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TRANSFER OF ADVANCED TECHNOLOGIES AS BASIS FOR THE RECOVERY OF UKRAINE'S ECONOMY

The economy of Ukraine has no prospects for recovery unless a huge accumulated potential of R&D works of Ukrainian scholars and researchers are widely implemented in the industrial and social fields. The success thereof depends on the organization and facilitation of the public private partnership at different levels: from the government to the institutions of the NAS of Ukraine.

Keywords: transfer of technologies, superhard materials, innovation, investments, financing, and public private partnership.

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The present-day situation in the industry and construction of Ukraine can substantially improve only due to intensive use of domestic and international experience in innovation development accumulated for a period of more than 100 years. In early 20th century, a prominent American businessman and engineer, carmaker *Henry Ford* said that his goal was to produce high quality products with minimal loss of materials and manpower, to sell with minimal margin, and to provide maximum wage, in other words, to ensure maximum purchase ability. He emphasized working for the common good over profit making. The historical experience has confirmed the effectiveness of such capitalist market and economic policy in many countries and nations.

The implementation of this rule in the economic policy of Ukraine can be a driving force for facilitating the economic recovery and consolidating the society that is divided now (especially, its business sector) into the oligarchic minority and the democratically minded, educated, but much poorer majority.

According to financial and analytical data for 2014 (*New Time*, issue 25 of October 23, 2014), the total wealth of 100 richest Ukrainian citizens is USD 28.9 billion. The ordinary Ukrainian having an average salary of USD 270 monthly has to work 3,370,786 years and 7 months without any break to reach the level of these persons. By the way, it should be noted that the total assets of the richest hundred is enough to buy only 19% stake in Facebook, one of the biggest American

companies. The total equity of Ukrainian banks is UAH 166 billion. It is not a large amount as compared with the leading German or Polish banks, for example, *Raiffeisen Bank* or *PKO Bank Polski SA*. In 2012–2014, the profit of Ukrainian banks ranged from UAH 2.6 to 1.7 billion. Twenty six leading Ukrainian banks out of the 168 banks have assets of UAH 832 billion and more. The experts from the National Bank of Ukraine believes that because of population's distrust of banks, currently, the Ukrainian residents hand more than UAH 280 billion or an equivalent of USD 19 billion according to the NBU official exchange rate. The use of existing private and banking capital for pursuing an innovative research-oriented policy is about the only chance for the development of Ukraine's science and national industry.

Having a more that 60-year experience in the field of research, I am deeply convinced that the application of scientific knowledge to the production and household activities will raise labor productivity and wellbeing of nations and states throughout the world. I do not believe that any government in Ukraine is able to drastically increase funding of research activities. The budget allocations are very limited. The experience of the last 23 years has clearly demonstrated this. Especially, given the fact that now, the budget is severely depleted by the war.

Only profound reforms of the budgetary and industrial policy of Ukraine, democratization and administrative deregulation (by the way, historically justified for the Ukrainian society) will enable the effective recovery of Ukraine's economy. Ukraine can be an economically prosperous country. It has necessary financial and human resources.

The innovation policy of Ukrainian government and the research and innovation activities of Ukrainian intellectual and educated society that according to the UN estimate is the fourth educated society in the world, should effectively utilize the 96-year experience of the National Academy of Sciences of Ukraine, as well as the important scientific achievements of Ukrainian universities and even the achievements of immortalized Nobel Prize winners, natives of Ukraine scattered around the world.

The brilliantly gifted and well-educated Ukrainians are a constituent of huge potential that cannot be taken from Ukraine and should be regarded in the government plans in order to assess the prospects of industrial and cultural activities of the Ukrainian nation and the state of Ukraine.

I suggest to choose the 1-10-100-1000 pattern of innovation policy.

Being the only representative of Ukraine delegated by the Chamber of Commerce and Industry of Ukraine to the European Parliament of Businessmen in Brussels (Belgium), within a period from 2008 till 2014, I was involved in the discussion and approval of the European innovation policy called the 20-20-20 pattern. It is expected to reach, by 2020, a 20% growth in labor productivity by the efforts of large and, mostly, of twenty million small and medium-sized businesses, to reduce energy consumption in the industry and in the household sector by 20%, and to improve the environment situation in Europe as a result of a 20% decrease in gaseous, liquid or solid pollutions.

