

# ANALYSIS OF PUBLIC UNDERSTANDING OF NEW TECHNOLOGIES AND INNOVATIVE DEVELOPMENT IN UKRAINE: CURRENT PROBLEMS AND PERSPECTIVES

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## Abstract

As Ukraine proclaimed the model of innovative economic development in 2001 and chose 'the development of new and resources-economy technologies in the industry and the agricultural complex' as one of the priority directions, this topic is of great interest for our society. Development of genetic engineering, biotechnology and their safe application are the most urgent questions.

There are some biotechnological risks, which are highly discussed in mass media. They are:

- transfer of artificial genetic constructions to genotype of existing organisms and appearance of more viable unhealthy organisms which can displace other organisms;
- appearance of new albumen and biologically active substances which are harmful for people and animals. These problems are known as 'biosafety'. Scientists of the world develop theoretical basis of 'biosafety', create legislative base which could provide health and environment protection.

Our Ukrainian scientists have good results in biotechnology. There are some examples: microbe super synthesis of some important albumen; creation of bio-sensory systems for medicine and ecology; creation of new transgene plants.

These investigations are biologically not so harmful as they are not used in practice yet. Another danger exists. Foreign biotechnological companies are interested in the promotion of their products at Ukrainian market. These products are very often not checked. Now in Ukraine transgenic products are being tested although it contradicts to our legislation. Thus, genetically modified potatoes are tested in Ukraine (resistant to Colorado beetle, MONSANTO Company), as well as corn (resistant to insects, NOVARTIS Company), sugar beet, etc.

Committee for safety questions was established at the Ministry of Science and Technology. Some conditions of ecological safety are included in the laws of Ukraine, but some standard legislative acts contradict to the Ukrainian legislation. Scientists of Ukraine proclaimed the necessity of intensification of the state control on safety during works in genetic engineering and on entry of un-audited products in Ukraine. Moreover, they emphasized the necessity of cooperation with European Community in terms of biosafety.

So, conferences, symposia on legislative regulation are held. Not only specialists take part in such discussions but also mass media, Internet visitors discuss them on-line.

The raising of the interest in biotechnology and ecological safety on the part of society is also necessary to mention.

*Keywords:* S&T and innovation performance in Ukraine today, public understanding of new technologies and innovative development, urgent questions for discussion over innovation outputs and perspectives in Ukraine: macro and micro aspects.

## 1. Introduction

The first question to put is what was typical and what was unique in the past of Ukraine? It seems most important to enumerate the following characteristics:

- There was a strong tradition in scientific & technical potential in Ukraine in the SU before the systemic change.
- Scientific research had a wide spectrum and high level S&T achievements attained in Ukraine led to important new materials, electric welding, biotechnology, nuclear physics etc.

What has been changing by now?

- Similarly to other, late-socialist countries, – although in different measure – the previously achieved S&T potential is not fully used in today's economic restructuring in Ukraine. Unfortunately, the earlier S&T potential is still dispersing, meanwhile the level of innovation activity is low and does not satisfy Ukrainian economy. (It is not to forget that steady economic growth of any state is only possible through the corresponding development of science, technology and innovation.)
- The fact that Ukraine proclaimed the model of innovative economic development in 2001 and chose 'the development of new and resources-economy technologies in the industry and the agricultural complex' as one of its priority directions shows that this topic is already of great interest for our society. There is a hope that being on the way to economic reforms, Ukraine can have an adequate position in Europe and in the world only through adopting a forefront S&T model of economic development.

As a first evaluatory remark it is to state that Ukraine inherited a rather high-level science & technology potential in a backward economy but this science & technology potential is still dispersing and not adequately used for the progress of the economy. This may be the most unique feature of the situation in Ukraine. Being on the way of economic reforms, Ukrainians are persuaded that their country can have an adequate position in Europe and in the world only through adopting an S&T based model of economic development.

