EU funded Project "Enhance Innovation Strategies, Policies and Regulation in Ukraine"

INNOVATION POLICY: EUROPEAN BENCHMARKING FOR UKRAINE

VOLUME 1

Key features of innovation policy as a basis for designing innovation enhancing measures leading Ukraine to a knowledge-based competitive economy – Comparison EU and Ukraine

Editors: Gudrun Rumpf, George Strogylopoulos, Igor Yegorov

(Analytical materials based on outcomes of the Project "Enhance Innovation strategies, policies and regulation in Ukraine" EuropeAid/127694/C/SER/UA)

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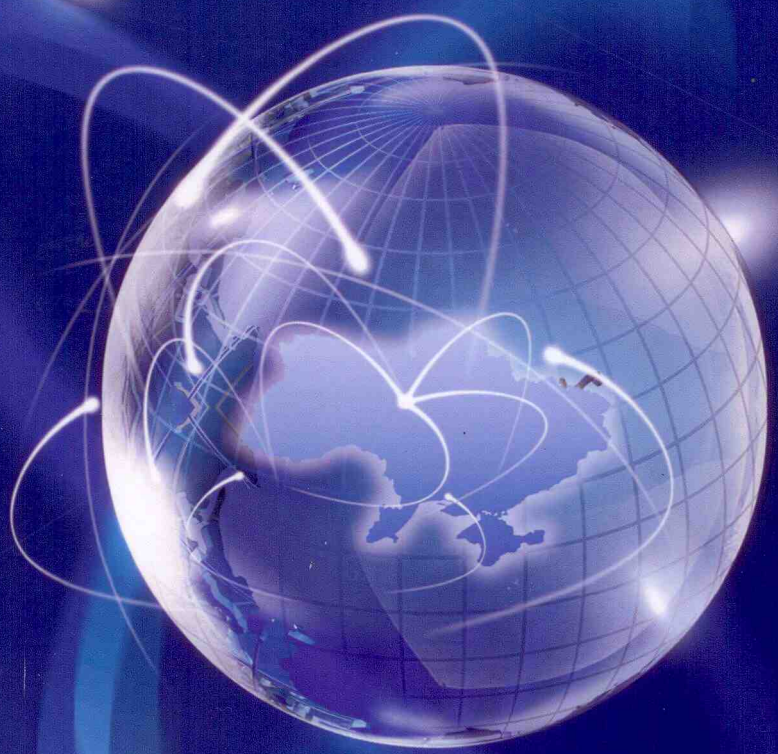

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INNOVATION POLICY: EUROPEAN BENCHMARKING FOR UKRAINE. VOLUME 1

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Chapter 1

Introduction (Gudrun Rumpf)

Congratulations to Ukraine for its 20th anniversary on 24.8.2011. The country has come a long way in the difficult and still ongoing transition process from state to market economy.

The basis of our publication was the observation that upon suddenly and unexpectedly acquiring its independence in 1991, Ukraine's technological, scientific and educational communities found themselves in a curious position. They had been a major and formidable player in the technological-scientific enterprises of the former Soviet Union. As such, they had at their command a wealth of developed scientific knowledge, a powerful scientific community, an extensive high technology industry, an advanced educational system, and a highly educated literate population thoroughly grounded in the sciences and technology.

With such substantial attributes, one might expect that after a certain period of adaptation, Ukraine would be ready to forge ahead and be able to compete effectively in the global marketplace of applicable ideas and technology, as well as in the areas of research and innovation. However, that is not what happened. Although in its study of global sustainability, "Geoinformatics and sustainable development" (http://www.wdc.org.ua), the World Data Center assessed that Ukraine at the end of the 1980's had one of the best starting conditions among the countries of the former Soviet Union and its sphere of influence, it also noted that Ukraine had not managed to benefit from its advantage. During the last four years, the rating table of the index of global competitiveness shows a decline from 72nd place to 82nd out of 139 countries ranked (http://www.weforum.org). And so, now after 20 years of independence, Ukraine is still struggling and unable to fully capitalize on its significant educational, scientific, and industrial strengths.

Considering the various positive developments that could arise from having a strong Ukraine, the major question at this stage is: "Can Ukraine's economic decline be turned around and, if so, how?" An understanding of why such a technologically advanced country did not thrive would begin to give us insight both into what was lacking and what is needed now.

The obstacles to economic and commercial success for Ukraine were numerous ranging from the shock of the breakup of the Soviet Union to the realization that Ukraine was not fully prepared for independence and was not prepared to fit into a market driven consumer economy, let alone to reap any benefits from it. A market economy requires a lot of initiative and capital. Initiative, while often available, was not always promoted. There were no precedents for business development on a large scale. There were no ready ways to know who owned what especially when it came to intellectual property. There were no laws to protect inventors, investors, businessmen, and their businesses. Both among potential innovators and among lawmakers, there was a lack of knowledge and experience in how Western style market economies work. As for capital, Ukraine was hard pressed to maintain itself and had no capital for innovation and commercialization investment. Foreign capital, given the legal uncertainties and the risks, shied away from investing in Ukraine.

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Evidence shows it is difficult for Ukraine and other countries of the former Soviet Union to change. The world is witnessing the struggles that arise when a country and its populace must consciously choose another approach to living and conducting their affairs. In the former Soviet system scientific research and innovation were basically state property and as such had to be strictly guarded and controlled. Since independence, Ukraine and the other CIS countries have tried to develop legal systems to help manage their scientific activities. The Western models for business creation and operations were, and are still regarded with suspicion by some. Changing a country's old habits and beliefs takes education, re-training, re-interpretation and time.

The old centrally planned economy had failed. The old system had determined the value and worth of the various scientific and technological endeavors according to how they furthered the priorities of the state. Foremost among these priorities was the military complex. Generally, rewards were not linked with economics or the consumer; consumer innovation and commercialization were be a central priority of the state run economy.

Changing to a consumer market driven system meant that the state's priorities had to change - a difficult process under any circumstances with Ukraine being no exception. In turn, a change in priorities would also mean changes in the established systems of rewards, honors and privileges. Such changes cause major disruptions that test and fray the existing social fabric of a country. Today, Ukraine is still struggling with these disruptions. Some segments of society have been willing to cast aside many of its former values; other segments have not. The formation of a viable, unifying and dynamic Ukrainian identity is ongoing, and the struggle to bring about useful and workable changes goes on. In such a climate Ukraine's economy help is especially critical in the areas of science, innovation, technology, commercialization, and international collaboration through knowledge management and exchange.