The governments, NGOs, manufacturers, and businessmen are involved in implementing this program by utilizing bank capital and big money rich Europeans, industrial potential, and economic reserves. The European scientific and technological program foresees to spend EUR 80 billion, i.e. more than USD 100 billion, on ambitious scientific plans for 5 years (till 2020).

Why does Ukraine as an associate member of the EU since 2014 not pursue this innovation program? According to the estimates, having created, in 2015—2020, only one (1) targeted PPP fund for innovative development of USD 2 billion, in 3 years, it is possible to raise the required amount for innovative development due to donations of rich Ukrainians, banks, lotteries, bonds, and loans. This is a reachable target.

I offer to establish a fund for financing one hundred scientific and technical projects in ten (10) fields: instrumentation and machine building, power engineering equipment and techniques, elec-

tronics, information technology, food and light industry, medicine, pharmacology and others during 2—3 years, in order to create several thousand jobs at 1,000 new medium-sized enterprises employing from 10 to 100 people and to manufacture knowledge-based products competitive on both world and domestic markets. This competitive project can give the innovative Ukrainian industry and IT based enterprises a powerful second wind for developing and utilizing state-of-the-art techniques.

Responsibility for launching the program and ensuring its effectiveness, transparency of funding, and performance for 2—3 years should be placed on a scientific board composed of 15—20 leading experts, the honest patriots Ukraine. It is quite possible, as the experience of existing research centers and universities of the NAS of Ukraine has showed.

The Managing Scientific Board with respective authorities can be established under the Prime Minister of Ukraine. Nowadays, the research activities and use of their results for the sake of the society are an efficient lever for raising strength and economic viability of the state. The governments of leading countries with high-income population are constantly caring for the development of research activities in their countries and for the efficient transfer of advanced technologies to the economic and social life.

The proposed concept has been confirmed by the experience of an effective innovation center, the V.N. Bakul Institute of Superhard Materials (ISM) of the NAS of Ukraine and its R&D complex *Alcon*.

The Institute of Superhard Materials as a single body consisting of research laboratories and a powerful industrial complex (a plant, a special design bureau, and a small foreign trade office) was established in 1961. At that time, it was necessary to solve an important task of commercial synthesis of diamonds from carbon materials. To create an effective technology for the production of synthetic diamonds and diamond tools and to ensure their profitable application the amount of 50 million rubles was allocated and the respective organizational and technical measures were taken. In fact, according to experts, the use of special diamond tools was a precondition for the successful creation of new electronic equipment to be used in the manufacture of special optical devices, aerospace systems, gyroscopes, nuclear technologies, precision engineering, and instrumentation. According to a government technical expert, the lack of diamond tools in the manufacture of military atomic space equipment could lead to the impairment or loss of overall effectiveness of the weaponry.

Therefore, the leadership of the state and the Ukrainian scientists made all necessary efforts for the rapid construction of institute buildings, their provision with equipment, and the creation of 3500 jobs till 1980. As a result, the production of synthetic diamond powders with a nearly zero weight and micrometer composite particles (from the super fine brands used for polishing to the coarse and highly abrasive ones for cutting) having a size of 400—500 microns increased from 400 g, in 1961, to 1.2 tons, in 1980. There were more than ten factories in Kyiv, Lviv, Yerevan, St. Petersburg, Tomilino (near Moscow), and the Poltava synthetic diamond factory involved in the process. The high-tech solutions created at the Institute of Superhard Materials were introduced in other countries, including Bulgaria, GDR, Hungary, Yugoslavia, and Czech Republic. The synthetic diamonds called «*Russian diamonds*» entered the European, Asian, and American markets. In 1980s, the annual profit from Kyiv synthetic diamonds totaled 1 billion rubles, according to official data.

Here are just a few examples of the implementation of innovative scientific products developed by the ISM for 53 years.

