.

The procedure has been put into practice by the authors of the article. Managers of lending divisions from five banks with foreign participation, which are investing or plan to invest in innovative organizations in Russia, acted as experts.

Each expert has identified the following strategic criteria for the first stage of the expertise (See Tab. 1).

The consultant who carries out the expertise analyzes the revealed characteristics and removes those which coincide in contents from the list. Each characteristic is awarded with a letter code.

The cards with answer tables are handed out to the experts and each of them in the box «Choice» marks with a special symbol those characteristics which are most important from his standpoint.

On the basis of all the tables obtained from and filled in by the experts, Tab. 2 is made. This table includes all the characteristics according to their priority − the first ones are the characteristics

mentioned by all the experts, followed by the ones mentioned by the majority of the experts. Further on there are characteristics identified as working ones. In the expertise that has been carried out there are five of such characteristics − A, B, C, E, F.

The results of the first stage of the expertise include the list, made on the basis of the data obtained from the experts, of significant characteristics to evaluate the effectiveness of the decision to be made.

The first step of the second stage demands that each expert should make all possible pair comparisons of the characteristics. They are made with the use of special deck of cards, every of which bears a pair of characteristics. The number of cards in the deck depends on the quantity of the identified characteristics. In the expertise that has been carried out, the number of cards is equal to the quantity of possible pairs − 10. ten.

The cards are shuffled and given out to the experts. Each expert has to distribute 100 points in between the two characteristics stipulated on the card.

Table 1

Experts' choice of strategic criteria

I Expert	II Expert	III Expert	IV Expert	V Expert
Access to resources Life extension technologies Counter-cyclical Faster growth The benefits of mass production	Competitive advantages Access to resources Extended Demand The benefits of mass production	Extended Demand Access to resources	Access to resources Faster growth Persistent-Susceptibility Honesty	Faster growth Access to resources Differences in activity The benefits of mass production Counter-cyclical

Table 2

Signs	Experts Index	1	2	3	4	5	Selection
1. Counter-cyclical	A	+	+	+	+	+	×
2. Faster growth	B	+	+	+	+	+	×
3. Extended Demand	C		+	+	+	+	×
4. The benefits of mass production	F	+	+	+	+	+	×
5. Differences in activity	E	+	+	+			×
6. Access to resources	H	+	+	+	+		−
7. Life extension technologies	D		+	+			−
8. Competitive advantages	G	+					−

The second step of this stage includes definition of the priority (significance) of the characteristics for every expert.

Evaluations of characteristics have been transferred from each card into the corresponding columns of the table and the total score has been calculated for every characteristic. Significance of the characteristic that got maximum score has been taken as one; evaluations of other characteristics' significance have been defined as the ratio between their scores and the maximum one. Thus, for example, for the first expert, characteristic A gets the maximum score − 280 points. The significance of this characteristic has been taken as one. Correspondingly, the significance of characteristics are as follows:

$$B = 250 : 280 = 0.89$$

$$C = 210 : 280 = 0.75$$

$$E = 150 : 280 = 0.53$$

$$F = 110 : 280 = 0.39$$

As a result the characteristics have been classified according to their significance for each expert. Thus, for the first expert, the most significant characteristic is characteristic A (significance 1), then − characteristic B (0.89), characteristic C (0.75), characteristic E (0.53), characteristic F (0.39). For the second expert, the most significant characteristic is characteristic B (significance 1), then − characteristic A (0.92), characteristic C (0.77), characteristic F (0.73), characteristic E (0.42). For the third expert, characteristic B is the most significant, too (significance 1), then characteristics C and E (significance 0.88), characteristic A (0.75), characteristic F (0.67). For the forth expert, classification of characteristics from the point of their significance looks as follows: characteristic E (1), characteristic A (0.88), characteristic C (0.73), characteristic B (0.65), characteristic F (0.58). For the fifth expert: characteristic B (1), characteristic C (0.88), characteristic F (0.77), characteristic A (0.65), characteristic E (0.54).

To identify the general priority of the strategic criteria for all the experts, the summary table of characteristics significance for all the experts has been made up (See Tab. 3).

Table 3

Significance signs by experts Signs	1	2	3	4	5
A	1	0.92	0.75	0.88	0.65
B	0.89	1	1	0.65	1
C	0.75	0.77	0.88	0.73	0.88
E	0.53	0.42	0.88	1	0.54
F	0.39	0.73	0.67	0.58	0.77

To identify the general priority of characteristics it is necessary to detect the characteristic whose significance in Tab. 3 gets maximum unities. Such a characteristic is called the leading characteristic. In the expertise that has been carried out, the leading one is characteristic B, which has a maximum significance for the second, third and fifth expert.

Then, significance ratios between the leading characteristic B and all other characteristics have been calculated.

For instance, for the first expert the following ratios have been defined:

$$B : A = 0.89 : 1 = 0.89;$$

$$B : B = 0.89 : 0.89 = 1.0;$$

$$B : C = 0.89 : 0.75 = 1.19;$$

$$B : E = 0.89 : 0.39 = 2.28;$$

$$B : F = 0.89 : 0.53 = 1.68.$$

Then, on the basis of the data obtained, the average value has been calculated for the priority of the characteristics which are compared. Thus, for characteristic A, the average value of the characteristic ratio for all the experts is the following:

$$(0.89 + 1.09 + 1.33 + 0.74 + 1.54) : 5 = 1.12$$

As a result the final scale has been formed, which identifies the significance of the characteristics chosen by the experts (See Tab. 4):

Table 4

Evaluation of strategic criteria significance

Signs	Coefficient value
A	0.90
B	1.00
C	0.89
E	0.60
F	0.72

Thus, characteristic B has proved to be the most significant (most rapid growth), characteristic A has become the next (anti-cycling development), followed by characteristic C (prolonged demand) and characteristic F (benefits of mass production) with characteristic E as the last one (differences in the conditions of business – low production costs). Thus, the foreign investors' value chain can be formed. Consequently, economic growth, active anti-crisis measures with still relatively low, comparing to the developed countries, labor costs, and availability of raw material resources are the factors which justify the foreseen growth of foreign investments.

The results of the expertise show that potential investors see Russia, in the first place, as a zone of strategic interests, which provides a larger, comparing to their own country, market share and gives insurance against production, sale and technology cycling. This result of the expertise proves to be unexpected and interesting, since it shows that instable economy of Russia can still be seen as a sort of buffer which diminishes instability in one's own country. Economic, financial criteria as such (benefits of mass production and low production costs) have been put by the investors in the last place in their value chain. This situation allows forecasting potentially possible appeal of the innovative business for foreign investors.

The contemporary situation in the Russian economic system characterizes with inconsistency and instability of the business environment for all economic agents, which results in increased instability of investment processes. The aforementioned negative trends significantly diminish opportunities to use multi-vehicle funding for innovative organizations and make them pay more attention to the mechanism of foreign investments attraction. All agents of the economic system whose interests, preferences and activities affect the uncertainty of investment processes (increasing or decreasing risks) are to be seen as participants (partners) of the investment process. Participants' (partners') interests, objectives and spheres of influence have hierarchical and contradictory character. The basic contradiction appears when implementing regulatory function (federal and regional legislative and executive bodies have it) and

ownership and user functions (this function is primarily that of investing companies and partner companies in the recipient country). It is related with the necessity to take decisions in the field of investment climate and implement innovative projects, whose implementation periods can exceed considerably the periods of power authorization, established by the political system [6].