In terms of growth, the economies of the West are knowledge-based. Technology is the major driving force, and through patenting and licensing and the formation of new start-up companies high technology jobs are created. Success leads to profits and more jobs which then lead to national well-being, national stability and further investment and success. These are all sorely lacking in Ukraine at present; the world of commerce is still relatively new and the world of consumer product commercialization still holds many mysteries. And yet, each year approximately 100,000 students graduate from Ukrainian universities only to discover that Ukraine's economy still has to create enough suitable jobs in order to absorb this annual flow of newly educated professionals. The development of high-tech ideas and products that can compete in the marketplace is a necessity, but so far it has not gained momentum.

There are many obstacles to the commercialization of scientific research in Ukraine: scientists lack adequate knowledge, experience, and preparedness for commercialization; management lacks effective managerial skills as regards research activities; financing for innovation is markedly insufficient; commercialization of research activity is hampered by the shortcomings of the legal structure; and overall there is the absence of an effective infrastructure for innovation. In contrast, market economies are empowered by their utilization of trained business and commercialization experts ranging from MBAs to patent and corporate lawyers, from knowledge and innovation managers to business development experts. Such experts are scarce in Ukraine. Formerly there had been no perceived need for them or their services. Now, however, it is becoming clear they are needed.

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Statistics in Ukraine show that only 14.2% of enterprises are involved in innovative activity and only 6.7% by sales volume is realized through innovative production. All of these factors highlight the need for training, experience, and exposure to effective practices. In order to compete globally, various Ukrainian professional and social institutions need to understand how technology makes money and affects the economy, and then to coordinate their efforts toward rewarding goals.

Certainly there are obstacles that Ukraine has to overcome, however, the foundation and potential for innovation do exist. Ukraine, today, has more than 100,000 industrial enterprises, about 300 scientific institutes and universities, and an active scientific community of approximately 100,000 scientists. In terms of the total volume of natural resources, Ukraine occupies one of the leading positions in the world for coal, metals, uranium ores, and minerals. Although Ukraine's exports consist largely of metallurgy products (up to 35%), every year the share of machine-building, high precision equipment construction, and information technologies is growing. Even more indicative of technological potential is the fact that today's Ukrainian university graduates and scientists are welcomed in all parts of the world, and Ukraine remains a world leader in the areas, among others, of space and aviation technology, cardiovascular surgery, high-tech specialized metal welding, and in the preparation of certified computer programmers.

Furthermore it is important to recognize that, even at such a time of economic difficulties, collaboration between investors and scientist-innovators can be mutually rewarding, and that the commercial potential from scientific discoveries and technology developments can be great if one takes the time to uncover them and to work collaboratively with them. Ukrainians scientists are eager to see their developments and inventions in use by consumers in the global arena, and they are seeking collaborative opportunities with Western investors and the formation of joint ventures. The more training, experience, and exposure to the West that they can get, and the more trained business and managerial professionals that they can work with, the more smoothly will it be possible for them to participate in the global market economy. It is clear that training business/managerial professionals is central to Ukraine's transitioning to a market economy.

This introduction has shed some light on Ukraine's major difficulties in transitioning to a global market economy. Our project has analyzed Western and Ukrainian experiences in detail in thirteen areas in innovation policy likely to having either a beneficial or a hampering effect on leading Ukraine to a knowledge-based competitive economy. The analysis brings us back to the major question posed earlier above: Can Ukraine's economic decline be turned around and, if so, how? In this publication we discuss the major concerns. Our aim is to turn to the issue of reversing Ukraine's economic decline: "Can it be done?" By our analysis we want to contribute to the answer "Yes." Ukraine has much to offer and all effort must be made to untap its enormous potential.

In the following the reader finds information and analytical materials that characterize the current state of policy in science and innovation in the EU and Ukraine. Thirteen topics of importance in research and development, technological and innovation policy were reviewed which yield in the compilation of chapter 15:

- Innovation driven, sustainable growth models (chapter 2)
- Financing innovation (chapter 3)
- Promoting R&D and innovation: Tax incentives and support services (chapter 4)

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- Innovation Culture (chapter 5)
- Setting priorities for innovation and technological development (chapter 6)
- Networking innovation and business support infrastructure (chapter 7)
- Coordination, roles, and responsibilities within National Innovation System (NIS) (chapter 8)
- State programmes in research and innovation (chapter 9)
- State and regional policy for SMEs on research and innovation (chapter 10)
- Innovation indicator tools (chapter 11)
- Regional innovation programmes (chapter 12)
- Decentralisation factors (chapter 13)
- Peculiarities of innovation development of steal and coal regions (chapter 14)
- INNO-Policy TrendChart Innovation Policy Progress Report (chapter 15).

These topics were analysed in the EU and in Ukraine with the help of international and Ukrainian specialists. Main comparisons between Ukraine and EU countries were drawn. Strategic policy issues and challenges for action drawn. The project analysed the legal framework of these issues (volume 2 of said monograph). Moreover this analysis was the basis to draw policy options for action (volume 3 of said monograph).

The underlying studies are promoted at http://innopolicy.com.ua/ We hope the materials can be used by policy makers for the analysis, discussion and adoption of specific decisions on the development of major areas of science, technology and innovation policy.

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Chapter 2

Innovation driven, sustainable growth models. Challenges and opportunities in a global economy (Hannes Leo, Boris Malitksy)

Looking at European growth experiences and the policies after the Second World War reveals distinctly different outcomes and approaches which are clearly country specific and tailored to the structures and challenges at the national level. Of course, the European heterogeneity was somewhat reduced through the creation and enlargement of the European Union but convergence in institutions and policy thinking is still slow. In a somewhat exaggerated interpretation of this situation, the existence of a European model of economic policy strategy and implementation could be simply neglected. Consequently, learning would only be possible on a country by country basis or at an even lower level of disaggregation, e.g. at the level of policy measures. The move to a lower level of aggregation would increase the information available substantially but demand a huge information processing capacity to arrive at workable conclusions. The Trendchart initiative, for example, has collected about 1400 innovation policy measures across Europe. Despite this tremendous effort, it is still somewhat away from presenting the complete picture including all measures. Even if someone is able to deal with this massive load of information, these measures operate in a specific context – an innovation system – and might be completely inefficient if transposed to another context.

A way out of this situation – the existing heterogeneity between countries and the overwhelming number of policy initiatives to support technology development and innovation - is a filtered approach that

- draws some lessons out of studies on growth and development across countries. This helps to identify some "universal" relationship that enable a deeper understanding of growth processes and offer some guidance in the design of growth policies
- looks at the variants of the European model which have been developed over time. Europe is far from being a uniform region but also not completely atomistic in policy approaches, traditions and underlying – often implicit – values and philosophies.

This filtered approach helps to somewhat reduce the information overload but does not provide a structure for the content to be discussed: innovation-driven sustainable growth models. The starting point clearly is innovation but the main issue is the innovation-growth nexus. This already hints that innovation is not seen as an end in itself but as an instrument to stimulate growth. "Sustainable growth" – clearly referenced in the title - adds yet another twist to this topic: if growth is to be sustained over long periods of time growth policy must pay sufficient attention to the limits of growth: the environment, the depletion of raw materials, energy, people… The extreme interpretation of the sustainability notion is the demotion of "growth" and the promotion of "development" which replaces a GDP based interpretation of welfare by strategies to sustain acceptable standards of living while conserving the environment.