The institute created a diamond alloy *Slavutich* that has been patented in 6 western countries. In 1970s–1980s, its application in the working layer of drill bits and crowns made it possible to drill effectively more than 5 million meters of oil and gas wells in the Baku region, Tyumen, and the

Komi Republic. The diamond-carbide plates used in drilling tools ensured a 2-fold increase in speed of drilling of oil wells in new fields of Tengiz and Karachaganak (Kazakhstan). Also, they were used in drilling the world deepest wells of 10—12 km. In 2010, the Institute researchers created a new superhard material, *the hybridite*, consisting of monocrystalline, film-plate, and powder synthetic diamonds baked at high pressure using a cutting-edge hybrid technology. This material has made it possible to increase the speed of drilling by crowns made of this material 12 times.

In 1960s—1970s, it would have been impossible to develop germanium and silicon electronics unless the Institute and its factory had developed and manufactured special abrasive cutting ultrathin diamond discs with internal cutting edge and several hundred special machines. This electronics was based on electronic silicon chips manufactured at the ISM using a diamond technique for cutting large crystals of germanium and silicon materials for electronic equipment.

The power laser optics is a large progress in the manufacture of quality optical devices for defense equipment, the basic elements of which are made using diamond tools and techniques for polishing and shaping up of optical elements.

The diamond tools developed in the ISM have been widely used for the processing and calibration of sugar beet seeds, the removal of fell from seed cotton, the processing and grinding of cacao beans and other operations in the food industry, the processing of polymeric fibers in the light industry, the grinding of wood tissue for the production of wood pulp, etc.

With its powerful capacity to obtain and to use superhard materials, in 1995, the Institute's research and engineering center established its innovation and technological line called *Alcon* (a diamond concern). This idea was supported by the program prepared in 2013—2014 and by experts from the European Union. It was the implemented within the *Start* European project (2012–2014) designed together with researchers from Poland, France, and Greece.

Today, the ISM offers the foreign and domestic partners to implement more than 20 important innovation projects. Some of them are presented in *Science and Innovation* journal.

Celebrating the 10th anniversary of publishing the *Science and Innovation* academic journal, it should be noted that the Ukrainian academic and research community has a lot of solutions for the innovative development and the effective recovery of industrial potential of Ukraine within the European Union.

According to the international experience (Japan, China, Finland, South Korea, and others), for the proper implementation of the proposed projects it is necessary to organize and to finance the organization of two important components. *Firstly*, to establish in the law the government guarantees of investments and clear incentives for businesses (especially, the SMEs) in terms of commercialization of R&D works; *secondly*, to organize the training of qualified managers, the business and technology professionals, who can ensure the commercialization and marketing of R&D works in the competitive environment.

The V.N. Bakul Institute for Superhard Materials of the NAS of Ukraine and *Alcon* concern have everything required for launching the innovative production, including positive experience, designs, research staff, workspace, and even very attractive demand in both domestic and foreign market, except for clear regulations for technology transfer, which will facilitate the economic recovery of Ukraine.

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ТРАНСФЕР НАУКОМІСТКИХ ТЕХНОЛОГІЙ – ОСНОВА ЕКОНОМІЧНОГО ВІДРОДЖЕННЯ УКРАЇНИ

Економічне відродження України можливе тільки завдяки широкому промисловому та соціальному запровадженню накопиченого потенціалу результатів дослідницької роботи українських вчених. Успіх цієї роботи залежить від організації та стимулювання державно-приватного партнерства на різних рівнях – від уряду до інститутів НАН України.

Ключові слова: трансфер технологій, надтверді матеріали, інновації, інвестиції, фінансування, державно-приватне партнерство.

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ТРАНСФЕР НАУКОЕМКИХ ТЕХНОЛОГИЙ – ОСНОВА ИНДУСТРИАЛЬНОГО ВОЗРОЖДЕНИЯ УКРАИНЫ

Экономическое возрождение Украины возможно только благодаря широкому промышленному и социальному внедрению накопленного потенциала результатов исследовательских работ украинских ученых. Успех этой роботы зависит от организации и стимулирования государственно-частного партнерства на разных уровнях – от правительства до институтов НАН Украины.

Ключевые слова: трансфер технологий, сверхтвердые материалы, инновации, инвестиции, финансирование, государственно-частное партнерство.

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