## 2. Questions of Public Discussion of S&T and Innovative Sphere in Ukraine, S&T Priorities

It seems that both acceleration of innovation through developing appropriate high-tech potential and the possible negative social consequences of new technologies

(especially biotech) to be introduced are in the focus, even when not in the same measure, of some but partly different layers of the intellectuals. The main tasks to accelerate innovation are as follows:

- Setting up an appropriate legal basis of S&T.
- Developing appropriate innovative policies in Ukraine that will stimulate innovative activity and new technology development by determining S&T priorities and provide their financing. (In contrast to the opinion expressed in the notorious book of T. Kealey that argues for non-financing of research and development by the state there is a widespread consensus that the state should preserve some supporting role in financial terms.)
- Problems of the missing innovative infrastructure are topic of public discussion.
- Technology transfer and commercialization is also in focus of interest.
- Last but not least the problem of how to accelerate international cooperation is to mention among the issues at stake.
- Beside the above mentioned topics that relate to the problem of acceleration of innovation safety problems of new technologies to introduce (technology assessment questions) are also discussed.

These questions are discussed in the media. Also, scientific conferences and symposiums are held. Preferably specialists take part in these discussions but occasionally mass media and Internet are also involved. The main recent discussion revolves around the main task underlying S&T policies in Ukraine. This task is the identification and framing up of S&T priorities. Thus, according to the decree of the Ukrainian Parliament issued in 1992, the following priority areas were accepted:

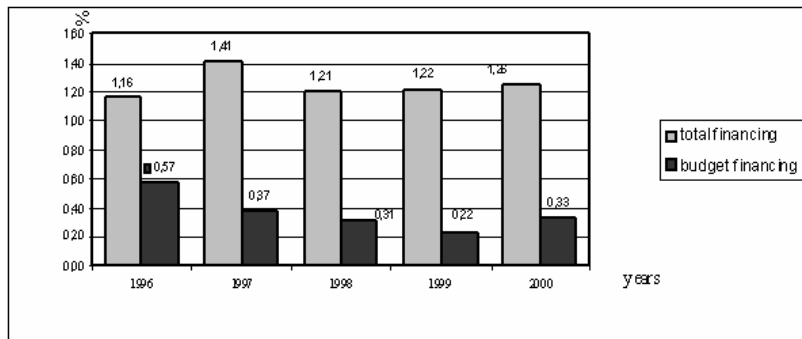
- environmental protection
- human health
- production, processing and conservation of agricultural products
- ecologically safe energy production, and resource-saving technologies
- new substances and materials
- advanced information technologies, complex automation devices, communication systems
- scientific issues of building up the national statehood.

Specialists in the innovation sphere consider that 'biotechnology' can be defined as a separate priority area serving agriculture, food-consumption, pharmacy, energy.

Decision to indicate biotechnology as a priority area was challenged by the raising interest, on the part of society, in biotechnology because of its problematic ecological safety. There are some biotechnological risks, which are discussed in mass media. The transfer of artificial genetic constructions to genotype of existing organisms, appearance of more unhealthy organisms which can displace others and appearance of new albumen and biologically active substances, which are harmful for people and animals can especially be mentioned. These are the problems known as 'biosafety'.

### 3. S&T and Innovation Performance in Ukraine Today: Macro Level

What is actually the S&T and Innovation performance in Ukraine today? Let us look first at the macro level. Research component of industrial production fails to exceed 0,3%. That is 10-20 fold less than the average international proportion. More than 90% of the Ukrainian production output do not have adequate R&D support. Just to make one comparison in the USSR, in 1970-1980 the share of 'science' categories in the central budget was 3.3–3.5% of its expenditure part. But the R&D component of GDP has continuously fallen back during the past years. Today, national expenditures on science make 1.26% of GDP in Ukraine. Share of research in the central budget makes 0.33%. It is to compare with sustained share in budgetary sources in developed countries during the latest 20 years. These are bigger by an order of magnitude. Ukrainian science policy specialists argue for increasing the share of budgeting of research in the central budget to 2%. What is the dynamics of the R&D component in the budgetary expenditures in Ukraine? The graphic below gives an overview of five years.

