INNOVATION TOOL FOR EARLY DIAGNOSIS OF GLOBAL PRE-CRISIS SITUATIONS

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Methodology

The model of National and transnational intellectual capital (**NTIC**) is used as a methodological forecasting tool. The four interrelated components form the cluster model for economic growth: 1) Universities as knowledge generators; 2) innovation networks transforming knowledge into technology, industrial designs and services; 3) commercial organizations manufacturing products and providing related services for mass market, ensuring added value (Diagram 1) based on knowledge, technology, industrial designs and new services; 4) considerable amount of added value is transformed into investments, which play the role of engine for economic growth.

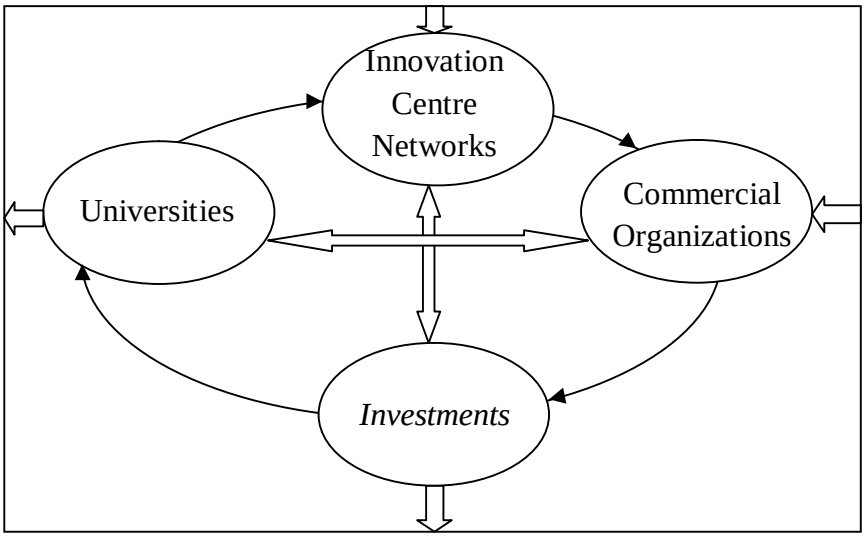

Diagram 1. Cluster model for economic growth

National and transnational intellectual capital in terms of development of network or digital economics, e-governance and business, e-trading and commerce is represented by simple and accessible virtual model clusters of NTIC (virtual representations of universities, innovation networks and commercial organizations in global networks) component, which are affordable and accessible for visual reflection, measurement and assessment. Four clusters of virtual components of NTIC model and their applying principles are analogous to the principles of **Natural Philosophy** and **Metaphysics**, modeling the four fundamental forces of nature: **fire**, **earth**, **water** and **air**.

To study the human body, medicine uses three different approaches simultaneously: the study of brain and nervous system, the study of cardiovascular system and the study of gastrointestinal tract. The results of the comprehensive study enable to diagnose more reliably and accurately the condition of a body and its development prospects in general. To perceive properties of an integer, one should know the properties and characteristics of its constituents. Thus, economic management implies that not knowing its features, advantages and disadvantages (both tangible and intangible assets) as a system, makes it impossible to increase its competitiveness. WB and IMF experts, using traditional approaches with indicators that are specific to tangible assets, do not always consider patterns of balanced development of intangible assets in their interactions (including tangible assets). The forecasts of international organizations gradually lack confidence.

The offered tools are widespread, accessible to all management levels on both national and supranational scales, to professionals and experts in the field of social and economic forecasting, to investors, universities, innovation and commercial organizations, government officials and public employees. The authors present below the results of the forecasts of the growth of World, Russian and Armenian Economies, which are formed based on the offered tool, compared with the forecasts of international organizations and national experts.

1. FORECASTS OF GLOBAL ECONOMIC GROWTH

RANKING OF QI CLUSTERS OF VIRTUAL INTELLECTUAL CAPITAL (VIC) OF TRANSNATIONAL CORPORATIONS (TNC), THE EUROPEAN NETWORK OF INNOVATION CENTERS AND WORLD LEADING UNIVERSITIES (RESULTS FOR 2016)

The analysis of the dynamics of the ranking indicators of **Arcaler QI of VIC of TNC on the results for 2016** confirms the accuracy of the forecasts by the authors: *diverse stages of global financial crisis persist.* As compared with the ranking for 17.06.2016, the value of QI of VIC of TNC on **17.12.2016 decelerated** from **0.17** to **0.14** (Diagram 2). Compared with the ranking for 10.06.2016, the average value of QI of VIC of the European network of innovation centers on **10.12.2016 decelerated** from **0.044** to **0.038** (Diagram 3). Compared with the ranking for 13.06.2016, the average value of QI of VIC of world leading Universities on **13.12.2016 decelerated** from **0.24** to **0.09** (Diagram 3).

