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# Intellectualization of national economy: experience of developing countries

### Annotation

The paper examines the factors and indicators of intellectualization of the current stage of economic development. The analysis of innovation policy and intellectual component in developing countries. Determinants and priority directions of development focused on increasing the added value in the medium and low-tech sectors in developing countries.

### Keywords

intellectualization, knowledge economy, economic governance, intellectual capital

## 1 Thematic justification

Intellectualization of economy is influenced by factors that are formed in the process of knowledge economy development. The processes of globalization necessitate formation of innovative structures that become the basis for further changes. The processes of working out innovative forms of economic governance are continuous in nature and cause permanent transformation of functioning systems, their interpenetration and interdependence.

One of the important tasks of economic activity in the process of globalization is a redistribution of intellectual resources in the global environment, their professional realization and accumulation, which may determine the pace of country's development, and forms the global parameters of economic development [19].

## 2 Latest scientist progress and publications review

Research of intellectualization of economic activity is in the limelight of significant number of scientists, including Ishchuk S.O., Lukyanenko D.G., Kalenyuk I.S., Lyakh V.V., Udovik S.L. Growth factors were studied in the works of Verdorn G., Atkinson, G., Kucera, D., Ronkolato L., van Ark and others. However, often works refer to only the performance of most developed countries, while developing countries are ignored by scientists.

**The article's goal** is the research of efforts of developing countries that develop under the principles of innovative activity.

## 3 Results

Penetration of intellectual component in all sectors of economic activity was caused by the

need to solve the pressing problems of society, produce new strategies of development. Such penetration can occur due to their innovative intellectual-intensive products, as well as due to taking existing ones from other countries. This is reflected in the constant production of key innovations and improving existing products and processes. Continuous improvement of strategy for increasing intellectualization of the economy at all levels enabled the US, the EU, Japan and China to occupy positions of world leaders in science and technology sector [20].

In the process of globalization of economic activity, leaders-innovators appear on the world scene. The transition to the knowledge economy happens with formation of the new factors and forces of competitiveness of company or country. Moreover, these factors are associated not only with human resources, intellectual activity its results as the latest achievements, technologies and their application are their basis [21].

The level of intellectualization of the economy is determined by the indicators of the R & D, education, qualitative demographic indicators, quality, patent activity, exports of high-tech products and so on. However, in modern world, competitiveness of the economy can be defined as well via the penetration rate of innovation, which is a determined by intellectual capital, to traditional sectors of economy.

For a quite long time, it was widely believed that the developed countries and countries - key innovators get development via foreign direct investment, licensing, various forms of technology transfer, via purchase of innovative products, etc. But the active development of technologies, enhanced access to the Internet and other communication sources reduce the cost of innovation and facilitate access to them. Thus,

innovation activity obtains active spread in the modern world. Of course, developing countries cannot very quickly take a leading position in the global economy, or in high-tech industries that form the forefront of modern production.

Dualistic of current stage of development of civilization is reflected in the formation of the two major "clusters". The first includes the highly developed countries that are at the forefront of economic activity: the USA, Germany, Japan, Singapore and others. The second includes countries - outsiders of economic development. The first group of countries produces goods within the technologically intensive industries. The countries of the second group are trying to increase the level of innovation in traditional sectors.

The leading countries in high-technology products

sector form more than €500 million euros in production volume, while services are estimated at almost €1 billion. Leading positions of Germany, the UK, Italy and France are determined by their participation in the formation of value added in high-tech sectors of economy [5].

According to the definition of the nature of innovation in international document, they are defined as a concept that is broader than high-tech products. Innovations also include the formation of new processes, business models and organization structures in all industries. In fact, any country can contribute to the formation of the global innovation system. However, analyzing the innovation activity of countries, it can be stated developed countries are still that the main players in the innovation market. (Table 1).

Table 1 GII of Prominent Economies and Regional Groups [9]

Country, region	GII	Institutions	Human capital and research	Infrastructure	Market development	Business development	Knowledge and technologies, output	Creative output
North America	57.91	49.65	89.73	52.50	59.87	77.48	49.94	49.36
Europe	47.99	76.37	44.15	49.61	54.95	42.29	39.44	45.56
South-East Asia and Oceania	42.68	65.87	38.43	46.25	56.16	41.70	35.53	35.84
N. Africa and East Asia	35.26	61.05	32.08	41.74	46.24	30.44	24.83	31.59
Latin America	32.49	54.87	25.29	35.37	44.29	35.37	21.01	30.86
Africa to the south of Sahara	27.05	51.66	16.89	25.60	41.37	30.29	19.34	22.53
Central and Southern Africa	27.03	47.67	22.41	31.77	43.00	25.60	20.12	19.82

