THE RESEARCH OF THE INNOVATION POTENTIAL STATE: NATIONAL AND GLOBAL ASPECTS

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ABSTRACT

The monitoring of Ukraine' innovation potential statistical indicators by the parameters which determine an innovation activity and based on which an integral indicator of the innovation potential development changes character was calculated, has been done. Based on calculations, quality characteristics of formation and using of Ukraine' innovation potential has been provided. The countries rating by the Global Innovation Index has been analyzed in detail; Ukraine' position in this rating has been determined; the comparing characteristics of Ukraine' and Switzerland (leading country) innovation index indicators has been provided. Within the GII formation analysis in 2017, strengths and weaknesses which affect Ukraine' rating have been determined; factors which increased during the analyzed period in comparing to the basic indicator have been also determined.

Keywords: Innovation Potential, Monitoring, Rating, Index, Country.

JEL Classifications: O11, O38.

INTRODUCTION

In current conditions of economic systems functioning, there is an essential influence of the globalization processes on the business development, in turn, the innovation activity is very important for the economic, social and image development of Ukraine.

Ukraine integration to the world innovation space needs the transformation of the innovation potential considering the features of the internal market and partnership development in the external market.

Innovations which are directed at increasing of public social and economic development and competitiveness level of domestic enterprises are widely used in the world practice. The importance of such development is determined by its multifunctionality and it gives an opportunity to assert that the economic increasing and ensuring of stable position on the world

market is determined by the efficient using of the innovation potential. In this regard, there is the necessity of the further research and evaluation of the innovation potential at the national and global level (Mazzucato et al., 2014).

The innovation potential of the national economics is considered as an aggregated totality of available country innovation resources which are in the system union what is determined the country's opportunities of the innovation resources mobilization on the certain time interval for the strategic and tactic aims implementation of the economic growth stimulation and also the economic system ability of innovations perception and an adequate response to them (Kasyanenko, 2011).

At the macroeconomic level, the innovation potential of the national economic system in general is a set of objective prerequisites (possibilities) of the national economic system of the functioning efficiency increasing implementation on a better innovative basis (Algina, & Bodnar 2011).

The article aim is the determination of indicators which affect the innovation potential development in Ukraine based on the results of the formation and using of the Ukraine' innovation potential by GII statistical parameters monitoring.

The hypothesis of our research is the expansion of this concept in terms of global and national innovation potential levels interaction, that is, we consider that in this case "domino principle" works i.e. the innovation potential which exists at the national level of some countries is an impulse for the innovation potential development in the world and vice versa the innovation potential which exists in the world is an impetus for the development of the national innovation potential and an individual country's innovation policy should be guided by global trends of leading countries, namely: increasing of general competitiveness of the world leading countries (Switzerland, Germany, USA); graduation of countries' education system; an information and communication technologies development; an optimization of absolute and relative indicators of the research costs; an innovation climate improvement; a cooperation intensification of different economy sectors with foreign partners (The European Commission, 2017).

Review of Previous Studies

Since the innovation potential has an important role in providing of long-term innovation country' economics development, there is a problem of its development level comprehensive research (Stenicheva, 2017).

For the country' innovation potential research, we need to define the essence of this category. The innovation potential is an ability to make an innovation activity in different science sectors and innovation sphere which functionate at some territory (Polyakova 2016).

Quantitative measurement of the innovation potential is done by statistical data use, in this case, it's considered as a dynamic information array of the research results, inventions, design and development, new technologies and production samples which covers all stages of scientific and technological cycle (Pavlov & Koretsky 2004).

There are a quantitative measurement of region' innovation potential methods which involve the use of the main parameters method; it lets identify hidden general higher rang characteristics during causal relations analysis from the set of elementary signs. In this case, the main parameters have a role of the integral indicators of the region' innovation potential particular parts.