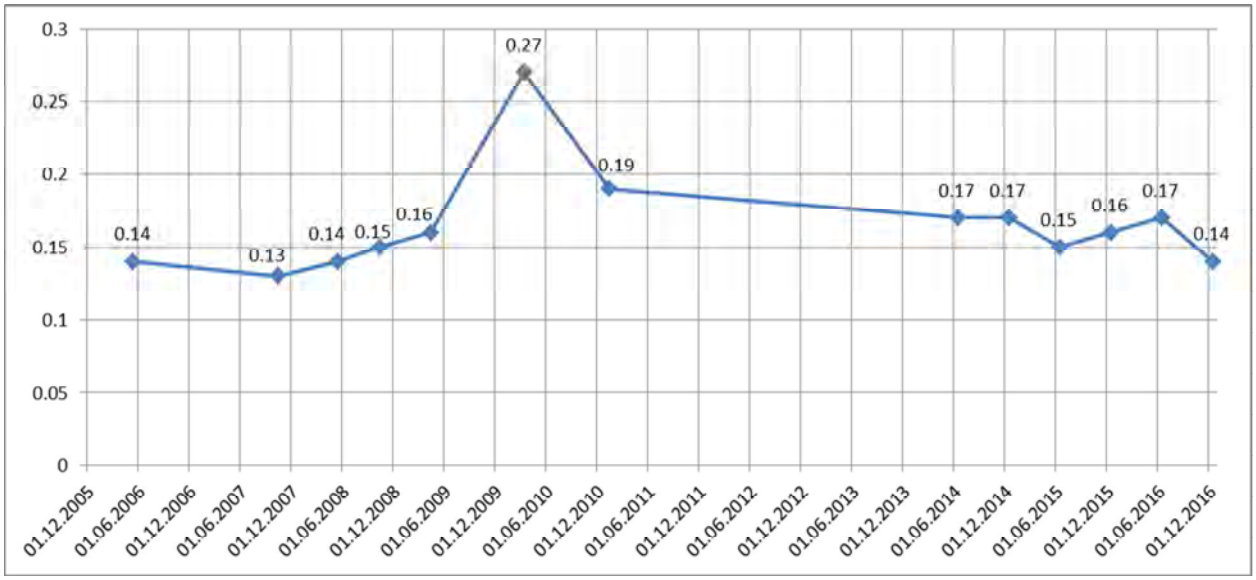

Diagram 2. QI of VIC of transnational corporations

The tendencies of deceleration of **QI of VIC clusters of TNC, the European network of innovation centers and world leading Universities** diagnose **symptoms of crisis extension, the emergence of new risks and threats**. Thus, QI of VIC of the European network of innovation centers fell from 0.178 to 0.038 since 2006 to 2016; QI of VIC of TNC for 2016 (0.14) tends to the absolute minimum registered in 2007 (0.13). QI of VIC of the world leading universities for 2016 (0.09) also tends to the absolute minimum of 2014 (0.091): for comparison, in 2007 QI of VIC of the world leading universities was equal to 0.275.

Comparison of the obtained indicators with the forecasts of the World Bank and other international organizations confirm the hypothesis: *ArcaLer (QI of VIC) is an innovative, vivid, secure and reliable tool for early diagnosis of global economic crises, mismatch of global social-economic processes.*

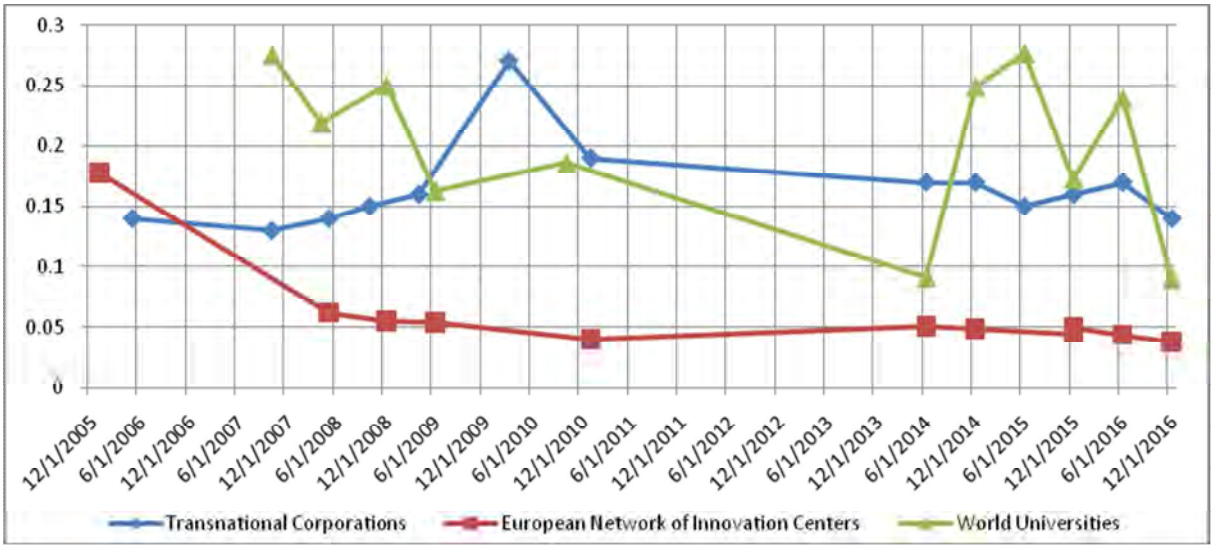

Diagram 3. QI of VIC of TNC clusters, the European network of innovation centers and world leading universities

Main Conclusions

It's time to change the development strategy at all levels of governance and to start increasing investments in national intellectual capital. This is extremely crucial for ensuring sustainable global economic growth for general welfare.

THE WORLD BANK FORECASTS

11 January, 2017 (TASS). **The World Bank deteriorated forecasts of global economic growth (0,1 percentage point) up to 2,7% and 2,9% in 2017 and 2018 respectively**. It is stated in "Global economic prospects 2017" report of the organization. Thus, the World Bank forecasted global economic growth up to 2,8% in 2017 and to 2,8% in 2018. In this regard, the World Bank lowered the forecast for global economic growth in 2016, projecting "*serious obstacles*" for "*emerging economies*".

According to WB experts, stagnant global trade, subdued investments and heightened policy uncertainty marked another difficult year for the world economy: "*A moderate recovery is expected for 2017, with receding obstacles to activity in commodity-exporting emerging markets and developing economies. Weak investment is weighing on medium-term prospects across many emerging markets and developing economies. Although fiscal stimulus in major economies, if implemented, may boost global growth above expectations, risks to growth forecasts remain tilted to the downside. Important downside risks stem from heightened policy uncertainty in major economies.*" (http://tass.ru/ekonomika/3930868).

11 January, 2017 (FINMARKET.RU). **The World Bank (WB) "Global economic prospects 2017" (GEP) report**. WB experts project global economic growth for 2017 at 0.1 percentage point lower than the June 2016 forecast. Forecasts for 2018 are also deteriorated reaching 2.9%, 0.1 p.p. lower. The WB forecasts that global economic growth rates are expected to remain at 2,9% level in 2019. According to WB evaluation, global economy expanded by 2,3%, estimating it as **the lowest pace for post-crisis period**.