The effectively functioning mechanism of investments attraction is possible on the basis of accommodated strategic criteria for taking investment decisions. The condition for reduction of the environmental uncertainty, affecting uncertainty of investment processes in Russia, is appearance of legal treatment of investments which is based on the ownership function prevailing over regulatory function [7]. This will ensure the priority of economic interest for agents performing ownership and user functions (the investor and investor's partner company) in comparison with the interests of agents with regulatory function (government bodies). Such legal treatment helps reduce corruption risks, which are bound to arise in case there is no accommodation of interests in the investment process.

It is reasonable to use the multi-dimensional expertise as a mechanism to identify the investor's value chain in the specific Russian conditions. Approbation of the proposed methods for expert survey has shown, that an opportunity to expand sales market and level off the effects of the economic recession (opportunity of anti-cycling influence) has proved to be of most interest for foreign investors. The obtained results can be used to form a system of measures to improve the investment climate on the level of a region, as well as to work out strategic plans of investment development by innovative organizations. The results of the expertise, carried out on the methodologically justified and correct basis, if being used, allow increasing the strategic planning quality and create prerequisites for risk reduction in innovative business. If the aforementioned prerequisites are implemented, possibility that the foreign investors' interests will shift from strategic priorities, mainly related with marking their presence in the Russian market, towards financial criteria, expressed in the grown profitability of investments, increases.

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RUDSKAYA, Irina A. — *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: intro9@yandex.ru

РУДСКАЯ Ирина Андреевна — *доцент кафедры финансов и денежного обращения Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, кандидат экономических наук.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: intro9@yandex.ru

UDK 378.14:339.92 (075.8)

D.K. Kozlova

THE ECONOMIC IMPACT OF INTERNATIONALIZATION
OF HIGHER EDUCATION

Д.К. Козлова

ЭКОНОМИЧЕСКАЯ ЭФФЕКТИВНОСТЬ ИНТЕРНАЦИОНАЛИЗАЦИИ
ВЫСШЕГО ОБРАЗОВАНИЯ

Four categories of internationalization of higher education have been allocated depending on the method for determining the economic effect. Educational hub — new trend in internationalization of higher education and the term which is offered by author — has been proposed. Main effects of the internationalization of higher education have been analyzed.

INTERNATIONALIZATION OF HIGHER EDUCATION. EFFICIENCY OF INTERNATIONALIZATION. EDUCATIONAL HUB. EDUCATIONAL PROGRAM EXPORT.

Выделены четыре подхода к оценке эффективности интернационализации высшего образования. Введено новое понятие — образовательный хаб, как новый тренд в интернационализации высшего образования. Приведены основные эффекты интернационализации высшего образования.

ИНТЕРНАЦИОНАЛИЗАЦИЯ ВЫСШЕГО ОБРАЗОВАНИЯ. ЭФФЕКТИВНОСТЬ ИНТЕРНАЦИОНАЛИЗАЦИИ. ОБРАЗОВАТЕЛЬНЫЙ ХАБ. ЭКСПОРТ ОБРАЗОВАТЕЛЬНЫХ ПРОГРАММ.

Internationalization of higher education is a general trend of twenty-first century. There are different approaches to evaluation of the efficiency of higher education; the main problem of these approaches is a high proportion of experts' personal assessment. The task of evaluating the efficiency of international part of education not sufficiently advanced today.

Internationalization of higher education in the world includes the following modern trends:

1. Increasing access. Comparing different reports dedicated to internationalization of higher education, such as CIMO annual report, OECD papers, EAIE conference documents, national reports, the increasing role of internationalization can be traced throughout. Every year more teachers, researches and students are participating in international educational programs.

2. Geographical educational borders are blurred. Programs and organizations such as ERASMUS, DAAD, CIMO, Fulbright give a lot of opportunities for a self-organized international studies. On the other hand — the Bologna process pushed forward the internationalization based on universities' level and it's developing successfully.

3. New attractive international educational centers have appeared. Generally recognized leaders in attracting international students, such as the U.S., U.K. are replaced by new ones. Modern students are looking more and more towards Asian universities and prefer South Korea, China, and Singapore. The same idea is reflected in the Studies, which were published in Financial Times newspaper, regarding ranking of the best programs of the leading business schools in the world. According to the article nine out of twelve world best Executive MBA courses are taught in Asian Universities [1].

The author of the article proposes a new term in the context of the above trends — educational

hub. Together with the existence of logistic hubs for goods and passenger hubs — the international airports, it seems reasonable to use the term «hub» for the internationalization of education. Educational hub (EH) is a country (city) of foreign students' concentration in order to obtain educational services. Specifics of EH are the following:

– generated in the areas of strong economic development;

– appreciable state support for science and education exists;

– developed export of educational services, programs;

– EH moves over time from one country (city) to another.

Examples of contemporary EH are: South Korea (Seoul, Daejeon), China (Shanghai, Beijing), UAE (Dubai, Abu-Dhabi).

In order to determine the efficiency of International Education, the next categories have been proposed:

1. Exporting / importing of educational programs;

2. Internationalization «at home»;

3. Students, teachers, scientists exchange programs;

4. Dual or joined educational programs.

Each category has to be evaluated separately, because the outcomes are different from one to the other.

The subject of this analysis has to be determined before proceeding with the evaluation of the efficiency of the categories listed above. In this study we have focused on the efficiency of the internationalization of higher education in terms of the State. We have to note that the international education cost-efficiency can be both positive and negative for the same state (country), depending on the direction of students', teachers', researchers' movement: in the country or outside. Along with the positive and the negative foreign trade balance of the country, we can determine the balance of sectors, including specific sectors, such as educational services. Traditionally there are countries — exporters of educational services (Canada, USA, Germany, Finland, France) and importers (Vietnam, Brazil, Ukraine, Kazakhstan, Lithuania). Considering general efficiency without shifting to the level of the cost approach to the assessment of efficiency, there can be also

negative figures or risks such as the risk of brain drain, or reduced performance.

Generally, the simplest way to determinate the economical efficiency is to compare the results and the cots. Sometimes this methodology can be used in the field of educational economics. The cost approach determination of efficiency formula (1) compares results and costs. Results (outcomes) should be determined for a certain period of time, based on market research (on the scale from 1 to 10). An outcome in this context refers to the amount of incomes obtained from tuition fees, net of taxes and other mandatory payments.

$$E = \frac{\sum_{i=1}^{n} R_i}{\Sigma Z}, \quad i = 1 : n, \tag{1}$$

E — Effectiveness, according to the cost approach; Z — costs of the program (all costs related to exporting educational program); R — outcomes of the program during n years period of time.

On the other hand, there are always economical and non-economical benefits from the international educational program. Analyzing the second group of benefits one comes to the fact that categories like tolerance development, cross-cultural cooperation, international networking have to be included in the efficiency determination.

The Legatum Prosperity Index [2], which provides more comprehensive approach to the assessment of quality of life than the traditional HDI, consists of 8 groups of factors. For the purposes of this study, the author analyzed eight groups of the factors included in the index:

1. Economy;

2. Entrepreneurship and opportunity;

3. Governance;

4. Education;

5. Health;

6. Safety and security;

7. Personal freedom;

8. Social capital [2].

Eight key dependencies and key findings were based on analysis of statistical material Prosperity Index 2012. One of the relations is that higher-ranking countries are also the most tolerant.

Also, the level of internationalization of education is reflected in the group 4 «Education» and 7 «Personal freedom.» Analyzing the non-economic effects of the internalization of higher education, we are faced with the following:

– Marketing and promotion (students abroad promote home Universities, make country more open for foreigners);

– Increasing number of foreign students at «home» university, because a lot of student exchanges are usually implemented on the parity basis;

– Tolerance and cross-cultural development, international networking leads to successful international cooperation.