As a result, authors have determined the main parameters (Amosenok & Bazhanov, 2006):

- the research potential of the population;

- gross regional product cost by the research;
- gross regional product "*knowledge-intensity*" by the PhDs;
- gross regional product "*knowledge-intensity*" by the researchers with the degrees;
- organizations' innovation activity level.

According to another method, the innovation activity evaluation is carried out using the regression analysis, it lets determine the factors which positively and negatively affect the territory innovation activity (Shterzer, 2005).

We agree with the idea that methods of the innovation potential evaluation should be based on the evaluation of both its resource and internal and performance components, as well as the combination of statistical methods and expert method (Bunyak, 2011).

Existing methods of the innovation potential evaluation can be an analytic base for the development of the priority activities complex of its strengthening. Among the main, there are the financial support of the innovation process at the national and regional level, the development of the innovation infrastructure objects and the innovation activity of branches and enterprises monitoring (Polyakova, 2016).

METHODOLOGY

The methodic basis of this work is the main principles of the system-wide economic analysis for the characteristic of the quantitative parameters which identify the state of the innovation potential development in Ukraine.

Using an extended range of analytical methods for the determination of the economic systems innovation potential development needs the systematization.

The following research methods are used in the tractate: statistical indicators monitoring – for the evaluation of the components of the innovation potential development in Ukraine; comparison-for the international and domestic innovation potential development analysis; schematic and graphic images-for the visual representation of the research results (Karashchuk et al., 2019).

The Global Innovation Index is more important and, as a consequence and it can used to rank countries in terms of innovation development. This rating was determined by organizations such as: International Business School (INSEAD), Cornell University, and World Intellectual Property Organization (WIPO) every year since 2007. At the moment, the ranking contains the most comprehensive range of indicators of innovation development. The Global Innovation Index consists from 82 components which can describe in detail the country's innovative development.

RESULTS AND DISCUSSION

An innovation potential is a basis for fundamental and applied research, design and technological works which contribute to solve the scientific, technical, social, economic and ecological problems at the state, regional and branch level.

In Ukraine, research and development in 2016-2017 were carried out by state organizations, entrepreneurial structures, and higher education organizations. During 2017, 972 organizations were engaged in research and development in Ukraine, 46, 6% of them belonged to the state sector of economy, 37, 7% to the business sector, 15, 7% to the higher education.

The statistic indicator analysis shows that in 2017 most of scientific organizations belonged to the state sector (453 organizations). Whereas in 2011 most of the scientific

organizations belonged to the business sector (610 organizations). There was a decreasing of the higher education institutions number which was involved to the scientific research. General number of organizations which did the scientific research and development had the negative dynamics, so in 2011, it was 1303 organizations, in 2016-978 organizations, in 2017-972 organizations (Scientific and innovative activity of Ukraine, 2018).

Presented data shows the change of the science sectors (academic, state, business etc.) role in the support of the country innovation needs, namely: business sector's role in research increasing, it needs the adaptation to the functioning conditions connected with the integration processes.

Ukraine is the country with high scientific potential, well-known scientific schools, advanced training system. The main training forms of the scientific and pedagogical employees are the postgraduate and doctoral studies. The training of the Doctor of Philosophy (PhD) and Doctor of Science (DSc) is done by the higher education and scientific organizations. In higher education organizations, 48% (231) postgraduate studies and 62% (176) doctoral studies are working, in the scientific organizations, respectively, 52% (250) and 38% (106). Most postgraduates are studying in the field of technical, economic, legal and pedagogical sciences.

The division of postgraduate and doctoral studies by region is uneven. Most of them are concentrated in Kyiv-218 and 108 respectively (Scientific and innovative activity of Ukraine, 2018). At the end of 2017, the number of such employees in the enterprises and organizations which carried out of scientific and research works was 97,9 thousand people, 63,7% were the researchers, 10%-technicians, and 24, 2% - support staff (Scientific and innovative activity of Ukraine, 2018).

The share of Doctor of Science and Doctors of Philosophy among the scientific and technical works performers was 27, 9%, among the researchers - 42, 6%.