Forecasts for global economy are clouded by uncertainty about policy directions in the world leading countries. A protracted period of uncertainty could prolong the slow growth in investment that is holding back low, middle, and high income countries.

"*After years of disappointing global growth, we are encouraged to see stronger economic prospects on the horizon,*" the World Bank Group President Jim Yong Kim said. "**Now is the time to take advantage of this momentum and increase investments in infrastructure and**

people. This is vital to accelerating the sustainable and inclusive economic growth required to end extreme poverty."

2. FORECASTS OF ECONOMIC GROWTH IN RUSSIA

RANKING OF QI CLUSTERS OF VIRTUAL INTELLECTUAL CAPITAL (VIC) OF THE LEADING COMMERCIAL ORGANIZATIONS IN RUSSIA, THE EUROPEAN NETWORK OF INNOVATION CENTRES AND UNIVERSITIES (RESULTS FOR 2016)

The analysis of the ranking indicators of **QI of VIC** clusters of diverse organizations allowed the authors to identify extension of the current phase of Russian economic and fiscal crisis. Tendencies of deceleration of **QI of VIC of the leading commercial organizations in Russia** diagnose adverse state of Russian economy (Diagram 4). Nevertheless, Russian economy displays possible modest deceleration of crisis and symptoms of economic recovery.

Compared with the ranking on 16.06.2016, **the average value of QI of VIC of the leading commercial organizations in Russia on 16.12.2016 lowered** from **0.13** to **0.12** (Diagram 4). Compared with the ranking on 16.06.2016, the average value of **QI of VIC of the network of Russian innovation centers** (**including centers in Belarus and Moldova**) lowered from **0.158** to **0.144 by the end of 2016**. Compared with the ranking on 02.06.2016, the average value of **QI of VIC of the leading universities in Russia has accelerated** from **0.26** to **0.29** (Diagram 5).

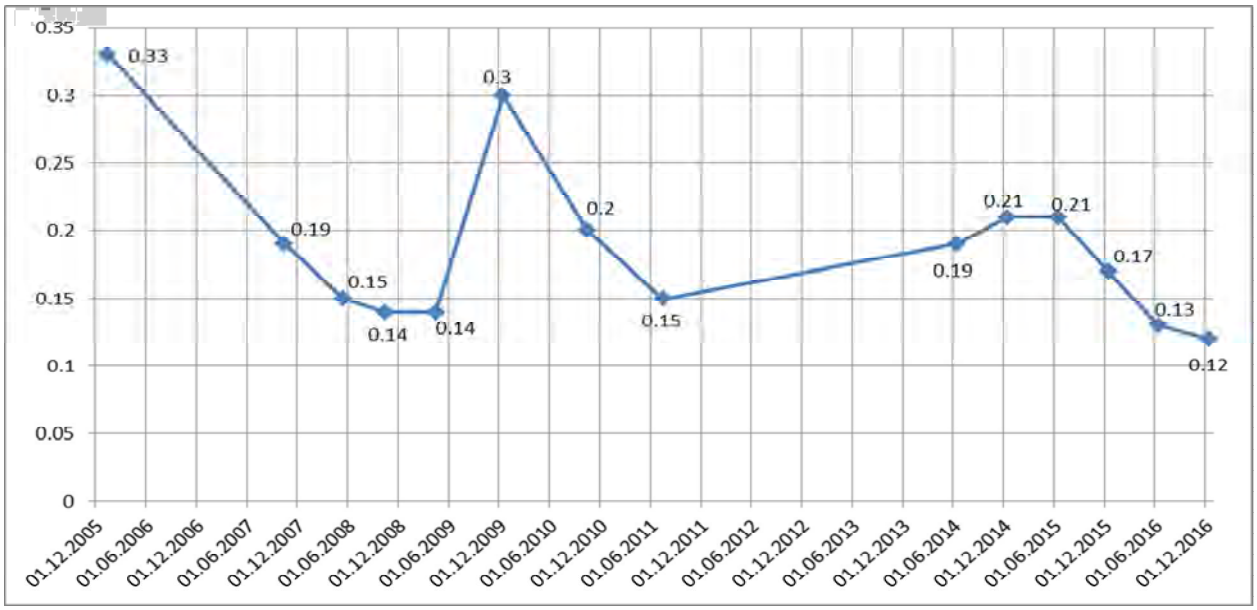

Diagram 4. QI of VIC of the leading commercial organizations in Russia

Tendencies of deceleration of crisis and its possible recovery symptoms are shown in Diagrams of **QI of clusters of VIC of the leading commercial organizations in Russia, the network of innovation centers and leading universities by acceleration charts of QI of VIC of the leading universities in Russia, compared to fall of QI of VIC of the leading commercial organizations in Russia and QI of VIC of the network of innovation centers** (Diagram 5).