Leading countries form a fairly harmonious policy to support intellectual component of the economy and its innovation. With that, analysis of these indicators by region shows a very significant gap. For example, in countries of Africa, Latin America and West Asia, indicators of innovation are rather low. However, this does not preclude the development capabilities in countries with lower levels of development. Use of successful tools to support commercialization of knowledge enables developing countries to accumulate their own intellectual capital. The main focus of those tools is to maximize the innovative benefits of national economy. According to this, as part of the Global Innovation Index, basic principles aimed at improving the innovation economy were formed: innovation policy should aim at maximizing innovation in all industries; innovation policy should support all types and stages of innovation; creative destruction; low prices for imports of ICT; support of the development of key innovations and low barriers to market entry and access to high-knowledge industries; development of a national innovation strategy and its supporting organizations [9].

State policy on innovation should be aimed at all sectors of the economy, and not be limited to high-tech sectors with high added value. In fact, if a country cannot develop the production of high-tech products, it must focus on producing something else [1, 17]

Although production trends have changed in the modern world, the laws of development are the same. In developing countries, stimulation of innovation occurs in traditional sectors (agriculture, trade, logistics, business services, etc.) [7]. Moreover, such development occurs in the non-productive sector, due to the possibility of active use of information and communication technologies and low barriers to entry. Productivity growth can be the basis of economic growth. In fact, the innovative development of the whole economy for developing countries is more top-priority than the development of one sector that is based on high-tech manufacturing. Implementation of this approach started in 2012 in Uganda, following the adoption of an innovative plan under which the need to "develop a general sectoral approach to stimulating innovation in all sectors ... including agriculture, energy, services and

information technology” [14] was determined. In Kenya, the priority is development of cluster “Konza Techno City” as a center of innovation design for entrepreneurial start-ups in agriculture, mobile banking, services development, etc. [11]. In Ghana, Farmer Field Fora was formed, and its main goal was to develop and implement innovation in growing crops.

Arguably, the core of innovation of developing economies may be not the development of high-tech industries, but increase of labor productivity and innovation of traditional sectors. This thesis is confirmed by Roncolato’s and Kucera’s estimates, according to which, the increase in internal efficiency sector in India by 5% was caused by labor productivity growth by 0.3%, and a total return is 94% [12].

According to the second principle, the most successful are the countries that focus not only on

Table 2 Global Added Value in Sectors, Percentage Distribution [10]

Sector, Country	1997	2006	2012
<b>Agriculture</b> (Added in average, \$ billion)	1140	1461	2879
<b>Construction</b> (Added in average, \$ billion)	1610	2585	1657
<b>Mining</b> (Added in average, \$ billion)	573	1713	
<b>Real estate</b> (Added in average, \$ billion)	2585	4283	5667
<b>Hospitality</b> (Added in average, \$ billion)	732	1202	1708
<b>Transport and warehousing</b> (Added in average, \$ billion)	524	855	1255

sectors. In fact, developed countries should consider all points in value added chain in all types of innovations and during all stages of production,

Table 3 Global added value in processing industries, depending on technology level, percentage shares [10]

Technology level/ region	1997	2003	2006	2009	2012
<b>Above average</b> (Added in average, \$ billion)	1467	1643	2139	2357	3480
<b>Below average</b> (Added in average, \$ billion)	1346	1482	2212	2418	3512
<b>Low technology sector</b> (Added in average, \$ billion)	1454	1594	1955	2371	2969

increase in each technological level is about 130%, and it shows the active penetration of high-intelligent technology. Thus, a deliberate government policy to increase the level of intellectual component can be focused on low-tech sectors, increasing their efficiency and effectiveness.

Innovative strategies of developed countries take into account such opportunities and form a coherent policy on unification of disparate elements. Such policies take into account almost all forms of intellectualization: research, technology commercialization, investment in information and communication technologies, education, intellectual property rights and so on. Inconsistent policies cannot provide an innovative position of the national economy, and thereby increase competitive positions [13].

Increasing of intellectualization of the economy can occur not only via increasing internal capacity, but also via outbound investments. For instance, purchase of technology, investment in

the production of high-tech products, but also on all forms of innovation that can occur at different stages of development - from concept to the use of market. The documents of OECD include a suggestion that innovation can lead to the formation of a new product, process, marketing techniques, organization of innovation, etc. [15]. Active development is required for innovations in management. Intellectual approaches to forming business models cause the transition to new innovative tools (Autodesk Innovation Genome, Business Model Canvas) and to the increase of results commercialization level.

The vast majority of economic sectors in terms of intellectualization are characterized by indicators of economic efficiency that is indicated by increase of value added in production (Table 2).

Added value increased significantly in some

without focusing only on high-technology products (Table 3).