To estimate the outcome of these effects expert assessments have to be integrated. Application of fuzzy multi-unit method for the formalization of expert assessments is justified. For the prediction of the uncertainty in the models the likelihood of the event is often considered, which is treated as an opportunity or a risk to the process. Use of probability estimates is not entirely correct, as the single inhomogeneous origin events do not have the statistical representativeness, and talking about the frequency of their occurrence is impossible. The use of peer review is limited to the difficulties with the coordination of the data, analysis and interpretation. That is why the author considers it appropriate to implement fuzzy descriptions in the process of determining the effects of the internationalization of education.

Indirect economic effects are the following:

– International students expenses (accommodation, food, entertainment, transportation, tourism);

– Expenses for books, library, internet access;

– Expenses for insurance and registration;

– New working places;

– Additional language courses.

Direct economical effects are tuition fees, which can be different for native and foreign students in some countries. Direct economical effects can be estimated for categories 1 and 4. The efficiency of educational exports (imports) (category 1) can be defined by ROI (Return On Investment) methodology. Performance measure is used to evaluate the efficiency of the investment or to compare the efficiency of a number of different investments related to exporting educational program. To calculate ROI in case of the present analysis, the benefit (return) of an investment (forecast income from tuition fees) is divided by the cost of the investment (expenses for exporting/importing program); the result is expressed as a percentage or a ratio.

ROI methodology can be compared to the general cost approach determination of efficiency in case of evaluation of the efficiency of educational program export.

$$ROI = \frac{G - C_{ei}}{C_{ei}};\qquad(2)$$

G – gains from investment in the exported international educational program; C – costs of investment to the educational program.

Return On Investment is a very popular metric because of its versatility and simplicity. That is, if an investment does not have a positive ROI, or if there are other opportunities with a higher ROI, then the investment should be not be undertaken [3].

Then the economical effect of exporting / importing program can be defined traditionally: the amount of revenue from the program for the year, net of expenses. In case if some governmental or other support had place at the beginning of the program, additional indexes can be added to adjust the effect. Usually programs and organizations supporting export or import of the academic programs provide financial support for the first two-three years. These supportive amounts have to me mentioned in formula 1 as an «investments».

For example report of economical impact of international education in Canada shows convincing results [4]:

– The economic benefit of international students studying in Canada is substantial. Total expenditure of long-term international students in Canada amounted to about $5.5 billion in 2008. This translates to almost $4.1 billion in GDP contribution to the Canadian economy, and represents about 7 % of the GDP contributed by the overall education services sector in the Canadian economy.

– International education services supporting these long-term students contributed to 64.940 jobs in the labor market. This represents about 5.5 % of the total number of jobs in the overall education services sector in Canada.

– Those foreign students in short-term language training programs in Canada also contributed an additional $746 million per year in total spending to the Canadian economy. This is equivalent to about $509 million in GDP, 13.210 jobs, and $36 million in government revenue [4].

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– In addition to capturing economic impact resulted from spending on tuition and fees and basic living expenses, we estimate that $285.240.000 per year can be attributed to additional tourism related activities, including international students and their family and friends [4].

Logically, the overall impact of the internationalization of higher education is the sum of the results by groups, analyzed above: non-economic effects, indirect economic effects, direct effects. From authors' point of view there is no need to list all the indicators to monetary terms, because for the further analysis different nature of the indicators obtained in the article is not an issue.

The conclusions of the article are the following:

1. There is a new particular trend in internationalization of higher education and the term which is offered by author – educational hub. Specifics of educational hubs have been formulated above.

2. Four categories (types) of internationalization of higher education have been allocated depending on the method for determining the economic effect.

3. There are three groups of effects, which can determine the economic impact of internationalization of higher education. Each group has is own way of efficiency calculation.

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KOZLOVA, Daria K. – *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: 9534795@gmail.com

КОЗЛОВА Дарья Константиновна – *доцент кафедры международного бизнеса Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, кандидат экономических наук.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: 9534795@gmail.com

E.V. Tulugurova

HIGHER EDUCATION VIRTUALIZATION SUBSTANTIATION FOR SUSTAINABLE NATIONAL ECONOMIC OUTLOOK

Е.В. Тулугурова

ОБОСНОВАНИЕ НЕОБХОДИМОСТИ ВИРТУАЛИЗАЦИИ ВЫСШЕГО ОБРАЗОВАНИЯ ДЛЯ СТАБИЛИЗАЦИИ НАЦИОНАЛЬНОЙ ЭКОНОМИЧЕСКОЙ ПЕРСПЕКТИВЫ

The world economy of 21st century poses new questions and challenges to the players worldwide. The old classical rules of natural resource economy, although still existing, have lost its dominating and defining meaning for the development of competitive advantage. Moreover old mechanisms of world economic regulations have recently been proved insufficient and incompetent to protect global markets from repetition shock of year 2008. The leading economies have to face new conditions of operating and competing in the era of knowledge economy. Knowledge economy is seen as one strongly based on the intellectual activities of its core players where their intellectual capital and potential become the key resources to build upon. Therefore in regard to the national economic competitiveness the index of national intellectual potential has to be taken into account.

EDUCATIONAL VIRTUALISATION. HUMAN DEVELOPMENT INDEX. EDUCATION STAKEHOLDERS. VIRTUAL EDUCATION ENVIRONMENT.

Экономика 21-го века ставит новые вопросы и бросает новые вызовы игрокам глобального рынка. Классические правила экономики сырьевых ресурсов еще существуют, но уже потеряли доминирующее и определяющее значение для развития конкурентных преимуществ. Кроме того, старые механизмы регулирования мировой экономики показали свою неэффективность в ходе мирового экономического кризиса 2008 года. Ведущие мировые экономики столкнулись с новыми условиями функционирования и конкуренции в экономике знаний. Экономика знаний строится на интеллектуальной активности ее ключевых игроков, где их интеллектуальный капитал и потенциал становится основным ресурсом. Следовательно, индекс развития человеческого потенциала необходимо рассматривать, как показатель конкурентоспособности национальной экономики.

ВИРТУАЛИЗАЦИЯ ВЫСШЕГО ОБРАЗОВАНИЯ. ИНДЕКС ЧЕЛОВЕЧЕСКОГО РАЗВИТИЯ. ОСНОВНЫЕ ЗАИНТЕРЕСОВАННЫЕ ЛИЦА В ОБРАЗОВАНИИ. ВИРТУАЛЬНАЯ ОБРАЗОВАТЕЛЬНАЯ СРЕДА.

The recent Global Competitiveness Index 2012−2013 published for the annual World Economic Forum shows where Russian Federation stands in this regard. It has taken 67th place out of 144 possible positions in the overall competitiveness index, droping one place down from the previous year's 66th place. The country is situated in the upper half of the list which does not look too bad. However, the composition of individual factors does not look optimistic: «A sharp improvement in the macroeconomic environment−up from 44th to 22nd position because of low government debt and a government budget that has moved into surplus−has not been enough to allow the country to compensate for the poorer assessment of its already weak public institutions (133rd) and the innovation capacity of the country (85th this year, down from 57th in the 2010−2011 edition of the GCI). The country suffers from inefficiencies in the goods (134th), labor (84th), and financial (130th) markets, where the situation is deteriorating for the second year in a row. The weak level of competition (136th) − caused by inefficient anti- monopoly policies (124th) and high restrictions on trade and foreign ownership as well as the lack of trust in the financial system (134th) − contributes to this inefficient allocation of Russia's vast resources, hampering higher levels of productivity in the economy» [7]. The only

group of factors that provide for growth opportunity in the sphere of global competitiveness are educational enrollment, higher education and training. This tendency proves the fact that investment in the educational area is bound to bring a significant growth rate for the national economy.