This contribution will provide an overview of experiences in innovation driven sustainable growth policies in EU member states. The main focus of attention is thus innovation and growth strategies at the European and member states level. The perspective is on the major factors that impact on innovation and growth (i.e. innovation, education, competition, regulation and macroeconomic policies) and both theoretical and empirical models will help to illustrate the case.

1. Innovation, Growth and Competitiveness

The study of growth and the sources of growth have a long history in economics and build on mathematical growth models and empirical analysis of the growth process and various subsystems thereof. It is reasonable to say that almost all components of a society do have an impact on the growth potential of a country. While this is obvious, its far less obvious how big the influences of the various component has been, is at present and will in the future and over which channel the impact is being transported. Some

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advantages, like apt access to raw materials, may be advantageous only at a certain point in the development process but may create reliance on these resources and may reduce the willingness to invest in other industries or education and thus may curtail future growth potential. Likewise, early adoption of regulation to safeguard the environment may stimulate innovation in products and processes that create first-mover advantage once other countries follow suit rather than just adding costs for the companies which are affected by the regulation which would deteriorate competitiveness. Simply, growth is a dynamic process which is hard to predict in a medium to long term time horizon. Consequently, policies that worked at a specific moment in time may be ineffective or even detrimental to growth at another point in time. Studying growth processes means studying complex systems with tentative rather than absolute answers which are context (i.e. country) specific. The same holds true for policy interventions aiming at increasing innovation, growth and competitiveness. Policy measures are always taken under insecurity and may trigger unexpected impacts. A consequence of this is the integration of evaluation into the policy making process. Evaluations are to investigate the real impact of a measure and the procedural rationality in the implementation and are thus instrumental to fine tune policy making which would be hardly possible in the absence of evaluations.

Another consequence of this starting position is the adoption of a system perspective that explicitly takes the interaction between policy fields and between measures into consideration. In innovation policy for example this would entail to jointly plan policy interventions in the education system, the research system and in the innovation system in order not to create bottle-necks in various areas. For example, ambitious innovation strategies may be hampered by shortages of well educated researchers as the policy was not coordinated with developments in the education systems. This approach – usually referred to by the European Union as triangle policies– helps to stimulate innovation which may then help to grow the economy by increasing competitiveness on the international markets.

Competitiveness is another important concept in this respect as innovation activity and innovation policy is to a large extent driven by the desire to increase the competitiveness of a nation, a sector or a company. The European Commission defines competitiveness "...as a sustained rise in the standards of living of a nation or region and as low a level of involuntary unemployment as possible" (European Commission, 2007) "on a sustainable basis" (European Commission, 2003) as is sometimes added. While the definitions vary it is generally acknowledged that competitiveness can be – at least in the long run – equated by the productivity level and productivity development of a nation, sector or firm.

European Experiences

The productivity levels (per person employed) in the European Union vary greatly. The economies of Bulgaria and Romania achieve about 40% or less of the European average while Luxembourg is 80% above this benchmark. The European productivity development has been regularly benchmarked on the US and consistently renders a substantial difference irrespective of the productivity measure used. The EU27 productivity gap vis a vis the US now stands – depending on the productivity measure applied - at about 50% in GDP per capita or 42% in GDP per person employed or 28% in GDP per hour worked (see Competitiveness Report 2008)[1].

These large gaps overshadow the fact that European countries had successfully caught-up vis a vis the US for decades and reached the US level in terms of hourly productivity performance in 1995 (see graph 1). At

[1] The most straightforward competitiveness measure in this context is productivity per hour worked because differences in the workforce participation ratio and working time arrangements are not present in this indicator.

this time the US embarked on an ICT fuelled sprint and boasted high employment and productivity gains and a marked raise in market services sector in the first half of the 2000s (see van Ark et al., 2008). Europe in contrast trailed with substantial distance and could not make it own success story out of the vast opportunities this technology wave offered[2].

For our purposes a distinct set of policies that directly impact on productivity is relevant: innovation, education, research (i.e the triangle policy fields), competition policy, reallocation policy and macroeconomic policies. Triangle policies are at the heart of policy intervention to increase competitiveness and productivity but their efficiency and effectiveness is dependent on the level of coordination within these policy field and complimentary action in the other mentioned fields. There is plenty of evidence on the impact of these policy fields on competitiveness or productivity growth:

- The ability to innovation is one of the core competencies of successful firms, institutions and countries. Not surprisingly, a vast amount of research from has shown that innovation exerts markedly positive influence on productivity change and thereby contributes to growth (Romer (1990), Grossman and Helpman (1991), Aghion and Howitt (1992), Coe and Helpman (1995), for a survey of the empirical literature see Cameron (1998). This view is broadly supported in empirical studies irrespective of the level of disaggregation, the time period under consideration or the analysed countries (Guellec and van Pottelsberghe (2003)). If innovation works as an ”engine of growth“ and if growth was the primary policy objective, then it seems highly advisable to implement appropriate policies to foster innovative capacities.
- Economists have discussed the relationship between innovation and competition for decades. Some economists have argued that innovation is a form of competition and, as a result, a market structure that encourages price competition is likely to encourage innovation. Other economists, often citing the early work of Joseph Schumpeter (1942), have argued that large firms, perhaps in concentrated markets, are more likely to support innovation than smaller firms. The present consensus prefers an inverted U-shaped relationship between innovation and competition: too little competition hampers innovation and too much may do so as well. At the same time an optimum relationship between innovation and competition exists (see also Aghion and Howitt (2005).
- Raising R&D intensity by more than 50% - as suggested by the Lisbon Agenda – only materialises if industry structures change substantially. New high-tech and high-R&D spending companies should be allowed to exploit existing technological opportunity and thus enlarge their share while traditional industries should be allowed to shrink. This sometimes painful process comes about by business diversification of incumbent firms, start-up companies or relocations of firms from outside Europe. There is substantial evidence that start-up activities are far less dynamic in Europe than in the US. The hardened European industry structures – marked by a low entry rates - limit potential productivity increases through the elimination of the least productive firms, reduce the stimulus (i.e. through new entrants) for incumbents to increase their productivity and neglect the opportunities to establish new industries. There is also evidence that the slow implementation of the internal market and rigidities in product and labour market reduce economic dynamism. Simulations with the QUEST model (European Commission 2007) to compute the macro effects of product market reforms between 1995 and 2003, suggest a positive effect on GDP amounting to almost 1.5%, consisting of a 1% increase in employment and a 0,5% increase in labour productivity.