Analysing the data, it can be noted that the

equipment and software, information and communication technologies may increase the efficiency of the economy as a whole. According to calculations made by van Ark, efficiency of investment in capital equipment is higher than the effectiveness of investment in new companies [16]. It can be explained by more complex effect of such innovations, as they are transferred to products, processes, methods of marketing activities, business organization, competition. In addition, in the market, the efficiency of investment in the sphere of information processing, equipment and software can be as significant as the consequences of their own investments in such activities (Hitt and Tumble).

Similar statements are stated in the report of the World Bank. Calculations show that in developing countries, investment in information and communication technologies account for about 25% of GDP at the beginning of the XXI century [18]. The restructuring of the economy

and improvement of its innovation through the introduction of information and communication technologies can be implemented in countries with low development levels via changing the structure of agriculture, retail, etc.

Thus, low ICT cost can enhance the efficiency level of the economy. Studies confirm that taxation of ICT products at a higher rate than other goods leads to a slowdown in the economy and the level of its innovation. Calculations of National Science Foundation show a slowdown in the economy by 0.7% and a 2.3% decline in GDP in countries that established a higher tax rate on imports and sales of ICT. The effectiveness of this activity can be demonstrated by the example of Malaysia, where, according to the OECD, ICT goods exports increased by 50% during the period from 1996 to 2011. Conversely, countries that have not joined the Agreement reduced their presence in this market for more than 60% compared to 1996. In addition, by Ease of Doing Business Index, Malaysia is the top-20, which indicates the presence of an integrated program of state support of entrepreneurship. Government policy to support research and development of ICT is manifested in different countries in different ways. For example, in Malaysia, to stimulate activity, it was possible to debit for depreciation full cost of equipment for 4 years. In Brazil, depreciation of equipment and intangible assets used in R & D is used only for 1 year.

In addition, the efficiency of the economy determined the general level of intellectualization and informatization. This may be the key access to innovative resources such as digital infrastructure, skilled labour, education and knowledge as components of production and the process of its transmission.

Development of wireless communication networks enhances the overall level of intellectualization of the economy. Stimulating of the deployment of a complete secured ICT sector (intelligent transport systems, mobile payments, digital signatures, e-government, etc.) promotes the digital transformation of the economy. ICT is one of the most developed sectors in the global economy. The added value in this area is almost \$16 trillion that is about 29% of global GDP.

Value added in the high-knowledge services category has provided growth in total value added in ICT by nearly 60% during recent years. This shows the active processes of transition to the knowledge economy. Thus, commercial high-knowledge services can be determined as drivers of global development [10].

Similar processes take place in developing countries, where informatization plan are developed. For example, Digital India, identified the need to provide high-speed Internet in every village and access to mobile communications [4].

Similar program was developed in Kenya, and growth of mobile users up to 93% followed it.

One of the key factors of intellectualization of the national economy is the level of access to high-quality education. Intelligence becomes one of the most expensive goods because it can be implemented in any sector. Growth of intellectualization of economy via the level of education is intended primarily to raise the general level of education, which in turn can manifest in all sectors.

Development of entrepreneurship education among children and adolescents is important for increasing intellectualization of the economy. Increasing of the level of intellectualization of the economy is influenced by to the formation of youth and civil society movements that are united in a youth organization, business, public authorities. This may take the form of business incubators (for example, 1776 in Washington, General Assembly in New York, Capital Factory in Austin, Cambridge Innovation Center in Boston, Warner Yard in London, Betahaus in Berlin), and their task is to communicate ideas to the business environment, to form certain portfolios and present them to many customers as possible. This environment promotes a combination of all market participants together. It should be noted that it is often realized in traditional sectors. Formation of such global business environment enables to spread innovative ideas and to combine them with the owners of capital or resources. Distribution of intellectual discoveries is becoming increasingly possible with the development of Internet and telephony, making it easier to develop business mentoring.

Traditional forms of employment in small and medium enterprises have quite a weak position in innovation and, accordingly, have a weak intellectual component. However, activity activation for development of small and medium enterprises can provide significant benefits to the economy, providing a certain level of specialization within the competition between the economies of developing countries. For example, in India, there is a program to support innovation active enterprises. Similar programs work in several countries of Latin America and the Caribbean (SERCOTEC in Chile and SPYME in Mexico) [2].

According to the report of the World Intellectual Property Organization, it is stated that recently, in the market of innovation and innovative products, emerging countries with stable growth of innovative component of economic activity are quite active. These countries are some ones in Asia and Africa. In 2010, a National Innovation Council was established in India, and it provides funding and coordinates innovation activity. In 2013, that program was expanded and in addition to science, technology and innovation, included also entrepreneurship as

a subject for innovation and opportunities to improve social welfare. It was targeted to raise R & D funding from 0.85% to 2% of GDP by 2020. Similar policy was adopted in Ghana. More than 50 countries have designed their innovative development strategies aimed at improving of the economy's functioning in traditional sectors [8].