Development of national intellectual potential is the key aim for the nation-wide intellectual index improvement. The core knowledge-hubs of any country are its institutes, universities and R&D centers. Therefore these institutions have to have knowledge multiplication and sharing as well as citizens' involvement into the educational area as their fundamental goals.

The Human Development Index (HDI) which is being monitored by United Nations Development Program (UNDP) is being calculated based on three integral factors: national life expectancy, education index and income index. As one of the ways of increasing the national HDI we will look upon the education index. This factor is being in turn composed of two sub-indexes: mean years of schooling (MYSI) and expected years of schooling index (EYSI). The combined education index shows the average schooling years of the population above 15 years old. This will be the target group of our future study. The group is represented by higher and professional education receivers, i. e. students. The MYSI takes into the actual length of study of those who have already finished their education, whereas the EYSI represents the expected length of study of current students. MYSI is being calculated by the following formula: $MSYI = MSY / 13.2$; EYSI in turn equals EYS/20.6. The composite index looks as follows: $EI = \sqrt{MSYI \cdot EYSI} / 0.951$ [2]. As we now see the larger the number of citizens of older than 15 years and the longer the period of their education − the higher the composite index of education of Russian Federation. Therefore the ultimate goal of higher education development should be widening the group of higher education students as well as lengthening the years of their study.

The new societal and economic trends have to be quickly adopted by educational institutions. As such digitalization and virtualization of all the aspects of everyday lives has long been present in the routine of an individual. The digitalization on governmental level − e-government projects − has only become part of national agenda in year 2007 when the concept of «electronic government» has been approved by the government of Russian Federation. The aim of this concept being provision of country's citizens with an easy online access to all the possible sorts of governmental services. The virtualization of governmental institutions have long been a worldwide trend together with the similar development direction in higher education.

Virtualization of higher education is defined by transfer of part or the whole of the educational process into the online sphere. Willoughby identifies three grounds for university education virtualization: *technological, geographical* and *organizational.* For the purpose of this paper under *technological* scope of virtualization we understand creation of a spectrum of technological solutions to provide full-scale educational services in the virtual environment. The technological need for virtualization appears when the educational institution authorities realize the need for new technological solutions to compete in the educational market. Technological virtualization can be divided into four major categories: virtual classrooms, technological communication platforms, multimedia means of education, e-libraries and databases. The «virtual classrooms» category is represented by highly-sophisticated technical solutions which allow users to share media and document files online, participate in one-to-one and one-to-all real-time online discussions, take part in and hold tests and exams, see the interim and final grading. This software category literary transfers the real classroom education experience into the online mode. The «technological communication platforms» are large scale software platforms that allow big data clusters such as lecture notes and literature, testing systems and real-time as well as regular communication bases to be combines in one system. The «multimedia means of communication» are include the all possible tools for making educational process more efficient and up-to-date, including the use of video-equipment for the close up of whiteboard writings, video-conferencing, as well as pure lecture-note storages and course participants management (such as Moodle). «E-libraries and databases» are the tool of modern ambitious researcher and student, that allow to access the most current as well as long-established classical research outcomes, industry information, science

field articles, statistics of the certain knowledge area, etc. This is an instrument no competitive university of 21st century could do without to ensure the highest quality of research and education.

The geographical scope of virtualization is being caused by the need of strong and efficient communication and information exchange between geographically spread university subsidiaries, cooperation partners, alumni and sponsors as well as the need for control function execution. The actual tools that could be used in this virtualization ground could partly repeat the ones mentioned in «technological virtualization» ground, but also include more efficient communication platforms as well as intranet systems that allow geographically spread subsidiaries and partners have a common virtual working environment that will compensate for the lack of face-to-face or direct communication.

Organizational virtualization has the easing of beaurocratic burden on administrative, professor and teaching stuff as well as students as its main goal. In the case of organizational virtualization ground the technological solutions that help manage the administrative functions of university authorities, faculty staff, students and outside stakeholders are being implemented and widely used.

As one can observe from the above the means and ways of educational virtualization differ by scope, goal and type. The reasoning for choosing a particular type of virtualization would be different for different interested parties. Therefore, to be able to efficiently choose the virtualization ground (or a combination of those) we need to identify core stakeholders of educational process. As higher education poses the main scope of this article, the stakeholders of university education are the students, the government and the business society. However there is another stakeholder to this — faculty staff, as their motivation to provide the highest quality educational services to the other three stakeholders is the ground for the educational system to work efficiently.

The four above mentioned stake holders have different interests in regard to educational virtualization. For instance, if faculty stuff is engaged into all of the scopes of virtualization grounds, students in majority would have a narrower interest in this case (the convenience of

educational process as well as the level of its current interest and personalization level). Apart from the virtualization *ground* we can also define the virtualization *scale.* Different scales of virtualization will be represented by different levels of technological solutions used and the final virtual services provided to the end user — student, lecturer, administrative staff, cooperation partner. For instance, the access to the e-library services are normally only provided to all levels of student and lecturer staff, whereas partners and administrative staff would normally not have the rights if use. Tyrtyi S. defines four types of university education virtualization: informational educational environment, distant learning system, electronic education environment (e-learning environment), virtual educational environment [5]. Trying to define the above mentioned terms will provide us with the information on the scale of virtual learning system. Informational education environment — serves the needs of basic academic information provision, i. e. «information» and not «knowledge». E-libraries and data-bases will be included into this level, however no direct contact to the knowledge-bearer will be possible here. The information including lecture notes and some course work is there to be uploaded and downloaded, but not communication means are possible. Whereas education is not possible in isolation, namely impossible without communication, the next scale level is presents by «distant learning systems». These systems do not necessarily include only online means of knowledge sharing and communication, but they do include both — sharing and dissemination of knowledge with the help of online and offline software and communication platforms. At this step the system gets a certain degree of interaction. The «E-learning environment» combines all the factors included into classical educational process, including virtual classrooms, technological means of communication, content sharing and knowledge control. The ideal model of large-scale «virtual education environment» does not only include all of the above mentioned technological and organizational solutions, but also provides its own communication centers, information channels, and is a fully functional software-communication environment with information storages, e-paperflow, and information support for any number and scale of users independent of their geographical position (See Fig. 1).
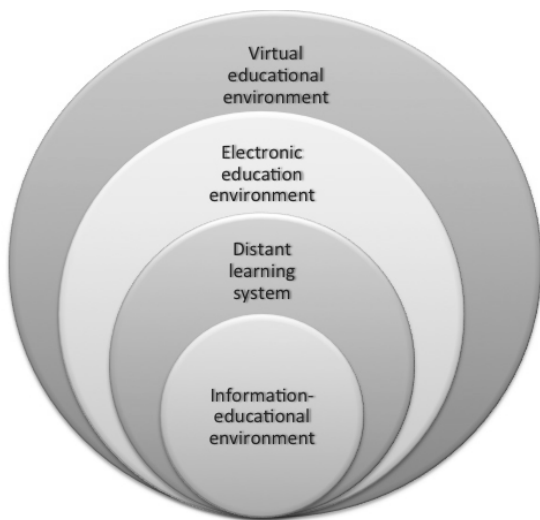
Fig. 1. The scale levels of educational virtualization

Basing on the scheme above we can define the spectrum of our core stakeholders interests. The two categories of student- and faculty-stakeholders will be active on all the scale levels of educational virtualization. Whereas business and government, as the key product consumers (future employers), will only be able to enter the system at the stage of e-learning environment as the vital strategic partners of the educational programs. Depending on the distant learning system technological solution being used it could be possible for the governmental and business stakeholders to take part in the educational process here as well.