The statistical indicators analysis showed the negative dynamics of the qualified specialists engagement to the innovation development which can cause the innovation development offers decrease and science potential structure change towards the departure of specialists abroad.

The research funding provides the formation and development of country's innovation potential. In 2017, the total cost of the research and development by organizations of themselves was 11530,7 million UAH, including salary expenses 5751,0 million UAH, other running costs – 5203,7 million UAH, capital expenditures-576,0 million UAH, among them equipment purchasing costs 487,6 million UAH (Scientific and innovative activity of Ukraine, 2018).

Most sources of funding were the state budget funds: 45% in 2011, 36, 3% in 2016, 33, 9% in 2017. Foreign sources funds were the significant share of funding sources: 25,8% in 2011, 18, 9% in 2016, 22, 1% in 2017.

The research and development internal costs structure analysis by the activity sectors shows that the largest share of costs was the entrepreneurial sector (61% in 2016, 62% in 2017). The state sector funded 34% of research internal costs in 2016 and 32% in 2017. Higher education sector was a small share of funding: 5% in 2016, 6% in 2017.

In 2017, 19, 3% of total costs were directed to the basic scientific research which were 91, 7% funded from the (state) budget. A fundamental change of research funding conditions and accessibility of the innovation process funding sources is contributing the gradual development of Ukraine' innovation potential, especially in entrepreneurial sphere.

The monitoring of Ukraine innovation potential development statistical parameters by the individual components (quantity of organizations were engaged in a research and development

by the sectors of activity; quantity of employees engaged to the research and development; the research funding; research costs; the share of enterprises which were engaged to innovations; quantity of innovation implementations at the enterprise) gave an opportunity to confirm the permanent character of changes in the formation and using of the country' innovation potential in general (Table 1).

Table 1
DETERMINATION OF UKRAINE INNOVATION POTENTIAL DEVELOPMENT STATISTICAL PARAMETERS CHANGES CHARACTER

Parameters	2011	2016	2017	Growth %, 2017 to 2011	Growth %, 2017 to 2016	Changes character
Quantity of organizations engaged in a research and development, pcs.	1303	978	972	74,6	99,4	Negative
Quantity of employees engaged to the research and development, thousand people	175,3	122,5	97,9	55,8	79,9	Negative
The research funding, million UAH	14334	13814	23230	162,1	168,2	Positive
Research and development costs, million UAH	8513	11004	11531	135,4	104,8	Positive
Share of enterprises engaged to the innovations, %	16,2	17,3	18,9	116,7	109,2	Positive
Quantity of innovation implementations at the enterprises, pcs.	2510	1217	3489	139,0	286,7	Positive
The integral indicator of the innovation potential development character of changes (is calculated as average geometric value of growth rates)				106,8	127,9	Positive changes character

Based on: Scientific and innovative activity of Ukraine, 2018.

Offered calculations give an opportunity to detail the quality characteristics of Ukraine innovation potential use:

The research and development costs have positive dynamics, it should affect the innovation production development and contribute to the formation of active demand for the innovation goods which are produced due to the business projects;

The share of enterprises which were engaged to the innovations had positive dynamics. On the one hand, it showed the imbalance of the research directions of organizations which were engaged in the research and development and practical needs of the innovation development, on the other hand, it showed the formation and using the own innovation potential by the development and innovations engagement;

The innovation implementations quantity at the enterprises had a significant growth, it provides the increasing of these enterprises' competitiveness and creation of country' competitive economic system.

The calculation of integral indicator of the innovation potential development changes character has revealed the trend of slow growth of the formation and using innovation potential parameters at the national level. It couldn't help to affect the position of Ukraine in the international ratings which are related to the innovation development in the world.

It's believed that the economy development success is related both to the availability of the innovation potential and conditions for its use. That's why the index is calculated as a sum of the estimates of two indicators sets (Figure 1).