Naming important policy fields that impact on competitiveness is only half the story if the strategy formulation is on the agenda. There is strong empirical evidence that policy measures have to be in line with the level of development of the respective economy. It is not sufficient to copy the policy mix of advanced countries – it might even be counterproductive to apply this approach. A concept to bring this into perspective is the “technological frontier” which draws a line between countries that work on or close to the technology frontier and those who are in a catching-up mode (see for example European

[2] The European productivity slowdown was the result of slower multifactor productivity growth in market services, particularly in trade, finance, and business services (van Ark et al., 2008).

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Commission 2008, Aghion, 2006). In the first place, the policy mix has to aim at an outward shift of the technology frontier by radical innovation while for the second group of countries it has to support a catching-up process where imitation is a major component.

The policy mix (i.e. the measures) but not the policy headlines have to be different in each of the two cases. Radical innovations are the major instrument to shift the technological frontier outwards and – if you are already working on the frontier – the only option to differentiate yourself from your competitors and to create potential for future growth. Radical innovation is – but not exclusively – more important for nations, sectors and companies that work on or close to the technological border. Of course, radical innovation also happens in catching-up mode but is most likely not the most prominent form of innovation. Even in front-running mode most innovation activities should be incremental.

There is no single policy measure to support either frontrunning or catching-up activities. Aghion (2006) describes the catching-up mode as being characterised by limited competition in the product market; large firms financed by banks and by government subsidies, educational systems emphasising primary, secondary, and specialised undergraduate education; and rigid labour markets that favoured the accumulation of experience within firms over mobility across firms. The frontrunning mode is just the opposite. Here is some evidence that the differentiation between the modus operandi has some bearings on the effectiveness of economic policy:

- Krueger and Kumar (2004) estimate that some 60% of the difference in growth between European countries and the USA can be attributed to the fact that European education systems are strongly geared towards vocational or secondary education. Knowledge-based societies – that is were Europe intends to end up - need general key skills and higher education, which promotes the adaptation of new technologies and the creation of new sectors with new businesses. The historic – and, as far as the catch-up process is concerned, correct - European focus on secondary education is therefore becoming an obstacle to growth given Europe's arrival at the "technological frontier" if the economic policies of the advanced countries is to be changed.
- Aghion et al. (2005) provides a good illustration for the different impact of an education policy[3] measure with respect to the development level of a country. A $1000 per person increase of higher education spending would boost the annual growth rate in an in a country at the technological cutting edge by some 0.27 percentage points, whereas investing this amount in a country that is lagging behind in this area increases the growth rate by only 0.1 percentage points. Employing people with higher education in countries close to the technological cutting edge thus yields a higher return, because these countries are also seeking more radical innovation, which can only be achieved through scientific research which employs people with tertiary education.
- Education system and tertiary education in particular are in strong demand if R&D expenditures are to be increased. A simple calculation, using the present ratio between R&D spending and the number for R&D employees, yields an additional demand for 700.000 researchers if the 3% target is to be achieved (European Commission 2007). Without increased output of people with tertiary education attempts to raise R&D expenditure would simply increase wages for the existing researchers. This already non negligible number of additionally demanded researchers with tertiary education is only the tip of the iceberg. Working at the technological frontier demands a larger base of people with tertiary education – and not just the 700.000 researchers – which are able to adapt to the constantly changing requirements in their professional live and to introduce radical innovation which shift the technological frontier outwards. Missing investments into the education system have thus been a major cause for the modest European productivity performance.
- Aghion et al. (2005) and Griffith et al. (2006) show that the proximity to the technological frontier is of importance in this respect too. In general, firms are stimulated by competition to innovate up to a

[3] In principle, investment in human capital yields very high returns. Increasing the average period of education by one year boosts potential economic output by 6% over the long term (De la Fuente, 2003).

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certain level. Too much competition discourages firms to innovate as they are having problems to finance innovative activities and to reap the benefits of their efforts.
It is increasingly acknowledged that the European failure to change from catching-up into frontrunning mode is an important issue in explaining the widening of the productivity gap since mid of the 1990s. Many of the advanced European countries had caught up to the US at the beginning of the 1990s. The arrival at the technological frontier was not accompanied by changes in policies or the institutional setup. The Lissabon Agenda aimed at changing many of the issues but was not taken up with sufficient vigour at member states level. Consequently, many European countries still face the challenge to update their strategies and structures in innovation, research, education, competition and reallocation policies. While sticking to catching-up policies may hamper growth in advanced countries it is just the right thing to do in those countries that are catching-up. Consequently, policy making has to pay more attention to the interplay between development level and the selection of policy measures. The heterogeneous European situation thus rules out a one size fits all strategy in many policy areas.

The Lisbon process so far has been particularly hampered by unclear multi-layer governance structures. Obviously, Europe still lacks in many areas a working system of policy implementation between the Commission and Member States. Thus one of the big challenges of any future innovation plan is to reform both the horizontal and vertical layers in the European governance system so that co-ordinated activities are possible on a much wider scale. Without these reforms, horizontal policy initiates will not only be less efficient but in some instances completely inefficient. Given the size and nature of the problems Europe and the globe are facing ignorance of the governance issues or a lacking innovation spirit would be difficult to communicate.

Models of development

2. The European model(s)

At first glance Europe appears to be a homogeneous economic area which has developed common institutions and principles that guide economic activities on an increasingly integrated common market. Consequently, many observers talk about a European economic and social model that is characterizes by

- Relatively high level of taxes, state activity, redistribution and social cohesion
- Universal public services (health and education)
- Comprehensive social protection (illness, old age, unemployment etc.)
- Extensive workers‘ rights and social dialogue
- Commitment to macroeconomic stability through monetary and fiscal policy (see Guger – Walterskirchen (2007)

This properties of the European model have been blamed by many observers for the somewhat slower economic growth vis-à-vis the US since the middle of the nineties despite the fact that the European economic and social model supported a successful catching-up process after the second World War that has narrowed the gap between the US and Europe (see above).

At second glance, this uniformity disappears and gives ways to national systems with deeply engrained patterns and behavioural traits that have developed over long periods of time, were disrupted by wars,

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revolutions and other events that changed the working of the system considerably. The quite distinct growth differences at national level are an indication that there is substantial heterogeneity in economic performance that is caused by the institutional setup, policies and strategies, sector specialization, etc.