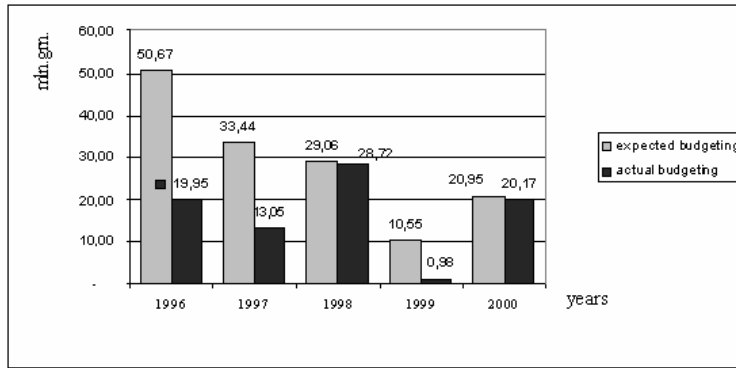


\* Derived on the basis of the data available with the Ukrainian Parliament, and the Ministry of Finance of Ukraine

Fig. 1. Dynamics of R&D component in budgetary expenditures in Ukraine (1996–2000, %)

### 4. S&T and Innovation Performance in Ukraine Today: Micro Level

The first characteristic to take into consideration is that the number of Ukrainian enterprises performing innovation has been decreasing annually by 8.8% on average during the last 2–3 years. Beside this it is important to see that, in 2001, taken as year to indicate the typical situation, a major part of the industrial enterprises (above 80%) did not perform any innovation. Actually, innovations were performed only by 1.800 industrial enterprises.



- ◆ Actual budgeting support of "priority areas" was quite often thinner than in case of any other budgetary expenditure categories. However, their aggregated budgeting from budgetary sources failed to exceed 9% of the total budget allocated in Ukrainian science.

Fig. 2. Dynamics of aggregated budgeting of the official S&T priority programmes in Ukraine

Is there any difference between the behaviour of large and small enterprises? The answer is yes. Large enterprises with more than 5000 employees were more sensitive to innovations. In 2001 the total budget of technological innovation was 1.2 bin. hryvnya (\$227 mil.) As in previous years, their basic source was the own assets of the enterprises (nearly 75% of the total budget). The share of the projects funded from the central budget amounted to 5.1%.

What are the most important factors limiting innovative activity of enterprises in Ukraine? What decreases the innovative activity of enterprises in Ukraine? The answers below are based on the opinion given by the enterprises themselves. The main factors are the following:

- deficit of enterprise's internal assets – (about 93% of Ukrainian enterprises has such opinion)
- difficulties in getting credits from the bank because of high interest rates – (42%)
- shortage of state support (32%)
- strong tax pressure and weak legislation bases (26%)
- deficit of ordering customers' assets (25%)

## 5. Recent Innovative Structures of Ukraine

In Ukraine the first steps have been made on establishing institutional and economic schemes integrating science and production such as concerns, special economic