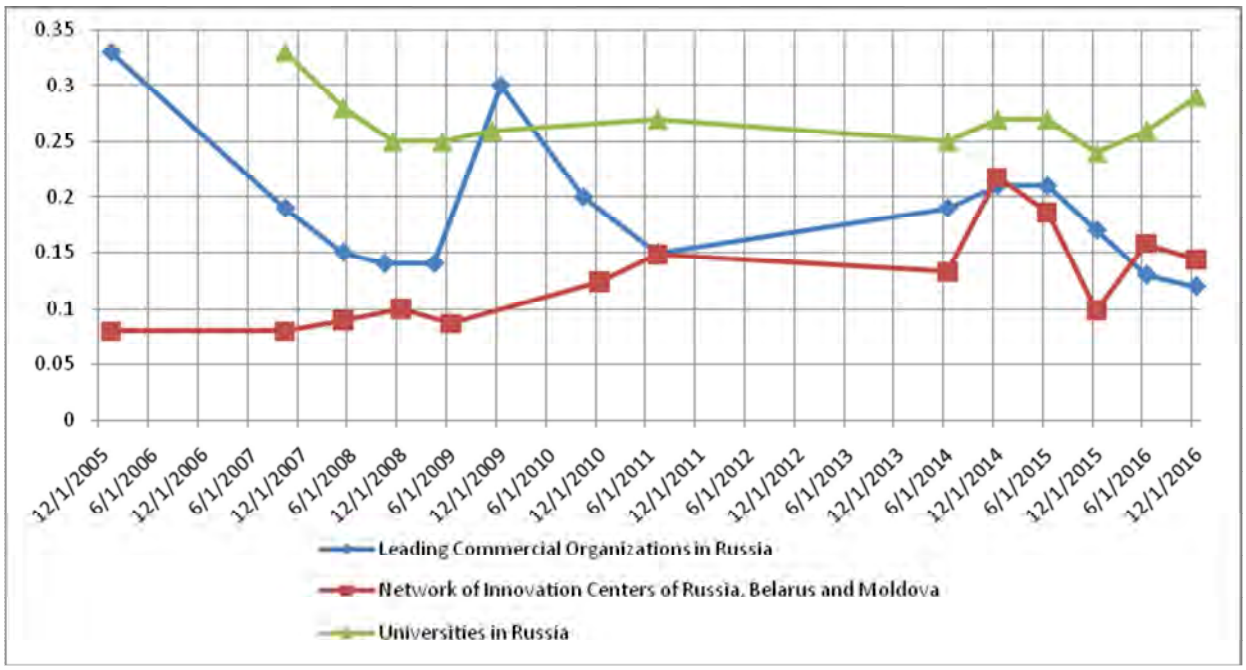

Diagram 5. QI of VIC cluster of the leading Russian commercial organizations, the network of innovation ceners and universities

However, instead of maintaining a positive trend, the Russian government is taking an inadequate solution: the expenses for the development program of the scientific-technological complex are reduced by 25 billion rubles. The expenses for scientific research will be reduced by 19 billion rubles (see **annex**).

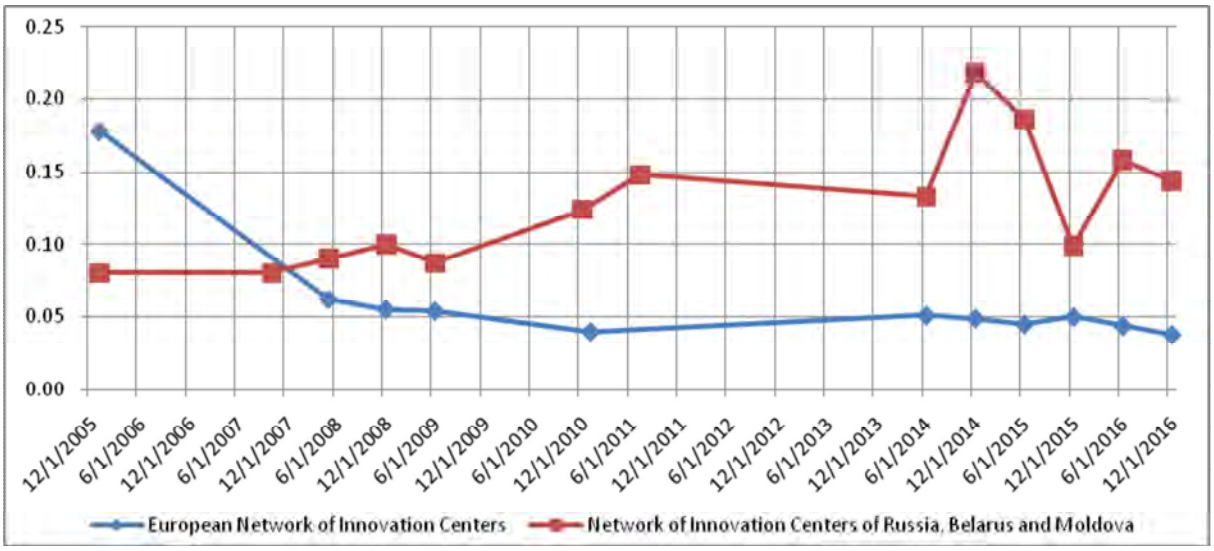

Diagram 6. QI of VIC of the clusters of the European and Russian networks of innovation centers

Consumptions on development of the scientific-technological complex in 2017-2019 will be reduced by 25 billion rubles regarding to the values established for that period in the federal targeted program for development of the scientific-technological complex in 2014-2020. The comparative diagram (Diagram 6) shows that **QI of VIC of TNC** is higher than **QI of VIC of the commercial organizations in Russia**. **This states that the level of competitiveness of the commercial organizations in Russia do not correspond to global standarts yet**. To accelerate their competitiveness, investments should be made in intellectual capital of the leading

commercial organizations in Russia, which requires fiscal investments in developing the scientific-technological complex.

The West and US tend to decelerate Russian economic growth and to lower competitiveness of the leading commercial organizations in Russia. It should be mentioned, that sanctions affected deceleration of **QI of VIC of the commercial organizations in Russia from 2014 to 2016**. QI of VIC of the commercial organizations in Russia fell from **0.21** to **0.12** (nearly two times). This is the lowest indicator for 2006-2016.

Despite deceleration of growth, value of QI of VIC of the **network of innovation centers** picked up from **0.08 (in 2007)** to **0.144**, **rising nearly twice**. Value of QI of VIC of **leading universities in Russia decelerated** from **0.33 (in 2007)** to **0.26**, which is inadmissible. **QI of VIC of the Russian network of innovation centers is higher than QI of VIC of the European network of innovation centers** (Diagrams 2, 4, 6). These features and advantages were not considered by the Government while making strategic decisions. If values of QI of VIC of the Russian network of innovation centers and commercial organizations (Diagrams 4, 6) keep on decelerating and reach the accessible limits, the future investments into development of the scientific-technological complex and education will not provide the desired effect. While making strategic decisions, the Russian Government needs complex, multivariant approach based on the data on managing national intellectual capital.

Main Conclusions

The growth driver of Russia is the balanced development of national intellectual capital. It is high time to start increasing investments in intellectual capital by anticipatory growth of investments in the leading universities in Russia and development of the Russian innovation network. This is extremely important to ensuring growth of the country's competitiveness, sustainable economic growth and general welfare.