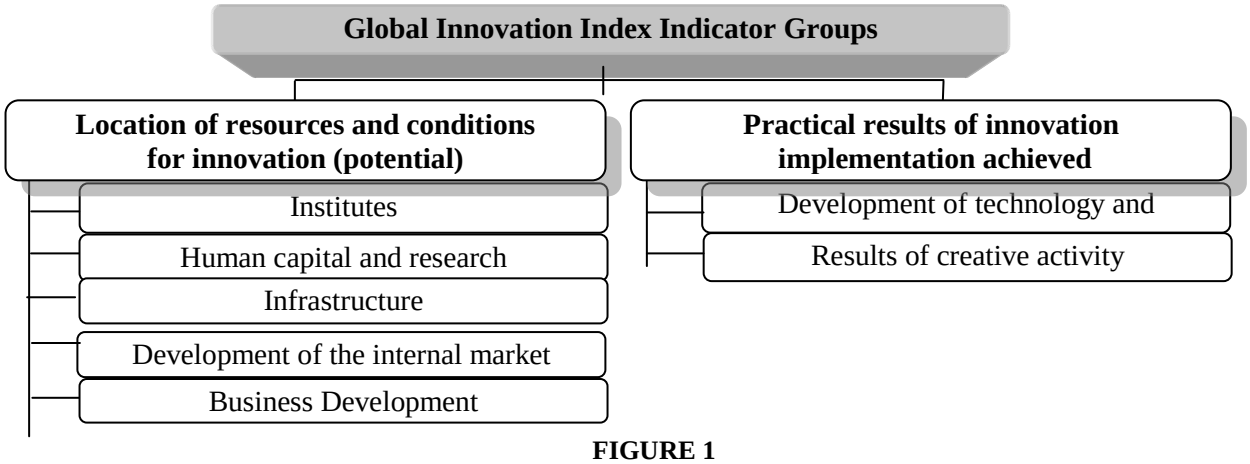

FIGURE 1
GROUPS OF THE INDICATORS WHICH FORM THE GLOBAL INNOVATION INDEX
Based on: Global Innovation Index. Humanitarian Encyclopedia, 2018.

So, the global index is the costs and effect correlation that lets evaluate objectively the efficiency of the innovations development efforts in one country or another.

The analysis of the Top-20 countries by The Innovation Index lets determine that in Top-20 there were European countries (Switzerland, Sweden, Netherlands, Great Britain, Denmark, Finland, Germany, Luxembourg, Iceland, France, Norway, Austria), Asian countries (Singapore, South Korea, Japan, Hong Kong, Israel) and countries of North America (USA, Canada). The winners of this rating were exclusively European countries: the 1st was Switzerland with the Innovation Index 67, 69; the 2nd was Sweden (63, 82); the 3rd were Netherlands (63, 36). It is worth noting the 12th position of Luxembourg (index 56, 4) and Iceland (55, 76) which have their features and low enough historical preconditions of the innovation development but held the decent position in this rating.

The dynamics of countries rating indicators by The Innovation Index is shown in the Figure 2. The researched have shown that an unquestionable rating leader was Switzerland which took the 1st place during the researched period (2015-2017), herewith The Innovation Index of this country permanently grew: 2016- 66, 28; 2017-67, 69. The one more favorite of this rating was Sweden with the 2nd position in 2015 (62, 4), 2016 (63, 57) and 2017 (63, 82). The 3rd position in 2017 was taken by Netherlands, in 2015 this country took the 4th position and 9th in 2016. 4th position during the last two years was held by the USA (61, 4). In Top-8 there was also Great Britain which lost one position in 2016 (from 2nd to 3rd) and in 2017 took 5th position, herewith its rating was 62, 42; 61, 93; 60, 98 respectively. In contrast to the UK, Denmark improved its rating from the 10th position in 2015 to 6th in 2017. The one representative from Asia in Top-8 was Singapore which consistently ranked 6th-7th positions. The 8th was Finland which lowered its rating from 5th-6th position to 8th.