Although there will always be distinct national differences, attempts to find typologies among European countries came up with (at least) 4 different European economic and social models which are characterised as follows (Giddens et al., 2006, Guger - Walterskirchen, 2007, Aiginger – Guger, 2005):

Scandinavian Model: Sweden, Norway, Denmark, Finland

Based on equality, comprehensiveness, social inclusion, universality

- Generous infrastructure of social services, affordable and of high quality
- High employment rates and emphasis on gender equality
- Tax financed unemployment benefits and health system
- Highest de-commodification, redistributive feature
- Progressive taxation, taxes on property and bequests
- Low taxes for business
- Rather high minimum wages, high replacement rates, pensions with generous minimum standards & income-related elements
- Cooperation between social partners (business, unions and government)
- Trade union operates unemployment insurance and training

Continental Model: Germany, France, Belgium, Netherlands, Austria, Switzerland

Based on preservation of social status, dominance of money transfers

- Income-related transfers with low minimum standards
- Contribution-based social insurance system for health, pensions, and unemployment
- Low re-distributive efforts, regressive tax structure (low wealth taxation, high taxes on labour and consumption)
- Co-operative industrial relations and coordinated wage
- bargaining

Anglo-Saxon Model: Anglo-American Model Europe: United Kingdom, Ireland

Anglo-American Model Overseas: USA, Canada, Australia, New Zealand

Pre-dominant role of markets, minimal role of the State

- Low degree of regulation
- High competition, sophisticated regulation of utilities
- Selective social transfers; i.e. means tested benefits
- Welfare-to-work strategies
- Public health system (UK, US only for the poor) and (partly) publicly-financed schools (UK not US)

Mediterrainian Model: Italy, Spain, Portugal, Greece

- Important role of supportive family networks
- Low transfers

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- High gender inequality, low participation rate
- Some traits of agrarian, paternalistic society remained

These typologies both increase but also reduce complexity somewhat: They are far more differentiated than the (non-existent) European Model that is often used in comparisons between Europe and the US but substantially reduce complexity with respect to approaches that analyse performance at the country level. Additionally, this typology can be used in analyzing the European growth performance. Of course, one motivation in doing so was to find out which of these types of the European economic and social model is best suited to respond to nowadays economic challenges and may thus be an alternative to the strictly market oriented approach of the Anglo-Saxon model which meets substantial resistance in many European countries.

Studying of the growth performance of these models in the long run yields surprisingly little growth differences: the average annual growth was in the range of 2.2% to 2.5% and thus almost identical between these models. Only in the past 10 -15 years the Scandinavian and Anglo-Saxon model clearly outperformed the continental and southern European models. It may be surprising that the two opposite poles in this comparison – i.e. the full fledged Scandinavian welfare state and the market liberal Anglo-Saxon countries - come out on par. This invalidates the welfare state, the less competitive labour and product markets, and the preference for leisure arguments which are frequently put forward to explain the lagging European growth performance.

Thus, a strictly economic comparison based on growth rates would not really come up with a clear winner. Nonetheless, the question can be raised why the Nordic countries were able to perform as well as the US. Aiginger explains this success story by the ability to these countries to reform their welfare state and thus provide security for citizens with efficiency and flexibility for firms. The reforms of the welfare which reduced cost significantly and stabilized public finances were combined with proactive policies to promote research, education and the diffusion of technologies. Thus the lessons to be learned from the analysis of growth processes were well taken and implemented in a mostly coherent way.

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Analysis of public innovation policy in Ukraine in the context of innovation model of sustainable growth

In developed countries, the growth rate of science-based industries, especially in terms of added value and employment, constantly surpasses other sectors in advanced countries where innovation activities in the enterprise sector are well developed. For instance, in the group of most developed states this sector stands for 35-40% both in added value and employment of manufacturing. Approximately the same index has the high tech industry in the overall output of manufacturing.

The significant structural change of global exports in favour of high and medium tech fields has been the result of the expansion of high tech industry clusters, which is typical for innovative countries.

The fact, the high tech production output and sales may also increase the economic effectiveness of the raw material based and low added value production in various forms gives an advantages to countries with a significant share of medium and high-tech industries. This can be derived from GDP per capita comparison between the developed countries (with a substantial high tech sector share as the rule) and the other countries. In the first countries GDP per capita is 5-10 times higher, than for the other countries, including Ukraine.

Along with the facts mentioned above there are pure economic reasons why innovation economies differ from traditional economies in the political economy aspect as well. New scientific knowledge transforms the basis of traditional economies, which is, first of all, related to such notions as property, goods and expropriation. Knowledge has the peculiarity that it may be distributed almost without cost but at the loss of the original proprietor of knowledge. For this reasons intellectual property regimes are far more important in knowledge economies, than in traditional economies. The knowledge economy stimulates growth through the activation of the creativity and entrepreneurship potential among citizens, which are necessary pre-conditions for the development of a socially balanced, stable and democratic civil society.

The innovative economic model foresees the necessity of the corresponding state society level achievement, as well as its intellectual potential which is defined by the level of education of citizen, science development, and the percentage of specialists in labour force. The average educational labour force level stands for 12-15 years of schooling in the most developed states. The number of researchers, new technologies and engineering developers, engineers and managers tend to increase faster in

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comparison with the general employment; annual expenditures volume on science and innovations tends to increase steadily.

The new specific task is set to the personnel educational and training system, mass media and the entire system of the scientific knowledge distribution and popularization system besides their traditional functions – the formation of innovative culture for society, people and executive power bodies.

One more important feature of the innovative model of the economic development and the necessary condition for its effective functioning is the provision of the systemic comprehensiveness of structures, resources and functions which are realized in the scientific technical and innovative processes. Besides, the following correlation of investments to science, education and capital investments with the production modernization as 1: 3: 3 is defined in the innovative economics, although for the most science intensive industries the expenditures on scientific and technical development equal the capital investments. Each newly created workplace in the scientific researches field causes the creation of 7-10 highly productive workplaces in the economy which is extremely important for both the unemployment problem solving and setting tasks to the educational system with the aim of the specialists training and efficient planning.

The above mentioned innovative economy model's main features which define it on the part of the resources and structural correlation as well as from the point of view of effectiveness have the common for such a model purpose – to increase the state's competitiveness by means of the new knowledge, high tech and innovation development and use in economy.

Nevertheless, in reality it goes without saying that the innovative models of different states differ. For the developed countries from a technical point of view (the states which have reached or are close to the technical limit) radical innovations are of key importance. Accordingly, the mechanisms and instruments of active development and usage of innovations dominate in such models; these innovations are able to make the country more competitive. In the models for catching up economies less radical innovations have to have a priority. The elements of the development model and political measures for support activities have to be adapted to the peculiarities of catching up economies.

That is why the corresponding innovation model of economic development requires appropriate policies and implementation strategies. In general, its main aim is to support stable economic growth and high living standards and social security for citizens as the result of the economic growth. The high living standards are the key point, by means of the highly productive work and the effective use of the labour, and a market based wage negotiation system. .

Transition to a knowledge economy should be linked to increasing investments into the knowledge sector. The average quantity of investments in the OECD states in the middle of the current decade stood at 2,3% of GDP (in total, with all the expenses on all educational activity except for the higher education, they exceeded 10%). As for Ukraine, the science linkage of the Ukrainian GDP has been cut down from 3% in 1991 to 0,84% in 2009. The same situation occurred with the financing of the education system, which is evidence of the significant innovative activity reduction in Ukraine.