FORECASTS OF THE WORLD BANK AND RUSSIAN EXPERTS

The World Bank retained its outlook for deceleration of Russian GDP in 2016 at 0,6% level. It has also confirmed its earlier forecasts on Russian economic growth at 1,5% level in 2017 and at 1,7% level in 2018, the growth is expected to edge up to 1,8% in 2019 (Finmarket.ru). "Global economic prospects" report defines terms for Russian economy overcoming the crisis; the analysts forecast sustainable deceleration in Russia. The World Bank experts state that Russia will resume growing after recession in 2017 and 2018: "In 2017 recession will be followed by growth at *1,3% GDP*". In 2018 growth recovery of Russian economy will expand by 1,5%. It is mentioned in the commentaries on numeric indicators that "economic activity will be receded by sustainably low prices for oil and international sanctions". "*Investments are constrained by weak confidence of investors and high interest rates, and consumption is obstracted by a sharp decline in the purchasing power of the population,*" the report authors write (http://tass.ru/ekonomika/3930868).

"**There are no miracles**": economic outlook and forecasts of the new Minister fpr Economic Development: "Taxes should not be raised; they need to be properly collected... If all companies pay taxes, competitiveness will lead to higher labor productivity. Otherwise, those who are more cunning will win, but not those who are better." State-owned companies need to save on costs and salaries to increase investment. Explaining how to achieve GDP growth of 3% per year, Oreshkin notes that it is necessary to increase the share of investments in GDP from the current 17-18% to at least 30%. And this money can be found only by saving on current consumption.

"Those who grow faster (countries whose GDP increases by more than 2% per year. – TASS's note) have a higher share of investment in GDP - 30-40%. Roughly, they consume less, save and invest more. ...It is important to reduce the least effective current consumption: the public sector, officials, and state companies. They should improve the efficiency of their

investments. It is not fair when the poorest pay the inflation tax, and the state-owned companies seem to live in an alternate reality: tariffs are increasing, salaries are rising," Oreshkin noted in an interview with "Dengi" magazine in February 2016. "All you need is growth and high consumption here and now. But having everything at once will not work. There are no miracles," the economist said.

The Minister for Economic Development says in this regard, that from the economic policy perspective we should not guess the price of oil. "We should realize the form of economic policy in each of the scenarios. We should envision the possible risks and corresponding reactions. More conservative ratings are preferable from the perspective of budgetary policy," he said in his TASS interview. "The main objective (of the Government) is to ensure medium and long-term segregation of Russian economy from fluctuations in the external economic situation. We face a mechanism that will give our economy the opportunity to stop following oil quotes. The price may fluctuate in foreign markets, while the domestic economy will obtain constant character. It is a corridor to $40-50 per barrel," Oreshkin said in an interview with TASS. To ensure this, a new budget rule should be introduced, which will oblige to provide part of the oil and gas budget revenues to the Reserve Fund or the National Welfare Fund, when oil prices exceed the established level.

Russia has new drivers for growth. "New drivers for growth have already emerged in the economy: agriculture, chemical and food industry, domestic tourism," Oreshkin said in an interview with Bloomberg agency in May. Nevertheless, he admitted that these drivers "have not yet managed to block structural single drop in other industries". Russia has better adapted to the crisis than the other countries (http://tass.ru/politika/3827628).

3. FORECASTS OF ARMENIAN ECONOMIC GROWTH

RANKING OF QI CLUSTERS OF VIRTUAL INTELLECTUAL CAPITAL OF THE LEADING COMMERCIAL ORGANIZATIONS AND UNIVERSITIES IN ARMENIA (RESULTS FOR 2016)

Tendencies of crisis intensification in Armenian economy are visualized in the diagram showing **QI of VIC clusters of the leading commercial organizations and universities** (Diagram 7). **QI of VIC of universities in Armenia** decelerated abruptly from **0.17 (in 06.2016)** to **0.1 (by the end of 2016),** resulted in deceleration of QI of VIC of commercial organizations from 0.13 (in 05.2016) to 0.1 (in 11.2016). **An unsastainable character of development of QI of VIC of Armenian commercial organizations and leading universities is observed** (Diagram 7).

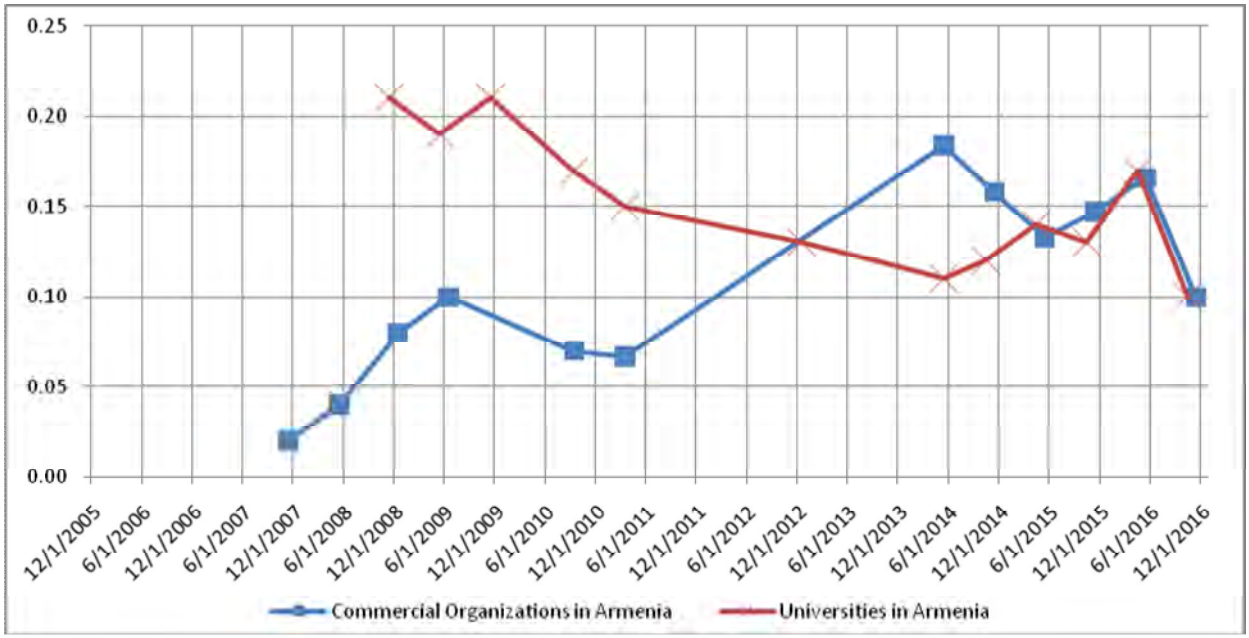

Diagram 7. QI of VIC clusters of the leading Armenian commercial organizations and universities