Conclusions:

Our research shows that there are three major groups of grounds for educational virtualization.

Each of the grounds can be represented through a set of corresponding instruments to be used to accelerate the virtualization process.

As we now see, moving up from the lowest level of educational virtualization allows the education provider to reach out for larger groups of stakeholders involved in the educational process. The larger the amount of four core stakeholders groups (students, professional staff, partners from other universities, business and government) – the more competitive becomes the final product of the education provider and the higher the «installed-base effect».

For the national intellectual index as the core competitive factor in the changing world economies to become stronger and develop substantial potential, it needs to be heavily invested in. As the continuation of this study we will be looking upon the effect the virtualization of higher education of different scale can potentially have on the Human Development Index. As it has already been mentioned above the number of years spent in higher education has an impact on the MYS and EYS indexes, as well as the amount of population involved in the higher education process does. The concept of «life-long learning» implemented in a row of developed countries should also contribute to the HDI increase. The main hypothesis for our future study will be: the level of higher education virtualization has its indirect effect on HDI and as such sustainability of national economy. Investments into the virtualization of higher education with the regard to its scale and final stakeholders will be proof for the national economic growth in the future. The deeper research on the issue of educational virtualization outcomes has yet to follow.

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TULUGUROVA, Ekaterina V. — *Saint-Petersburg State Polytechnical University.*
195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: Ekaterina.tulugurova@gmail.com

ТУЛУГУРОВА Екатерина Владимировна — *доцент кафедры международных экономических отношений Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, кандидат экономических наук.*
195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: Ekaterina.tulugurova@gmail.com

UDK 339.92

J.V. Lichy, A.V. Kozlov

RETHINKING OF THE TEACHING OF CROSS-CULTURAL MANAGEMENT: AN INVESTIGATION

Дж.В. Личи, А.В. Козлов

ИССЛЕДОВАНИЕ НОВЫХ ПОДХОДОВ К ПРЕПОДАВАНИЮ ДИСЦИПЛИНЫ «КРОССКУЛЬТУРНЫЙ МЕНЕДЖМЕНТ»

The purpose of this enquiry is to explore the skills gap in cross-cultural management (CCM). The focus is on investigating the gap by identifying the CCM skills that students can demonstrate in international business programmes within an academic context, then comparing these elements with the skills that employers require for a career in international business. The enquiry puts forward that there is an urgent need to change the fundamental approach to teaching CCM, away from traditional hard skills towards applied soft skills; to keep abreast of ongoing changes at a global level, and to take into account the impact of technological transformation. The findings point to a number of shortcomings in CCM education today, and serve as a forewarning to those concerned with the future of delivering CCM skills − researchers, faculty and scholars of cross-cultural research.

CROS-CULTURAL MANAGEMENT. INTERNATIONAL BUSINESS PROGRAMMES. GRADUATE SKILLS.

Целью исследования было изучение несоответствия между необходимыми для работы в современной глобальной деловой среде навыками в сфере кросскультурного (сравнительного) менеджмента и навыками, получаемыми в данной сфере выпускниками университетов. Представлены методика исследования и полученные результаты, свидетельствующие о наличии разрыва в требованиях к сотрудникам, работающим в мультинациональной деловой среде и навыках, получаемых выпускниками университетов. Сделан вывод о необходимости изменения фундаментальных подходов к изучению кросскультурного менеджмента путем смещения акцентов с традиционных инструментальных навыков на умения в области деловых коммуникаций и взаимодействий.

КРОССКУЛЬТУРНЫЙ МЕНЕДЖМЕНТ. СРАВНИТЕЛЬНЫЙ МЕНЕДЖМЕНТ. ОБРАЗОВАТЕЛЬНЫЕ ПРОГРАММЫ. НАВЫКИ ВЫПУСКНИКОВ УНИВЕРСИТЕТОВ.

Introduction

The contemporary business world has entered a new era characterised by rapid, dramatic and turbulent changes; change is taking pace globally. The accelerated pace of change has transformed the skills needed by employers, to such an extent that change has truly become an inherent and integral part of modern society. Recent changes have forced organisations of all types, including business schools and universities, to become more internationally competitive. Foreign universities have formed partnerships to facilitate the international mobility of students and faculty, with the aim of enriching or broadening the learning experience; based on the belief that internationalising education can prepare and equip business students with the international knowledge and skills necessary to work in a global, cross-cultural economy.

Cross-cultural management (CCM) is taught worldwide to students of international business programmes. The students are usually familiarised with the iconic work of the cultural essentialist Hofstede; many programmes also include the work of his peers, Trompenaars and Hampden-Turner, plus reference to the studies of Hall. Some students are also taught about the weaknesses of using notions of cultural difference, drawing on the work of McSweeney. By and large, the emphasis is on describing the cultural traits and behaviour of a community who are largely perceived as relatively homogeneous and stable, in order to understand the potential hazards of communicating and negotiating with people from 'different' cultures. Class materials are usually derived from the literature on cross-cultural management, often focusing on two main themes: expatriate failure and a broader inability by Head

Office managers to appreciate the cultural challenges of doing business overseas [1].

It is the view of the authors that this approach to teaching CCM is out of sync with today's changing business environment – characterised by international knowledge management, transnational companies and the rise in global online business communities. Over the past quarter century, globalisation, international mobility and digital technologies have had a dramatic influence on society and business. Concepts such as the *global village*, *international subcultures* and *globish* underscore some of the changes taking place; cultures are crossing languages and languages are crossing cultures. There are strong signs that a certain degree of convergence is taking place, as a result of increasing international mobility. Keeping abreast of change – and incorporating this knowledge into business programmes – is an ongoing challenge for faculty.

CCM is a transversal competence and as such it is «not a clearly demarcated discipline of management» [2]. It is taught by staff from various different backgrounds; in some institutions it is taught by faculty in the language department, in others it is taught by business faculty or international practitioners. The result is that students have at best a one-sided view of CCM and at worst a personal anecdote. There seems to be a lack of contemporary studies into CCM in international business that focus on widening our understanding of the knowledge, skills and contextual influences that can impede effective cross-cultural management.

The present enquiry aims to redress the balance by exploring the skills taught in international business programmes in order to compare them with the skills that recruiters claim graduates require for an international career. Our investigation discusses the changes and evolutions taking place, drawing attention to the need to redefine the delivery of CCM and reformulate the theoretical approach used in teaching.

Existing literature

Two key works have influenced our understanding of cross-cultural management: Adler's *International Dimensions of Organizational Behaviour* [3] and Hofstede's *Culture's Consequences* [4]. Adler studied the impact of culture on different organisational functions;

Hofstede put forward a study of work-related value orientations in 50 different countries. Similarly, the work of Trompenaars [5] contributed an insight into the impact of cultural difference on conducting business in some 40 countries, focusing on three culturally-sensitive aspects: relationships with people, attitudes to time and attitudes to the environment. These early contributions draw attention to the importance of knowing which cultural values are most likely to impact on business, and the necessity of adapting to cultures whose values are different from one's own.

The work of Adler, Hofstede and, to a lesser extent, Trompenaars is frequently referred to in the discourse of international human resource management. International HRM is often considered an integral element of CCM competencies. Notions of international HRM are included in many management training courses to draw attention to the errors caused by «**cultural myopia** – how ethnocentrism blinds us to the salient features of our own cultural make-up, while making us see other cultures as deviations from the correct» [6]. However, it is recognized that many CCM training programmes delivered in the workplace have been «designed for a white middle-class rather than diverse population» [7]. There is clearly a need to adapt the delivery of CCM skills training to different socio-demographic learning communities, adapted for different professions, in order to ensure a better understanding of the cultural influences on the professional and social environments [8].