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The Strategy of Innovative Development of Economy of Ukraine has been worked out and discussed at the Parliamentary hearings in June 2009. Although this Strategy has been agreed by the Verkhovna Rada of Ukraine (Parliament of Ukraine) and it had to be adopted as the Law of Ukraine, it has not been done yet.

It should be noted that the results of such document working out experience of research in many countries, the innovative development of Ukraine possibilities and its state's assessment compared with the EU states had served the grounds for the Strategy of Innovative Development of Ukraine for 2010-2020 under the Globalization Challenges Terms draft (this is the new title of the Strategy); the research had been conducted by the domestic and foreign specialists who had used the European Innovation Scoreboard indicators and. The complete text of the Conception has been published in the Verkhovna Rada of Ukraine official documents. The article under review contains the general prognosis assessment of the innovative development of Ukraine in comparison with the EU27 only (table 2.1)

Table 2.1

Table 2. 1: Ukraine in comparison with EU27: the generalized forecast in the case, if the offered Strategy option will be implemented

Generalized indicator	Ukraine/EU27 (%)
Possibilities in the informational technologies field	80–85%
Possibilities in the development and research fields	85–90%
Industry structure possibilities	70–75%
Patents, trademarks, industrial specimen	20–30%

According to the generalized assessment in case of the offered Strategy being implemented there is the possibility of achieving rather high generalized indexes of the innovative development.

It should be noted that the dynamics of many indexes will mainly depend on the speed of the structural changes in economy of Ukraine, strengthening of the sectors with high level of the production processing and its volume increase in the general output, significant improvement of the state management system which governs the country's innovative development.

In case of favourable events it will not lead to the leading EU states level immediately, but will assist the general level of innovative activity increase and achieving the average for the EU level of the innovative activity by the innovative index meaning.

In case the innovative policy is weak one should not expect for the improvement of Ukraine's position in comparison with other EU states. In such a case Ukraine is likely to start losing even those little advantages it still preserves. As the result, the country may find itself at bottom of the list of countries according to the European Innovative Scoreboard (EIS) indicators.

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In general, EIS may be used for the corresponding comparison of the innovative development level of Ukraine with the other states, the EU member states first of all.

The necessity of conducting of the comparative analysis of state and perspectives of the scientific and technical and innovative potential of Ukraine is determined by the need of having indexes values which allow to define the state of Ukraine from the scientific and technical cooperation, which in its turn is the key point for integration, expansion and deepening the Ukrainian participation in the European and world structures.

It is worth mentioning that the scientific and innovative activity indexes comparison with the corresponding other states indexes causes definite problems due to the different methodological approaches to the statistic data collection. That is why the problem of adjusting the existing Ukraine index system to the international standards is still existent. As for Ukraine, it is necessary to preserve the balance between the national interests, that is, the objective state of things in the corresponding fields of activity on the basis of the traditional indexes, and the competent international comparison holding provision.

The EIS indexes were calculated for Ukraine within the “Benchmarking Russia and Ukraine with respect to the Innovation TrendChart” (BRUIT) special draft in 2007 for the first time; it was done under the assistance of the European Community.

On the basis of the generalized data obtained by means of 17 indicators calculated for Ukraine on the experimental grounds, the general innovative index of the country has been established, and the corresponding comparisons had to be held.

If to have a look at the EIS list, one can see that Ukraine and Russia as well as the majority of the Central European and Eastern European countries are among the “catching up countries” group. It should be treated as the fact Ukraine has to exert itself to reach at least the average European level of the innovative development. It is quite evident that in terms of EIS the innovations are to be treated in a wider context than just the simple technical innovations. They reflect different aspects of innovations, development and research, and the indexes of their diffusion also, including those which reflect the new knowledge distribution and the informational technologies usage level.

The general value of the resulting EU index turned out to be rather high for Ukraine (0,23), but to a larger extent it is the result of the fact, that the several indexes value could not find the correlation with the existing data, and that is why they were not taken into account for Ukraine. The obtained index turned out to be higher than that of Turkey and some other states on the one hand, but on the other hand it turned out to be rather low in comparison with the EU leading states: Ukraine remains behind Sweden three times as much.

Coming back to the Strategy, it should be noted that while designing it, the Ukrainian experts have partially used the ideas contained in the “technology frontier” conception, having adapted them to the local conditions. The local conditions are ones which do not allow defining the real gap to the front line of the technology frontier quite clear. According to the results of the prognosis of analytical research within the frameworks of the State program of scientific and technical and innovative development forecasting (2004-2006), Ukraine has the definite technical potential for reaching the front line of the technology frontier.

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In the opinion of experts, the high innovative potential is common for the digital communication and data exchange systems, microwave technology, high intellect level computers, new methods and algorithms of data processing and images recognition.

The agricultural experts are sure that Ukraine is able to become a significant food and agriculture products world market player only under the condition of the domestic agriculture science activity and the close cooperation with the production, processing and marketing. They think it is possible to transform the agriculture into the high tech economy sector, and emphasize the importance of the stereotypes overcoming concerning the raw, pure traditional and low technological nature of the agricultural.

Admitting the fact that energy intensity of production is one of the key factors of Ukrainian goods and economy competitiveness, general thinking is that Ukraine has a tremendous potential of energy saving – more than 50 million tons of equivalent fuel; the implementation of energy efficient technologies is the only way to realize this potential. This problem solving mostly depends on the energy saving stimulation by state, not even the new technologies design. Such technologies are numerous, and one should take into account that their implementation is the powerful cause for their design and development itself.

It is interesting to note that the majority of experts consider the most urgent problem not the direct state funding of scientific researches, but the investments by industry to science and innovations.

For the majority of the industry fields, science demand reduction is linked to the production shortening and difficult financial situation the enterprises have faced. The other situation should be with the flourishing metallurgy. Nevertheless, taking the forecasts into account which state that steel will dominate in construction within the first quarter of the XXI century, the experts are worried that steel-smelting enterprises ownership change led to the dramatic shortening of the innovations implementation and science linkage decrease. New owners are not interested in contacts with science, they do not see in future. Nonetheless, the production competitiveness provision by means of the cheap labor force only cannot last for long. If the necessary measures are not taken, the domestic metallurgy will face the severe systemic crisis. It will lead to the crisis in the economy of Ukraine because the metallurgy sector is too significant for it.

The Strategy foresees the choice of the combined model of the innovative development of Ukraine for the nearest 10 years taking into account the pointed out significant scientific and technical possibilities; the model combines the “catching up countries” model features and “moderate innovative countries” model (according to the EIS definition).