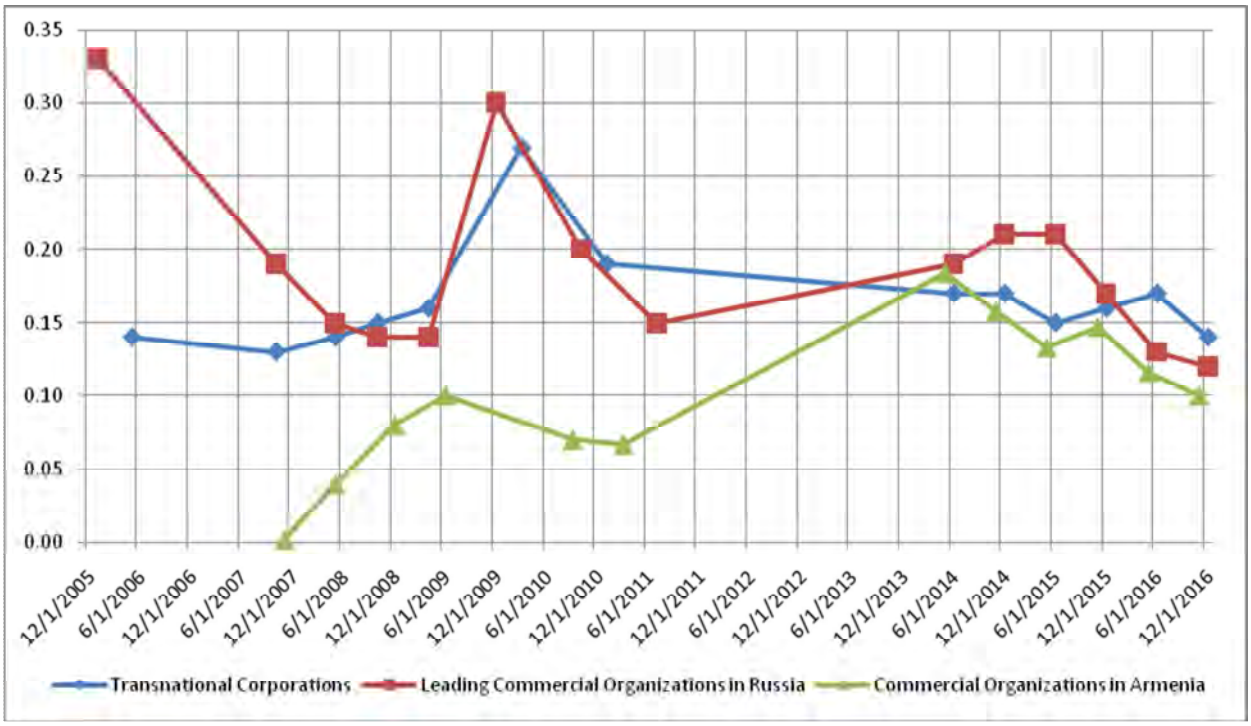

Diagram 8. QI of VIC TNC clusters of the leading Armenian and Russian commercial organizations

QI of VIC of Armenian commercial organizations is significantly lower than QI of VIC of Russian TNC and leading commercial organizations (Diagram 8). **The level of competitiveness of the country's economy is far from the desired indicator**. Analysis of QI of VIC trajectory in Diagram 8 shows that Armenian economic growth depends on global and Russian economic growth.

The Armenian Government did not manage to decrese the level of this dependency. New threats and risks have arisen. All this decelerates the level of Armenian economic security.

Analysis of the trajectory of QI of VIC clusters in Diagram 9 shows that Armenian economic growth is mostly affected by growth of QI of VIC of the leading universities. For this purpose, investments in higher education are needed to ensure its growth to at least the level of QI of VIC of the leading universities in Russia.

It should be mentioned, that in 2008-2009 QI of VIC of universities in Armenia outpaced QI of VIC of universities in Russia. Nevertheless, for 2015-2016 while marking the growth of **QI of VIC of Russian universities in Armenia, decrease of QI of VIC of universities is observed**.

Large investments are needed in forming and developing an innovation infrastructure in Armenia, in scientific-pedagogical training in the RA. Armenia can resist the threats if having the concept of anticipatory growth and effective management by developing national intellectual capital as the basis of the development strategy.