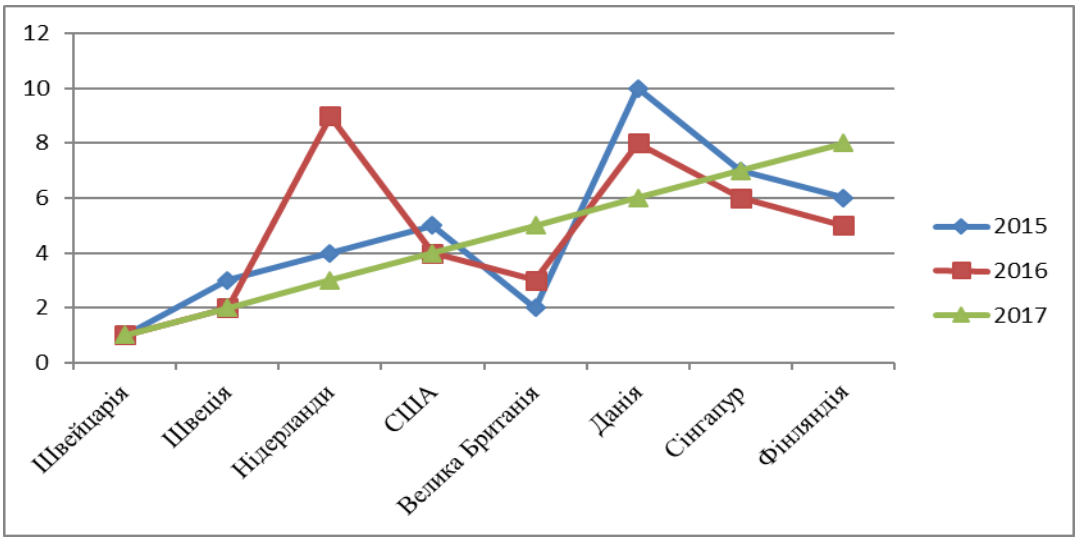

FIGURE 2
TOP-8 COUNTRIES BY THE INDICATOR "THE POSITION IN THE COUNTRIES RATING BY THE INNOVATION INDEX" IN 2015 - 2017

Based on: The Global Innovation Index 2015, 2016, 2017.

According to the countries rating by The Innovation Index, our country improved its position in this rating (Figure 3): in 2015, Ukraine took 64th position (index 36, 45); in 2016-56th position (35, 72); in 2017-50th (37, 62). The comparing of The Innovation Index indicators of Ukraine and Switzerland is shown in the Figure 3 according to the chart; the innovation indexes of Ukraine were almost two times lower than Switzerland, this indicates that Ukraine needs to make enough efforts for the innovation increasing and implementing of the active innovation politics into the economic system.

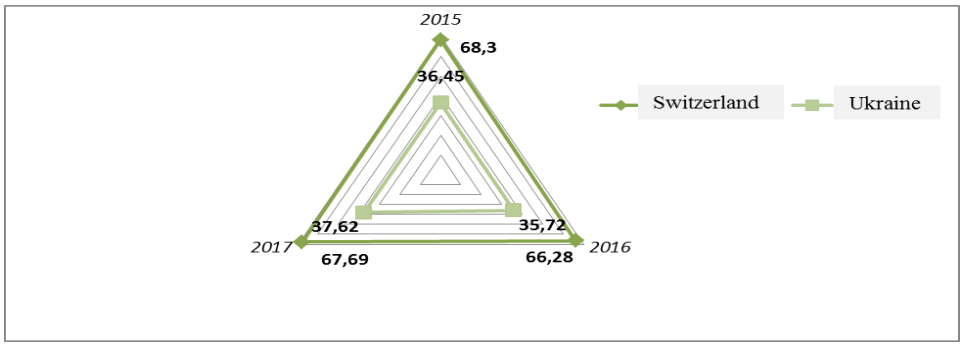

FIGURE 3
THE COMPARING OF UKRAINE AND SWITZERLAND (LEADING COUNTRY) INNOVATION INDEX

Based on: The Global Innovation Index 2015, 2016, 2017.