In other words, the main goal of the Strategy has a specific task: to provide the increase of the innovations influence on economic growth of Ukraine in 1,5-2 times as much comparing to the current situation up to 2020.

Taking into consideration the fact that the innovative development is the natural component of microeconomic, social, political and other contemporary processes, and with the previous negative experience of attempts innovative development, deep systemic negative consequences of the new liberal economic reforms implemented and blocked the innovative development taken into account, the main pre-

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condition of the successful Strategy implementation is the conceptual grounds change which now define the state's role and functions in market economy.

The main reason of the ineffective market reforms implementation in Ukraine is the loss of the state management in the social and economic development of the country. Neither at the beginning, nor while implementing these reforms the functions, role and subject of the state's responsibility were defined when the country had started its market economy transformation.

Only in this case it is possible to transform Ukraine into the modern innovative society, in which the economy growth and development will take place on the basis of the scientific, technology, information and entrepreneur activity potential realization, which in its turn will lead to the improvement of living standard of every Ukrainian citizen.

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Conclusions

There is no single policy measure to support either front-running or catching-up activities but a bundle of measures across horizontal policy fields. The catching-up mode is characterised by limited competition in the product market; large firms financed by banks and by government subsidies, educational systems emphasising primary, secondary, and specialised undergraduate education; and rigid labour markets that favoured the accumulation of experience within firms over mobility across firms. The front-running mode is just the opposite and stresses radical innovation, strong competition on markets for products and services and an educational system that stresses the acquisition of a broad skill basis and tertiary education.

The indicators of the European Innovation Scoreboard provide a first comparison in terms of innovation performance between the European Union and the Ukraine. Vis a vis the European Union the Ukraine does particularly well in the level of ICT expenditures and youth education where it surpasses the European average. The share of S&T graduates and of new-to-market innovations is close to the European average. The Ukraine is at about half or two thirds of the European Union in terms of public R&D expenditures, innovation expenditures, employment in medium to high-tech manufacturing and high-tech services. The positive or at least moderate performance in these indicators is in stark contrast to the level of broadband penetration, business R&D expenditures, public funding of innovations and high-tech exports.

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Overall the pictures of the Ukraine is rather mixed and somewhat contradictory: a well educated labour force, a substantial number of S&T graduates, moderate innovation expenditures despite missing public support but remarkable new to market product sales. The latter obviously does not translate into high-tech exports.

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Chapter 3
Innovation financing (Kimmo Halme, Igor Bulkin)

The logic of government intervention

Governments are motivated to ensure the availability of finance for young innovative companies given their important role for the growth and renewal of modern economies. In particular, it is the small number of the nation's most growth-oriented companies that have a disproportionately high impact on employment growth. These growth oriented young companies often require substantial amounts of external finance. This high risk finance is often not forthcoming from traditional bank sources and venture capitalists or business angels assume an important role. A functioning venture capital market has been shown to be a very important element of the economic infrastructure. Active, informed and experienced risk capitalists promote innovation and thereby assist the growth of employment and economic activity.

The key role of the government in growth-oriented entrepreneurship is unquestionably to provide a framework and environment conducive for informed and profitable risk taking by private investors. Growth oriented entrepreneurship simply cannot develop as a government driven and managed activity. Supportive government involvement should best be seen as an interim and temporary activity to allow the evolution of an informed and experienced private market.

The primary role of the government's entrepreneurial focus should be to ensure that the tax and legal frameworks do not inhibit well functioning markets. In this role the government supports improvements in the tax and legal environments, entrepreneurial culture, stock exchanges for growth companies, and other framework conditions that influence the supply and demand for both formal and informal venture capital. Of particular importance is the effective functioning of a range of exit markets available to investors. Without a means of liquidating both good and poor investments, early stage activity is highly unattractive to professional investors.

Secondarily, in the absence of sufficient private finance being forthcoming from commercial capital markets, the government can also intervene in markets by supplying risk capital. The state can invest directly in individual portfolio companies. Alternatively, the state can invest indirectly by contributing finance as a limited partner to one or more professional, venture capital funds. The clear consensus is that indirect intervention is preferred to direct intervention by the state. For example, rather than civil servants selecting enterprises to be funded with tax payers' money, governments should create the necessary conditions and incentives for professional investors to emerge and fill the gap.

Whatever the public intervention, the main lesson to be learnt from international experiences is that governments should take a long-term perspective. It is crucial to understand the simultaneity problem: both supply and demand should be addressed simultaneously with the understanding of proper intermediation mechanisms. Government must be mindful to not distort the functioning of the extant capital market and substitute for (i.e. 'crowd out') private actors. Government should listen to commercial investors and the market's participants very carefully in order to best correct identified market failures. Furthermore, prior to any intervention, government should have a plan as to how their involvement will be phased out the clearly specified goal has been reached. Accordingly, government venture capital programs should be evaluated periodically. An important criterion for measuring program success is the extent to which venture capital funds or small firms are created which can operate on a commercial basis independent of any direct state involvement, i.e. generate an attractive, risk adjusted, rate of return.

Overall, it can be clearly observed that countries have learned both from their own experience and other nations how to design (and not design) policies that catalyze the growth of efficient capital markets. For instance, considering government sponsored venture capital programs, Israel learned from its unsuccessful Inbal program and designed a completely different Yozma program with a clear focus on creating a competitive venture capital industry in Israel. Critically, it designed simple and attractive incentives for

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private investors and directly invited experienced foreign investors to Israel in order to achieve its developmental goals. The new design was successful. In many countries such as New Zealand, newer programs have adopted a similar design. Overall, it appears that experience has resulted in many countries coming to rely more on private actors (both funds and angel investors). Such countries have designed policies that more effectively harness private resources instead of creating investment activities operated by governments.

Recent trends in R&D and innovation financing

EU and its member states' policies are fast adapting to the new economy, globalisation and increased competition in the field of innovation. Several countries have been facing remarkable structural changes of their R&D national system, many as a result of major evaluation exercises. Within 2009, many of the EU Member States have set up new priorities and strategies for their state research and innovation policy.[4] As a consequence, many new programmes and instruments are designed and more are expected in the near future.

On the European level, the research and innovation policies are also under change. Further to the new Commission starting in 2009, the research and innovation Directorates General will be reorganised. President Barroso has proposed a new EU 2020 strategy, which essentially builds upon innovation and will be followed with a specific new innovation plan for the Europe in fall 2010. More importantly, the planning for the next EU framework programme for research and innovation (FP8) has started, and it is expected to bring closer together the Member States' national research and innovation programmes at the EU level.

At the same time, EU Member States are deeply struggling in the turmoil of the global financial crisis and ever increasing competition from new emerging markets. As further investments are requested for research and innovation, less funding is available both in government budgets and in businesses. This raises a major challenge for policy makers and planners, and a heavy pressure to ensure all investments are well targeted and effective to stimulate economic growth.