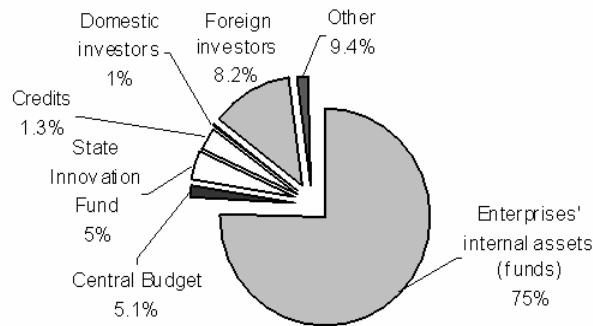


Fig. 3. Innovation budgeting by source in Ukraine








-  1. Business-incubator at Kiev Polytechnic Institute; 2. Business-incubator at Lviv University; 3. Mono Crystals Business-incubator in Kharkiv
-  1. Techno park "Semiconductors" 2. "Electro Welding" in Kiev; 3. "Mono Crystals" in Kharkiv; 4. Agro techno park "Brody" Lviv region
-  Valeological innovation center in Truskavets; Innovation Technological Scientific and production center "Blitz Inform" in Kiev; Crimea regional innovation center
-  1. Techno polis in Lviv 2. Techno polis in Kharkiv
-  Priority development territory (on innovation bases) Javoriv, Interport Kovel, Slavutich, Sivash, Azov, Donetsk.

Fig. 4. The map of innovative structures of Ukraine

zones (SEZ), scientific & production zones (SPZ), S&T incubators, innovation centres etc.

These should promote:

- activation of innovation business
- more rapid transfer of S&T knowledge to production

- favourable conditions for high performance of small innovation firms implementing advanced scientific ideas.

Innovative Structures Foundation, free economic zones, scientific & production zones analogue to technoparks and technopolices are to mention as tools to accelerate innovation. The Innovative Structures Foundation in Ukraine started in 1996. There are strong territorial differences concerning innovative regions. Innovative places are concentrated preferentially in central, western and eastern areas with highly developed S&T potential (Kiev, Kharkiv, Lviv). Some of them are enumerated below.

- Business-incubators with financial support from Renselear Polytechnic of Troy, the USA at Lviv University, Kiev Polytechnic Institute; Kharkiv Mono Crystals Business-incubator by MCI.
- Innovation technological scientific & production centre (established by the joint-stock enterprise publisher 'Blits-Inform') in Kiev.
- Truskavets valeological innovation centre (development of advanced technologies of recreation, treatment with a heavy R&D component).

It is to add

- The project of the Crimea regional innovative centre that is at the pilot stage now.

By the end of 2001 11 free economic zones have been established in Ukraine. They were granted the status of priority development territories (PDT). Our analysis indicates, that 6 of 11 PDT in Ukraine are based on high technologies and innovations ('Donetsk', 'Azov', 'Interport Kovel', 'Slavutich', 'Kurortopolis Truskavets', 'Javoriv').

Further, there are scientific & production zones (SPZ) analogue to technoparks and technopolices.

- Economic and technological experiment on the basis of agro technopark 'Brody' (Lviv region) has been launched in 1994.
- Three technological parks on the basis of the institutions of NAS of Ukraine, such as the Institute of Semiconductors, the Institute of Electric Welding and the Institute of Mono Crystals (founded in 1999).
- 'Lviv Technopolis', integrating more than 10 innovation firms and small enterprises.
- 'Kharkiv Techno Region', integrated approach to technological supply of production, building up advanced transport and communication infrastructure, solutions to ecological problems.

Experts estimate that today in Ukraine there seem to be about 40-60 territories which have suitable conditions for SPZ. But to accelerate the process certain legislation conditions should first be realized.

## 6. Public Discussion About Improving Steps

In the centre of the public discussion are the following issues: resources for S&T, stimulating legal conditions, involvement of venture capital, attraction of foreign capital, adjustment of financial and taxation system, innovation policy. Let us make some remarks on all of them.