Without a doubt, it is time to place greater importance on the skills needed to work collaboratively and effectively in a multicultural setting; «cross-national differences in managerial values are commonly recognized as being crucial considerations in the global marketplace where cooperation and understanding are essential to make effective decisions» [9]. Managers must develop multinational skills to compete in today's increasingly complex business environment. Problems can arise «not just because people of different cultures have different sets of values and beliefs but because they either do not realise that differences exist or recognize but fail to respect the differences» [10].

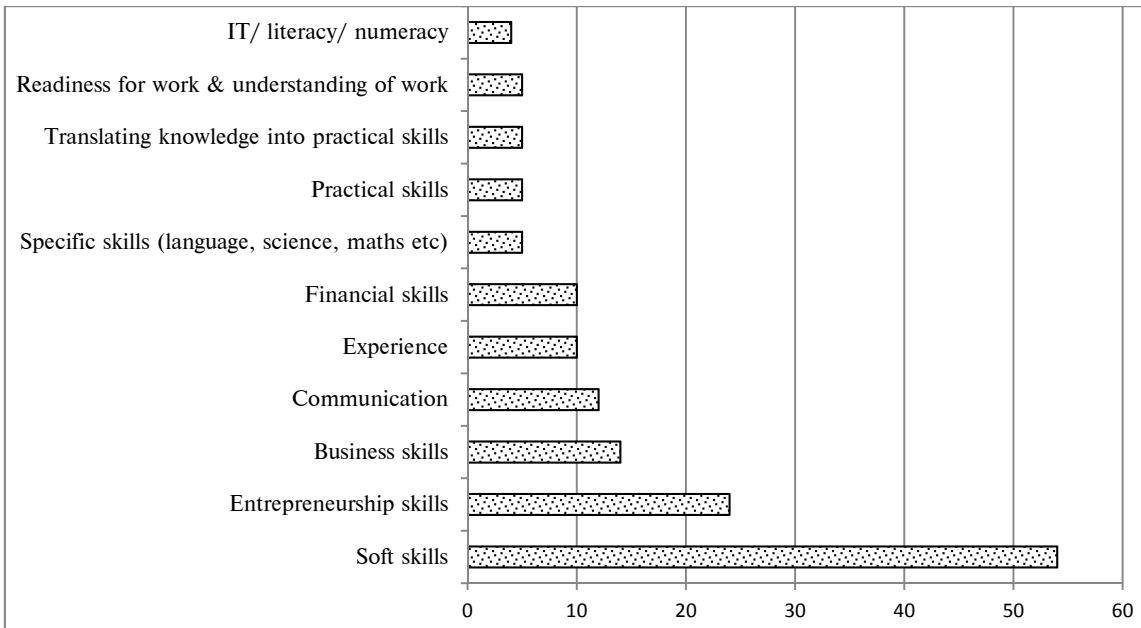Many business schools and universities stress the intercultural dimensions of their curricula,

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Fig 1. Skills needed to close the gap between business and education (Europe)

yet the textbook market has not kept up with that demand. Students need an integrated approach to prepare them for managing at an international level, focusing on «foreign language aptitude; exposure to tutors and students from other cultures; exchange programmes which permit individuals to study in a foreign country; knowledge-based courses which provide a review of key management issues (and not just theoretical models and constructs)» [11]. Many skills, vital for efficient cross-cultural understanding, seem to be lacking or insufficiently taught. A survey by JA-YA Europe provides an overview of the skills that young people need to develop (see Fig. 1) – including soft skills (including Emotional Intelligence, communication, leadership ability, etiquette, conflict resolution, decision making, self-motivation, self-discipline, persuasion, etc.), entrepreneurship skills, business skills, communication, experience, financial skills, specific skills (language, science, maths etc), practical skills, translating knowledge into practical skills, readiness for work & understanding of work, IT/ literacy/ numeracy. No mention is made of cross-cultural management skills [12].

The skills gap is not confined to Europe. The Russian weekly business review *Expert* interviewed university rectors and top management of leading companies in Eastern Europe [13]. The purpose was to estimate the ability of university graduates based on certain criteria (see Tab. 1). The findings highlight a difference of opinion between rectors and employers.

Tab. 1 reflects a disparity between the perceptions of business practitioners and the views of university rectors. Most alarming is the claim that graduates lack basic business competencies including professional skills, ability to apply theoretical knowledge to practice, and skills in self-development. This mismatch underlines the gap between education provision and industry demands.

Table 1

How university rectors and top management perceive graduate ability (Russia)

Criteria of evaluation	Opinion of businesses	Opinion of universities
Basic knowledge	In most cases acceptable	Acceptable
Computer skills	In most cases acceptable	Acceptable
Professional skills	*Weak, outdated*	*Quite good*
Skills in self-development	*Low level*	*High level*
Ability to apply knowledge to practice	*Low level*	*Satisfactory*
Communication skills	Low level	Low level
Team work	Low level	Low level
Involvement ability	*Low level*	*High level*

It can be inferred that international business competencies, including CCM skills, *in practice* cannot be learnt from textbook theory, but from context and the individual perceptions of people as they carry out their actions and routines in organisations. The overarching idea in literature is that business theory as explained in textbooks is rarely found in reality, yet teachers perpetuate the classic frameworks as being extremely useful [14]. It follows that the problem may lie with the pedagogical approach; «textbooks have been criticised as being out-of-date and out-of-touch with contemporary thinking» [15]), indeed «they represented a flawed view of the practitioner world» [16]. It is unreasonable to think that CCM skills can be studied theoretically by an abstract and generalised method.

Taken as a whole, the literature highlights the complex issues facing the acquisition of skills in cross-cultural management. We acknowledge that the fast pace of change in business and technology makes it difficult for academics to keep up-to-date with the needs of industry. Nevertheless, it seems that the CCM skills acquired in an academic context are out of sync with the skills required in the workplace. Reflecting on the literature, we were inspired to take a closer look at the skills gap. To this end, we set out to interview teachers and employers to gain an understanding of skills that students can demonstrate in the classroom and the skills that employers would like to see in the workplace.

Methodology. The setting for this enquiry is a new partnership between two international business institutions; one in the Russian Federation and one in France. Both wish to remain nameless. The 'study abroad' programme enables students to follow international business courses delivered in English at either institution for a semester or a year. Similarly, faculty can participate in teaching exchanges to deliver courses of CCM. It has come to the attention of the visiting professors that CCM education seems far from consistent with industry needs. This perception is the genesis of the enquiry.

The research method for this enquiry is based on a social constructivist approach. Quantitative and qualitative data collection were selected in order to broaden our understanding of the CCM skills taught in business programmes, then contrasted with the CCM skills needed by employers. The methodology is structured in two phases; a secondary research phase followed by a field research phase. The secondary phase examines a number of macro-literature aspects including cross-cultural management learning, the higher education environment, technological advances and so on. An analysis of the literature revealed the importance of understanding cross-cultural communication and cross-cultural awareness for an international career, and the problems associated with imparting these skills and knowledge to students. The illustrations are not produced with the intention of generalising across different national contexts. This is indeed a weakness of much international work; it is recognised that there can be as much difference *within* countries as *between* them.