Considering the detailed profile of Ukraine, which the Global Innovation Index was formed in 2017 according to, it's been determined that all indicators cover two directions of research:

The first direction-the indicators at the profile beginning are directed to the economy characteristics, they describe the number of population, GDP and GDP per capita, the income level of the population and the geographic region.

The second direction contains the economy estimates and ratings of which affect The Global Innovation Index (GII), the estimation is done using the sub-indexes of the innovation production, innovation potential and innovation efficiency.

According to the calculation methodic of the country rating be The Innovation Index, seven factor groups are determined which are estimated by the statistical and expert data: the institutions, human capital and research, infrastructure, market development, business innovation, the results of knowledge and implementation of technologies, innovation production.

By this profile, strengths (the coefficient of innovation efficiency; convenience of business starting; correlation "*pupil-teacher*"; enrollment in studying; the state of clusters formation; knowledge creation; women with a higher education; patents implementation; utility models development; computer soft costs; export of the information and communication technology services; trademarks availability; production designs implementation) and weaknesses (the political environment; the political stability and security; government efficiency; the regulatory environment regulation quality; rule of law; ease of insolvency; ease of the taxes payment; an international research and development companies; an information and communication technologies access; ICT using; government online-services; e-technologies development; the logistic productivity; gross capital for the innovation; ecological indicators; getting a loan convenience; gross microfinance loans; investor protection; an information and communication technologies creation and business model creation) which affect the country rating, also, marked as factors which increased during the analyzed period compared to the basic indicator (enrollment in studying; market capitalization; an innovation business). As we can see, the number of weaknesses far exceeds the number of strengths that indicates significant problems in the innovation policy of Ukraine during the researched period.

The results of our study using the methodology for the formation of the Global Innovation Index showed that in Ukraine, with sufficient resources and subject to the use of innovations, the achievement of scientific and practical results is not enough high.

CONCLUSION

Unlike the leading countries in the world, efficient national innovation system in Ukraine hasn't been created yet. Ukraine's innovation activity is characterized by inconsistency and imbalance of research, entrepreneurial and economic aspects. The innovation processes in Ukraine haven't yet gained the sufficient scope and haven't become a significant factor of its competitiveness formation. The formation and use of innovation potential in Ukraine should help to solve these problems.

Offered system of Ukraine's innovation potential analysis which is based on the results of the statistical parameters monitoring of Ukraine's innovation potential development and determination of Ukraine's rating by GII, gave an opportunity to determine the innovation potential current state which can be characterized as slowly developing because the dynamics of basic innovation activity parameters as a result of the innovation potential application is multi-vector and has both negative and positive characteristics. It's confirmed by the calculation of integral indicator of the nature of changes in the development of innovation potential which accumulates growth rates of the formation and use of innovation potential individual indicators.

Ukraine's innovation potential development results which are characterized by the statistical parameters, affected Ukraine's ranking by GII rating. In 2017, Ukraine ranked 50th of 127 countries with an index of 37, 62, it's a very low indicator because Ukraine has a sufficient potential and historical preconditions for the innovation potential development.

RECOMMENDATIONS

Based on our research results, we recommend (based on the parameters monitoring of the domestic innovation potential development) to identify positive and negative consequences as for scientific, entrepreneurial and other spheres development which directly affect the formation, development and use of the innovation potential in the country, use the corrective actions at the level of the state, regional and branch policy.

One more innovation potential research direction should be a world ratings' monitoring which reflect the innovation potential development state comparing to the other countries, namely: GII which will give an opportunity to use the progressive experience of other countries in this question and provide the opportunity of the innovation integration to the world community by the relations and cooperation debugging at the leading countries' level by these ratings.

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