- Consolidation of resources on fundamental and applied research in the areas where Ukraine has heavy scientific, technological and production capabilities able to bring the national production to the world market is very important. This should involve investment from centralized funds and programmes in priority S&T areas.
- But to create appropriate legal conditions that should stimulate and boost establishing of new innovation enterprises and firms is *conditio sine qua non*. A primary objective in this context is the adoption of such a legal document as the law 'About innovation activities' to implement the legal regulation of innovative process. Ukraine joins with this step to the developed countries that have recently re-regulated their legal frame of innovation.
- The next important element to develop an innovation supporting system is building up a venture budgeting sector. It is to remember that the amount of the venture capital used to support innovation is in the USA about 8 times more than in the European Union and all the late socialist countries are far behind the EU.
- Ukraine is a capital-poor country. Hence, attracting foreign capital to free economic zones of Ukraine favourable for establishing innovation enterprises is also a decisive element of the innovation supporting system.
- Further, we have to mention the adjustment of the financial and taxation system, and crediting policies. This adjustment should have the purpose of further innovation development to encourage investors' involvement in innovation projects with long-term cycle, high risk or long-term capital return. This includes the introduction of favourable taxation schemes (among others discount on income tax equal to a part of R&D costs; favourable terms on depreciation of fixed assets). There should be certain policy measures to push commercial banks to innovation process.
- Infotech-supported decision-making also belongs to the not well-developed areas. Development of computer data bases for collection and processing of information, decision-making support, and consulting services for business sector and physical persons is one of the urgent requirements.
- Last but not least will be mentioned the development of an adequate statistical base on this sphere through introducing relevant international standards for statistical research.

Let me clear the special situation of Ukraine concerning biotechnology. Ukrainian scientists have already good results in biotechnology research. Some examples: microbe super synthesis of some important albumen, creation of biosensory



systems for medicine and ecology, creation of transgenic plants. The results of these investigations have not been used in practice yet. But there is another danger. Foreign biotechnological companies are interested in the promotion of their products on the Ukrainian market and make large scale experiments in Ukraine. These products are often not appropriately checked previously. Thus, transgenic products, genetically modified potatoes are being tested in Ukraine (resistance to Colorado beetle) by Monsanto company, as well as corn (resistant to insects) by Novartis company, sugar beet etc. The problem with these processes is the externalization of possible dangers by non-Ukrainian firms.

To deal with this question the Committee for Safety Questions was established at the Ministry of Science and Technologies. Scientists of Ukraine proclaimed that it is necessary to tighten the state control over safety during works in genetic engineering and over entry of unaudited products in Ukraine. Moreover, the necessity of cooperation with the European Community in terms of biosafety is emphasized. Thus, conferences and symposia are held on legislative regulation. Not only specialists take part in such discussions but also the mass media and Internet visitors discuss them on-line. All these show the raising interest in biotechnology and ecological safety on the part of society.

## 7. Conclusion

- Present S&T and innovation activity in Ukraine is at a distance from the developed market economies that feature heavy innovation component in industrial output, investments, GDP, reasonable factor of corporate and individual profit.
- S&T and innovation, being announced by the government as a “priority, strategic platform of economic development of Ukraine” become an urgent question of PR discussion.
- Possible dangers for ecological system or human health are discussed but not widely by the public in Ukraine.
- A further step towards excellency of S&T and innovation policies must be made to optimize adequate market mechanisms, and effective state mechanisms of regulation of business sector as a whole.

## References

- [1] The Law ‘Bases of State Policy in Science and Scientific & Technical Activity’ adopted by the Ukrainian Parliament (UP) in December 1991.
- [2] The Decree of the UP ‘About Priority Areas of S&T Development’ issued in October 1992.
- [3] The Concept of S&T and Innovation Development Adopted by the UP in July 1999.
- [4] Project of Law ‘About Innovation Activity’ (1999–2000).
- [5] KEALEY, T., *The Economic Laws of Scientific Research*, London: MacMillan Press, 1996.
- [6] BALABAN, A. T. – CARABATEAS, E. N. – TANASESCU, F. T. (eds), *Science and Technology Management*, IOS Press, 1997.

- [7] S&T and Innovation Activities in Ukraine. Statistical Book (Ukrainian Edition) State Statistics Committee of Ukraine. Kyiv, (2000), p. 94.
- [8] S&T Potential of Ukraine: Performance, Problems, Perspectives (Ukrainian edition) Centre for S&T Potential and Science History Studies, National Academy of Sciences of Ukraine. Kyiv. (2000), p. 50.
- [9] Proposed Guidelines for Collecting and Interpreting Technological Innovation Data – Oslo Manual, Paris, 1992.