For the field research, data collection was conducted using a semi-structured survey developed for the purposes of this study (see appendices). A pilot test was undertaken with a group of 10 teachers in each institution in order to gauge the appropriate style for asking questions, and to check for nuances in syntax. We found that more information was shared by participants when the tone of discussion remained informal and style non-antagonistic. Teachers were asked to list the CCM skills which their students were able to demonstrate by the end of the taught programme; employers were asked to list the CCM skills they believe that students need to be able to demonstrate in the workplace. Both groups (teachers and employers) were asked to comment on how CCM skills can be developed.

Teachers and employers were invited by email in late March 2012 to participate in the investigation and share their experience. In total, 38 individuals aged between 27 and 60 years old came forward to be interviewed; 18 male and 20 female participants from across Europe, China, Russia and USA. The surveys were administered face-to-face throughout April and May 2012 to the two groups of respondents; teachers of international business programmes and employers who recruit graduates for an international career. Teachers were asked to outline the skills which the students were able to demonstrate during the course of study. Employers were asked to identify the skills which they felt students needed to develop in order to work effectively in a CCM environment. The respondents were based in either Russia or France, but represented a total of 11 different nationalities; all had several years'

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experience of working or teaching in an international context. They therefore had an informed opinion of broad CCM issues.

During the course of the interview, the participants were encouraged to discuss any issues, particular modules or additional competencies that they believed would enhance CCM learning. These questions, purposely broad, enabled us to capture a snapshot of CCM education today, and thus contribute to our understanding of the challenges faced by CCM faculty and practitioners. To enhance the quality of the responses, the surveys were carried out by two researchers in the native language of each country, even where the subjects claimed to be fluent in English. The surveys were conducted *in situ* in April and May 2012, in the natural environment in which the respondent works in order to gain further insight into the context. Classroom discussion and conversations with the respondents regarding educational challenges and opportunities were an integral part of this investigation.

In each case, the participants were left time to discuss their observations, their frustrations and, occasionally, their proposed solutions. These qualitative data added depth to the understanding

of the situation. Their responses were grouped into 16 broad skills: knowledge of current events, time management, organisational skills, effective communication, interpersonal skills, language skills, team work, ability to discuss theory, ability to apply theory, ability to take notes, ability to understand instructions, appreciation of strategic issues, critical analysis, conceptual thinking, web skills, problem solving. Demographic and personal data was also gathered from the respondents. Personal data was also collected from the respondents. The interviews lasted on average 30 minutes.

These insights — along with the survey findings — were analysed against data published in the public domain (government reports, industry data and academic literature) in order to explore the degree to which students are taught the pertinent CCM skills required by employers. Our main guiding hypothesis was that: the greater the acquisition of relevant skills, the greater the managerial effectiveness of the employee working in a cross-cultural context.

Findings. An analysis of the 38 completed interviews shows strong signs that there is a lack of transferable skills (see Fig. 2). Employers claim
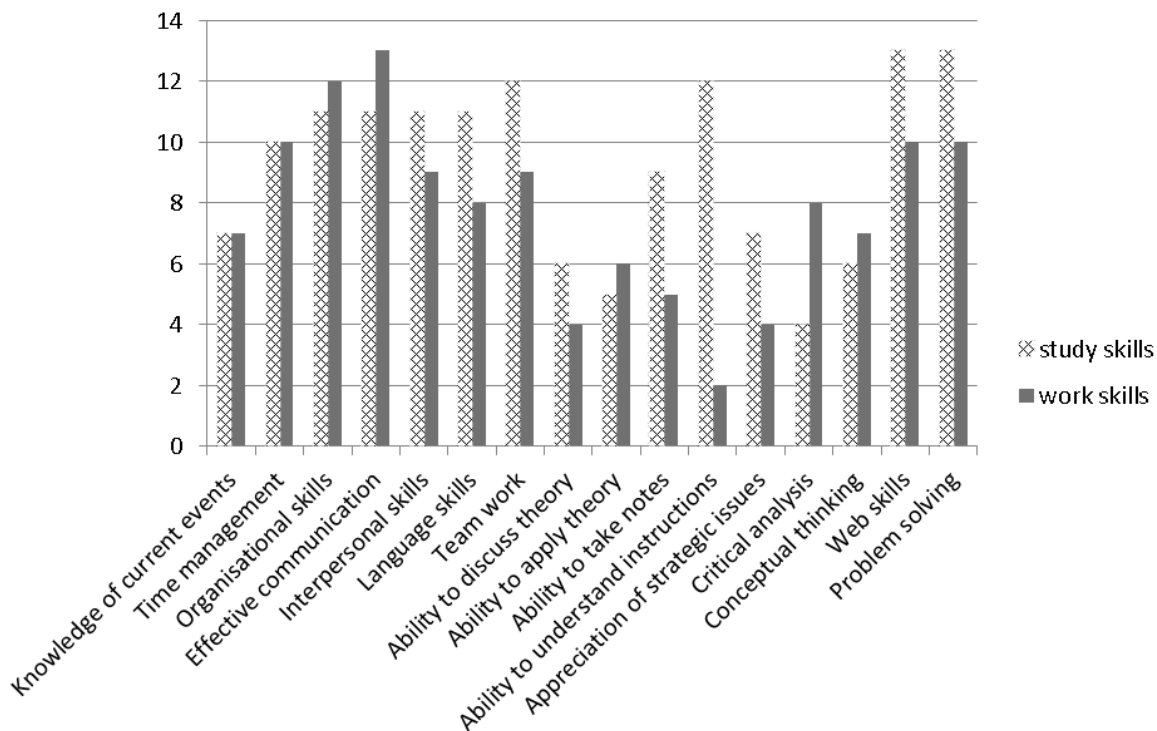
Fig. 2. Comparison of skills demonstrated in academia compared to skills needed in industry

that staff must master a wide variety of skills for CCM *beyond* academic subject matter, including organisation skills, communication, ability to apply theory, critical analysis plus conceptual thinking. In comparison, teachers seem anchored in focusing on delivering hard skills such as the ability to discuss theory, to take notes, to understand instructions and to appreciate strategic issues.

These findings show strong signs that some teachers may be unfamiliar with the changing dynamics of the professional world; that they are unaware of the evolution in the skills needed for graduate jobs in CCM. To a certain degree, Internet technology has overcome many of the traditional barriers in CCM in terms of communication flow and information storage/ retrieval. However, cross-cultural management skills have not been obliterated by converging trends in Internet user behaviour.

In informal discussions following the interviews, a number of respondents shared their views of the skills gap. We ran the comments through Sphinx Lexica to find commonly-cited words and expressions. Employers frequently cited the need to develop skills in time management, interpersonal relations, and digital know-how. Teachers cited language skills, presentation techniques, the need to focus on the task in hand. Another preoccupation mentioned by teachers was the increasing pressure to compete internationally with other academic institutions to recruit students.

Both employers and teachers acknowledge the challenges of managing cultural diversity particularly in terms of *time-keeping*, *reaching consensus* and *applying rigour* when following instructions. To a lesser (yet noticeable) degree, both groups of respondents commented on the need to focus on transversal skills for numeracy and analysis, plus «ethics of behaviour», «speaking and negotiating», «business etiquette» and «cultural nuances».

Several employers commented that they would expect graduate job seekers to have acquired a certain skills set during their studies, including the ability to work autonomously and manage their time effectively, to be able to find solutions to the various problems that arise without asking for help, to take responsibility for decisions made, and so on. One respondent emphasized that the most important expertise in

CCM is organisational skills and personal qualities such as showing initiative, honesty and integrity; over his 20 year career, this respondent has noticed a distinct difference in how cultural origin affects performance at work. Another employer emphasised the preference for employing graduates with «an enquiring mind» who have the potential to build networks internationally – implying the need for fluency in several languages – then added that she believes networking is a vital competence that can enhance both corporate communications and interpersonal relations. It was the view of an American employer that academics «fear students can find new materials faster than teachers can» and that this technology gap is likely to get wider. Over half of the employers stated that graduates of business school programmes can often appear «too self-assured», unable to accept constructive criticism and too eager to implement change. This finding challenges the literature that describes Gen Y graduates as insecure and needing mentoring or «educational hand-holding» [17] because they lack skills in how to manage themselves [18].