In addition to these strategies, there are successfully operating agencies targeted at enhancing domestic innovation. Such agencies operate in Kenya, India, Malaysia, Thailand, Vietnam. Most of them started their operation during the past 5 years. Their goal is the growth of the enterprise performance via implementation of new technologies and processes, providing of employee training, the formation of innovative skills, and their transition from institutions and laboratories to real companies. One of the tasks of these agencies is to involve domestic enterprises into global supply chains.

The purpose of National Science in Kenya is introducing the results of research, science and innovation in all sectors of the economy. In some countries (Armenia, China, India, Malaysia, Moldova, Mongolia, Thailand, Vietnam, Jordan),

regime of intellectual property rights was strengthened [3].

In addition to the above criteria, patent activity is also included to intellectualization of the economy. Performance indicators in the sectors of high-tech products indicate potential accumulated in the countries and prospective trends of future development. This is reflected in the report World Intellectual Property Organization, which analyses the patenting activity of countries and the number of patent applications both from residents of countries and from non-residents [6].

Quite a large number of active patent economic activities are not related to the high-tech sector in its core form. Some of them belong to the average level of technology, or below average.

A prerequisite for increasing patent activity and high-intelligence products is investing in research and development. The level of spending on research and development activities reflects the government's attention and potential of the country in the transition to the knowledge economy. Comparing the cost in developed countries and developing countries, it can be noted that the growth rate in the latter is some higher (Figure 1).

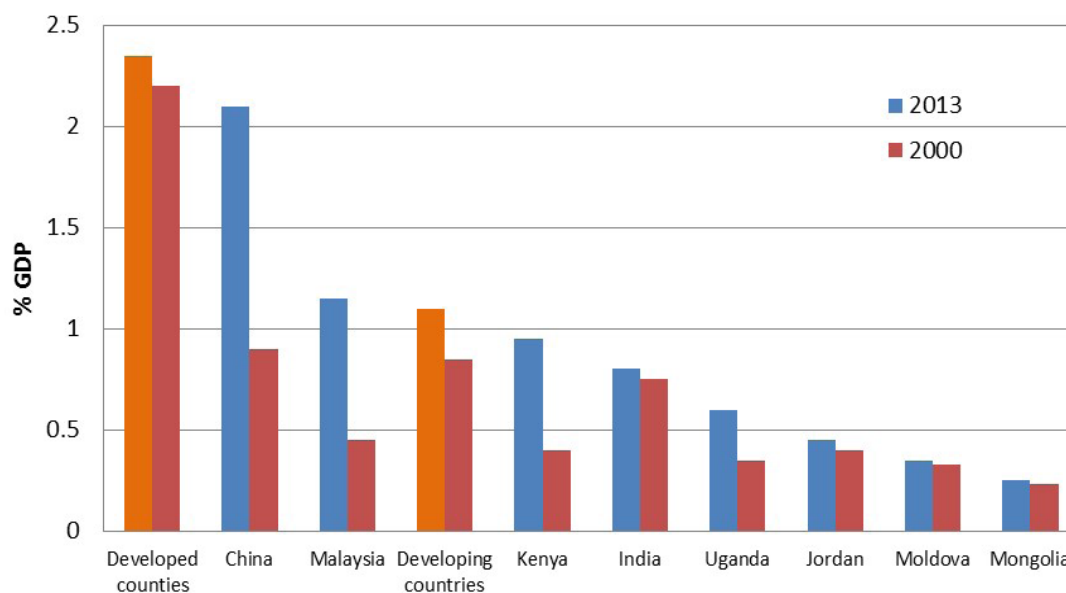


Figure 1 Level of expenses for R&D in developing countries, % of GDP [9]

The effectiveness of active policies of intellectualization in modern world is evident. Proceeds from increasing of intellectual component in the economy far exceed the costs of research and development. Proceeds from innovation in business activities exceed the costs of their development more than 10 times. The dynamics of their growth demonstrates strong growth and significant efficiency.

#### 4 Conclusions

Analysing all the above indicators, it can be noted that in the last decades, government policies of countries are aimed at significant growth of intellectual component of economic activity. Most government programs are aimed at stimulating innovation through increased funding, attracting investors, promoting patent activity, increasing of education level and returning scholars who have emigrated. Statistics shows that this activity

is quite successful and effective and leads to the formation of world clusters of innovation. Intellectualization of economy is the basis for major government programs in a large number of

countries. The success of such a program is evident, but experience needs further study of methods and tools used during its implementation.

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