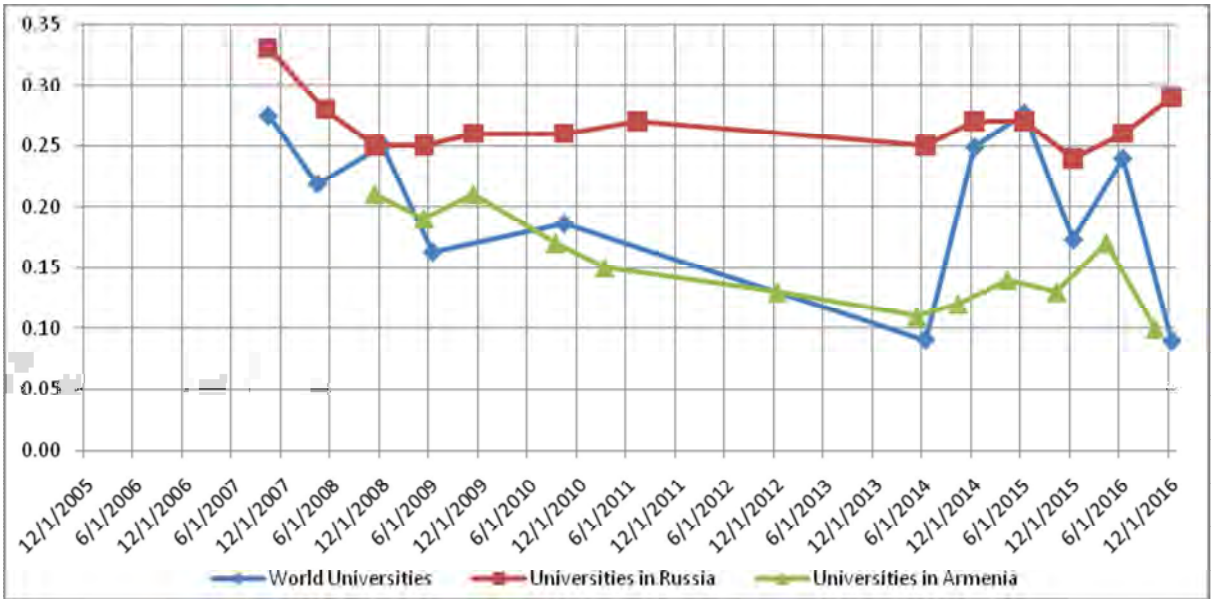

Diagram 9. QI of VIC cluster of leading world, Russian and Armenian universities

The World Bank declined forecasts for Armenian economic growth in 2017 up to 2,7%[1]

The January review "WB Global Economic Prospects - Weak Investment in Uncertain Times" of the World Bank forecasts Armenian economic growth to 2,7% in 2017. According to the World Bank rates, Armenia will have economic growth by 2,4% by the end of 2016. The WB forecasts Armenian GDP growth to 2,7% in 2017, to 3% in 2018, and to 3,2% in 2019.

In previous June "Global Economic Prospects" report of the WB, Armenian economy was projected to expand by 1,9% in 2016, by 2,8% in 2017 and by 2,9% in 2019.

As the co-director of the World Bank's program in Armenia noted last December, the WB has changed to zero the forecast for the growth of the republic's economy by 2016 results. The Armenian Ministry of Economic Development projects that economic growth in the republic will reach 0.5-0.6% by the end of 2016. According to the state budget of Armenia, GDP growth in Armenia is planned at a rate of 2.2% for 2016, and 3.2% for 2017.

Significant economic growth in Armenia projected in 2017[2]

"Growth of economy, export and investments in Armenia will significantly accelerate in 2017", Minister for Economic Development and Investments of RA Suren Karayan said on Thursday. He states that the Government revised the model for economic development, and puts the main emphasis on economic development, based on market proposal. "Considering Armenia's small size, we put special emphasis on the necessity to build up our exports to propel the country's economic development," Karayan said.

Presenting the forecasts for 2017, the Minister mentioned that it is planned at least to retain the indicators of the country's export growth registered in 2016 and even increase them. "Investments are also expected to grow thanks to particular efforts made in the fourth quarter of 2016. Significant indicators in economic growth and economic activity in industry are also expected in 2017," Karayan said. Earlier the Minister said that in 2016 Armenia will hit two economic records – in export and industry. Armenia's export will grow by 21% in 2016, compared with 2015, edging up to min 25% in the fourth quarter. Export acceleration resulted in significant industrial development; particularly, Armenia might end the year 2016 with a 7% industrial growth hitting the record high.

[1] 11 January 2017, Lragir.am, ARKA
[2] 12 January 2017, Lragir.am, ARKA, http://www.lragir.am/index/rus/0/economy/view/53128

The Ministry of Economic Development expects direct foreign investments in Armenian economy up to $150-200 million. Direct foreign investments totaled $92 million in a nine-month period in 2016. Karayan says a 5-6% economic growth a year is needed in Armenia to have the population's income increased.

Afterword

Even short-term forecasts of the World Bank and other international organizations and experts are not always objective and are usually regularly updated. A new approach and a more reliable tool for short-term forecasting at global and national levels are required. One of these new innovative tools is the forecasting based on the ranking of **QI of VIC clusters of commercial organizations, universities and networks of innovation centers**. The Russian network of innovation centers has a considerable potential for Russian economic growth, compared with the European one which has practically exhausted its resources. Much more investments will be required to ensure the growth of intellectual capital of the European network than that of Russian.

A competent management will allow the Russian network of innovation centers, along with the innovation centers of the EAEU countries, to become a locomotive for formation and development of EAEU intellectual capital. This will ensure growth of competitiveness of EAEU.

An indisputable success will be achieved through a thorough coordination of the policy in the field of innovation management for forming and developing national intellectual capital. **The developers of economic policy in EAEC member countries should consider the highest effective, balanced use of positive effects of innovation activities in national economies**.

Innovations in management of national intellectual capital require continuous investments. Before the crisis in 2009 the world R&D expenditures expanded by about 7% a year. The data (published in 2016) shows that R&D expenditures around the world expanded by only 4%. The EAEC member countries registered two times lower indicators. Independent experts project up to 3% growth of R&D expenditures around the world in 2017. Thus, it cannot be assured that the global crisis will be successfully overcome.

References

1. Vahanyan, G. and Vahanyan, H. (2016), "Winning with the help of global innovations (on the example of Russia and other EAEU member countries)" in **Modernization of Russia: Priorities, Challenges, Solutions proceedings of the XVI International Scientific Conference, Moscow, 20-21 December, 2016**, Russian Academy of Sciences, Institute of Scientific Information on Social Sciences of the Russian Academy of Sciences, INION RAN, Moscow, available at:http://ukros.ru/wp-content/uploads/2016/12/ваганян_ваганян.doc (accessed 07 April 2017).
2. Vahanyan, H.G. (2016), **Management of the formation and development of intellectual capital (concept, technology, systems engineering)**, Monograph, Megaprint, Yerevan, 236 p.
3. Vahanyan, G., Vahanyan, H. and Tumyan, L. (2015), "Comparative analysis of the national intellectual capital of the BRICS countries as a key factor in the growth of the quality of public administration and competitiveness" in **BRICS countries: development strategies and mechanisms for interaction and cooperation in a changing world 2015 proceedings of the I International Scientific and Practical Conference in Moscow, 2-3 November, 2015**, INION RAN, Moscow, 2016, pp. 218-221.
4. Vahanyan, G.A. and Vahanyan, H.G. (2016), "Key problems of Russia in inefficient constitutional management", **Yearbook "Russia: Development Trends and Prospects"**, Vol. 1, Russian Academy of Sciences, INION RAN, Moscow.