Discussions with teachers of CCM revealed different areas of concern. Teachers discussed various interrelated issues that *in their opinion* impede the delivery of CCM knowledge such as students failing to see the relevance of CCM, students insufficiently preparing class materials, a perceived lack of motivation or maturity that prevents some students from grasping the key concepts of cross-cultural communications and cross-cultural awareness. Although almost half of the teachers indicated no need to radically change the content of the courses they deliver, they emphasized the importance of developing core skills such as note taking, understanding instructions, appreciating strategic issues, web skills and problem solving. The level of frustration that some teachers feel was expressed in the emphatic tones used in comments such as «generally quite poor communication skills», «seriously lacking are writing skills and analytical skills» and «poor grasp of English language among native speakers». Another popular theme was the importance of encouraging awareness of «current events and their relevance to what is happening around us».

Comparing the comments from each group, there are strong signs that young people have inadequate skills in CCM. For teachers, students

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lack a wide range of basic skills and knowledge; for employers, graduates lack the ability to *apply* these skills in an international business context. This situation is further complicated by the fact that the skill set needed for today's workplace is constantly shifting and increasingly complex.

Naturally, our interpretation of the findings has certain limitations. The interview questions capture only a very narrow dimension of the research area. Due to the scale of CCM education and practice, it was not possible to ask questions to cover the entire field. Furthermore, given the timeframe and small sample size used in this exploratory study, caution needs to be exercised when interpreting the data. Generalisations have to be avoided. The study focused on a specific cross-cultural context (Russia and France) in mid-2012 within an undergraduate business programme of cross-cultural management. The findings should not be applied to other national contexts, disciplines or sectors.

Suggestions and recommendations for narrowing the gap. Having made a modest attempt at exploring the skills gap, the authors firmly believe that it is essential to increase awareness of the 'chasm' between business and education communities in order to tackle the problem. In the sample, employers observed a perceived lack of skills in 5 key areas: organisational skills, effective communication, ability to apply theory, critical analysis and conceptual thinking. In contrast, teachers raised concerns about the basic skills that students lack, in particular written and verbal communication, time management and general motivation or attitude to learning. This finding suggests that academics and employers need to work closer together to develop relevant syllabi. It draws attention to the importance of partnership-building between business schools, higher education institutions and government bodies as a means of embedding engagement with corporate citizenship, and ultimately sharing examples of best-practice.

Looking at the issue from a provider perspective, the findings can be described as a result of – and can therefore be linked to – the continuation of outdated training methods used by some teachers who favour an approach based heavily on instructive training tools instead of interactive involvement. In other words, the students have no difficulty comprehending instructions (although the results show that recruiters perceive students to lack this skill); it could be that they are merely refusing to comply, or lack the applied competencies to comply. On the other hand, interactive training tools (case study analysis, role play, group projects with industry, and so on) are more likely to motivate students by giving them the opportunity to reflect without constraints, to think creatively, to formulate innovate solutions, and thus develop ideas to aid decision making, critical analysis and strategic thinking. In the learning environment, more emphasis therefore needs to be placed on group discussions in order to facilitate initiative and leadership. Likewise, there needs to be a wider usage of interactive training tools.

Given the range of digital tools available today, a number of possibilities exist to bridge the gap virtually, from social networks to apps. It would be relatively straightforward to create an online community that covers contemporary business events as they unfold, develops debates from business practitioners and academics, hosts a forum to share knowledge and exchange ideas, and provides rolling news-based commentary on international affairs. Many online platforms exist but few are accessible to both the academic community and the business world. The authors aim to extend the study by embarking upon longitudinal research to explore the skills gap in CCM. With sufficient resources, we intend to widen the sample to participants in different cultural and linguistic communities. Research into CCM education is needed to improve our understanding of the technicalities of cross-cultural issues. It is relevant to a number of stakeholders and decision-makers.

Conclusions. The importance of global thinking and global management has been widely promoted over the past quarter century, yet findings of this exploratory investigation show strong signs that it has not impacted on the learning of CCM skills.

The results of the survey provide a narrow snapshot of the challenges encountered in the acquisition of skills for cross-cultural management. The various comments raised by employers and teachers serve as a reminder of the complexity of developing knowledge and skills in this field. Although the participants in the sample came from different national backgrounds, there was

considerable commonality in their responses. Teachers tend to focus on a scholastic approach to developing core skills for CCM; employers require graduates to have mastered the basic skills and be able to apply them. In practice, a number of factors can prevent this process taking place including poor learning methods, lack of resources, behavioural issues and so on. Teachers who build course materials around theory and case studies are likely to impart a different view of CCM compared to teachers who have experience of working in an international context and can thus discuss the extent to which theory is relevant.

It can be said that developing skills in CCM is likely to be more effective when it occurs through life-long-learning than in a classroom context. Successive waves of technological advances and dynamic change in the business world have had *and continue to have* a dramatic effect on the way we do business; with the result

that it is increasingly difficult to keep up-to-date with the latest technological developments and the new business models for the global online environment. Comments raised by employers highlight the fact that practitioners are confronted with these changes on a daily basis. They are equipped to anticipate and respond to changing circumstances. On the other hand, discussions with teachers indicate that the academic community seems less able to keep up-to-date.

Collaborative efforts between employers and academics are urgently needed to create a focused approach to developing competencies and to avoid creating 'silos' of knowledge. This collaboration can take place online and offline. Clearly, more research is needed at an international level into the delivery of CCM skills. We envisage that future research can be undertaken using focus groups, sourced from the business world and the academic community.

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LICHY, Jessica V. — *International school of Management IDRAC, Lyon, France.*

69258, rue Sergent Michel Berthet. 47. Cedex 09. Lyon. France. E-mail: jessica.lichy@idraclyon.com

ЛИЧИ Джессика — *профессор международного маркетинга, PhD; Международная школа менеджмента ИДРАК, Лион, Франция.*

E-mail: jessica.lichy@idraclyon.com

KOZLOV, Alexander V. — *Saint-Petersburg State Polytechnical University.*

195251, Politekhnicheskaya str. 29. St. Petersburg. Russia. E-mail: akozlov@spbstu.ru

КОЗЛОВ Александр Владимирович — *заведующий кафедрой мировой и региональной экономики Инженерно-экономического института Санкт-Петербургского государственного политехнического университета, доктор экономических наук, профессор.*

195251, Россия, Санкт-Петербург, ул. Политехническая, д. 29. E-mail: akozlov@spbstu.ru

УСЛОВИЯ ПУБЛИКАЦИИ СТАТЕЙ

в журнале «Научно-технические ведомости Санкт-Петербургского государственного политехнического университета. Экономические науки»

ОБЩИЕ ПОЛОЖЕНИЯ

Журнал «Научно-технические ведомости Санкт-Петербургского государственного политехнического университета. Экономические науки» является периодическим печатным научным рецензируемым изданием. Зарегистрировано Федеральной службой по надзору в сфере информационных технологий и массовых коммуникаций (Роскомнадзор). Свидетельство о регистрации ПИ № ФС77-52146 от 11.12.2012 г. С 2008 года выпускался в составе сериального периодического издания «Научно-технические ведомости СПбГПУ» (ISSN 1994-2354).

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