5. Vahanyan, G. and Vahanyan, H. (2016), "Patterns of world economy and cognitive models of the clusters of virtual intellectual capital", **Yearbook "Russia: Development Trends and Prospects"**, Vol. 2, Russian Academy of Sciences, INION RAN, Moscow.

6. Vahanyan, G.A., Vahanyan, H.G. and Ghazaryan, M.E. (2015), "Early diagnosis of global pre-crisis situations", available at: http://www.iatp.am/news/rating/rating-2015.pdf (accessed 29 July 2015).

7. Vahanyan, G.A. and Vahanyan H.G. (2014), "The concept of interactive management of intellectual capital of the Eurasian Economic Union as a key factor in the growth of competitiveness and modernization" in **Modernization of Russia: Key Problems and Solutions proceedings of the XV International Scientific Conference in Moscow, 18-19 December, 2014**, INION RAN, Moscow.

8. Vahanyan, G.A. and Vahanyan, H.G. (2011), "The strategy of cognitive public management or how to transform capacities into competence" in **Situational Centers - 2011 (situational centers and "electronic government") proceedings of the Scientific and Practical Conference in Moscow, 26-27 April, 2011**, Russian Academy of Public Service under the RF President, Moscow.

9. Vahanyan, H.G. (2009), "A Virtual Tool for Intellectual Capital Management" in **proceedings of the European Conference on Intellectual Capital, Haarlem, the Netherlands, 28-29 April, 2009**.

10. Vahanyan, G.A. (2009), "Strategic analysis of virtual intellectual capital and indicators of knowledge economy in the Situation Center (not traditional capture of knowledge)" in Situation Centers – 2009 (modern information and analytical technologies for decision making) proceedings of the Scientific and Practical Conference in Moscow, 14-15 April, 2009, RAPA.

11. Vahanyan, G.A. (2008), "Global financial crisis, measurement and evaluation of intellectual capital of the leading commercial and innovative organizations, educational institutions in the world and in Russia" in **Russia: Key Problems and Solutions proceedings of the IX International Scientific Conference, Moscow, Russia, 11-12 December, 2008**, INION RAN.

12. Vahanyan, H.G. (2008), "Tool for measuring and evaluating the intellectual capital of Russian organizations in network economy", **Proceedings of the Federal Service for Intellectual Property, Patents and Trademarks**, RSIIP.

13. Vahanyan, G.A. (2007), "Reducing the quality of public administration is a threat to national security (on the example of Armenia)", **"Public Service" Scientific and Political Journal**, Russian Academy of Public Service under the RF President, Vol. 4, No. 48.

14. Vahanyan, H.G. (2007), "Management of intellectual capital as an effective instrument of strategic management in Russia through knowledge economy", **Creative Economy**, No. 5, 6, 7.

15. Vahanyan, H.G. (2007), "Methodology of efficiency assessment in intellectual capital", **Creative Economy**, No. 9.

16. Vahanyan, H.G. (2007), "Refined estimation of intellectual capital based on Tobin's q and the methodology for efficiency assessing in intellectual capital", **Russian Entrepreneurship**, No. 11.

17. Vahanyan, H.G. and Gaponenko, A.L. (2007), "Comparative analysis of indicators of economies based on knowledge, formed in the US, Europe and Russia", **"Europe: Transition to the Knowledge Society?" proceedings of the Actual Problems in Europe**, No. 2.

18. Vahanyan, H.G., Vahanyan, G.A. and Bleyan, V.Yu. (2006), "Methods for rating determination and assessment of intellectual capital of the leading Russian innovation universities", **Journal of Telecommunications and Informatization of Education**, Vol. 6, No. 37.

19. Vahanyan, G.A. (2006), "Intellectual capital: investments in the future", **Cnews analyst, Survey "IT in National Projects", Education in the Information Society**, Moscow, Russia.

20. Vahanyan, G.A. (2006), “Russian universities - who is better?”, **Cnews analyst, Survey “IT in national projects”, Education in the Information Society**, Moscow, Russia.

21. Vahanyan, G.A. (2006), “Where is Russian intellectual capital concentrated?”, **Cnews analyst, Survey “IT in national projects”, Education in the Information Society**, Moscow, Russia.

22. Vahanyan, G.A. and Vahanyan, H.G. (2005), **Virtual technologies of management (systems engineering of electronic control)**, Russian Academy of Public Service under the RF President, Russian-Armenian (Slavonic) State University, Monograph, Njar, Yerevan.

23. Vahanyan, G.A. and Bleyan V.Yu. (2005), **Information technologies in legal activities (in the public service system)**, Monograph, Njar, Yerevan, 176 p.

24. Vahanyan, G.A. (2004), “Systems engineering of democratization management. Systems engineering of construction”, in Gusakov, A.A. (Ed.), **Encyclopedic dictionary, II revised and enlarged edition**, International Engineering Academy, International Academy of Sciences, Moscow State University of Civil Engineering, Institute of System Analysis of RAS, Moscow.

25. Vahanyan, G.A. (2004), “Systems engineering of social and economic processes. Systems engineering of construction”, in Gusakov, A.A. (Ed.), **Encyclopedic dictionary, II revised and enlarged edition**, International Engineering Academy, International Academy of Sciences, Moscow State University of Civil Engineering, Institute of System Analysis of RAS, Moscow.

26. Gusakov, A.A., Vahanyan, G.A. et al. (1991), **Aerospace Informatics in the management and organization of large-scale construction**, Monograph, Hayastan, Yerevan.

27. Vahanyan, G.A. (1985), **Computer graphics in management**, Monograph, Hayastan, Yerevan.