Types of support mechanisms

Government support for R&D and innovation takes many forms and mechanisms for support are included also in many other policies and instruments than those that are directly related to R&D and innovation. When looking at the set of policies, the following mechanisms can be identified[5]:

- **Direct, financial investment measures** relate to the direct transfer of public support to innovation performers. These can be distinguished between:
  - *Thematic (or vertical) policies*, which focus on specific themes such as Biotechnology, ICT, Sustainable Development, Security Research and others, and
  - *Generic (or horizontal) policies*, which have no thematic priorities but cover issues such as scientific quality of academic research (grants from science funds), Public Private Partnerships and other forms of collaboration.
- **Fiscal, indirect policy measures** provide incentives for higher private sector R&D and innovation investments as the public sector is forsaking tax income in exchange for R&D investments.

[4] E.g. Czech reform of the system of R&D, the Estonian RDI strategy for the years 2007-2013, the Finnish national innovation strategy, the German High Tech Strategy, the Greek 2007-2013 operational programs, the Hungarian mid-term sciences technology and innovation policy strategy, the Luxemburg eight futures priorities for public research, the Portuguese National strategic reference framework, the Slovakian Long-term objective of the State S&T Policy up to 2015, or the UK new DIUS science and innovation strategy

[5] Adapted from: Reinhold Hofer and Michael Dinges: Thematic report: R&D – R&D Policy Interactions. Monitoring and analysis of policies and public financing instruments conducive to higher levels of R&D investments: The "Policy Mix" project. May 2008. A study funded by the European Commission – DG Research

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- **Catalytic financial policy measures** seek to provide better access to private sector sources of finance. Typical catalytic innovation measures are:
- Risk Capital Measures, i.e. measures taken by the public sector which catalyse the flow and use of risk capital for both R&D and innovation-related activities likely to increase R&D investment levels in the future;
- Loan and Equity Guarantee Measures, i.e. measures whereby the public sector tries to encourage additional investment in innovation by offering to share part of the risk involved in the provision of support for R&D and innovation-related activities.
- **Structural R&D policy measures** focus on the provision of research infrastructure and knowledge pools which include university research funding, public sector re- search institutes, centres of excellence, and human resources funding and policies.

o In addition, **R&D and Innovation Linkage policies** have to be mentioned. R&D link- age policies aim at increasing knowledge transfer between R&D performers in both public and private domain and hence spurring innovation.

Public procurement in support of innovation

Innovation and competitiveness of companies have been traditionally supported by supporting the research and development work at companies, research institutions and universities in the forms of grants and loans. These are so called technology push instruments for innovation policy. During the past years, more and more emphasis has been put to the development and utilisation of various kinds of demand-based policy instruments in parallel to the more traditional push –measures. The most common demand-based innovation policy instruments are public procurement, influence on the development and use of norms and standards, as well as other market development measures (such as living lab user platforms, etc).

The particular interest to use public procurement to support innovation is largely related to its significant volume. The volume of public procurement accounts for some 16-19 percent of GDP in most EU countries, being roughly ten times bigger than the respective volume of public and private R&D investments.

Public procurement has been used to support technical advancement for long time in some countries[6], while its use to support innovation is more recent trend. Although there are significant differences between in the public sector structures in these countries, there is a wealth of experience to take stock of.

In EU, public procurement has emerged as a powerful instrument to drive research and innovation by providing 'lead markets' for new technologies. Firms are given the incentive to spend money on research in the knowledge that an informed customer is waiting for the resulting innovations and thus the risk of investing in R&D is reduced. Competition is shifted from a sole focus on price to the provision of solutions, which offer the greatest advantage to users over the whole life use of the purchase. At the same time this opens up opportunities to improve the quality and productivity of public services through the deployment of innovative goods and services. Technologies launched in this way may then move on to further deployment in private sector markets. Other policy objectives such as sustainability may also be achieved by procurement of innovative solutions. [7]

Public procurement is a powerful policy instrument, which is worth taking proper stock of for the development and dissemination of innovation. Normally, the most significant barriers to using public procurement for innovation are not in the legal procurement laws and guidelines, but rather in the competence, resources and willingness of the procurers to look for innovative solutions.

The European Commission guidelines for public authorities in using public procurement for innovation emphasise the following points:[8]

- Act as an ‘intelligent’ customer

[6] Particularly at UK and USA, but also to some extent in Germany, Sweden, Norway, Italy and the Netherlands
[7] Public Procurement for Research and Innovation. European Commission Expert Group, 2006
[8] Guidelines on dealing with innovative solutions in public procurement. European Commission Staff Working Document. DG Enterprise and Industry, SEC (2007) 280

- Consult the market before tendering
- Involve key stakeholders throughout the process
- Let the market propose creative solutions
- Seek value for money, not just the lowest price
- Take advantage of electronic means
- Decide how to manage risks
- Use contractual arrangements to encourage innovation
- Develop an implementation plan
- Learn for the future.

Venture financing

Venture capital can be very valuable and help ambitious companies to grow and internationalize. However, it is not a suitable financing solution for all companies.

Venture capital is mostly targeted at companies with clear technological innovations, preferably protected with international patents. This makes their intellectual properties and intangible assets easier to trade internationally, but it also makes the venture assessment easier. In comparison, for service-intensive new ventures, access to risk capital may often be an important challenge when seeking to grow rapidly and expand operations internationally.

In order to access and benefit from venture capital, it is important to understand venture capital as a form of finance and whether or not it is relevant and attractive choice in a particular situation, and if yes, become investment ready. This *investment readiness* refers to understanding of venture capital and the process of raising it and working with VCs, willingness to seek and accept external equity finance and related commitments, and investability of the business i.e. ensure the venture fulfils the requirements of external investors as an investment opportunity.[9]

Entrepreneurs can often do a lot to improve their chances of attracting venture capital investments both by grooming the company to be investment ready and running the VC fundraising process smartly. Improving the opportunities of client companies to access venture capital to facilitate growth can increase the impact of public funding. Government innovation support institutions can help their client companies by improving the visibility and quality of information concerning investment opportunities among its clients, by strengthening the certification role of funding, and networking and further developing the collaboration with VCs.

Business angels

Business Angels are private individuals who invest equity in new or existing companies. These are typically wealthy individuals with a long experience from some specific business areas, and who can and are interested to utilise their wealth and experience in other businesses. Typical business angels are former entrepreneurs who have sold their companies, or retired executives from successful companies. The investments of Business Angels are often a combination of money, business and substance experience and contact networks.

Due to the private nature or Business Angels (categorised as informal venture funding or invisible), there are only estimations of its volume and importance in different countries. Some studies suggest that the funding volume of Business Angels can be several times larger than the formal venture capital (i.e. by registered Venture capital companies).

[9] Adapted from: Professor Markku Maula, VC Report to Tekes, 2009.

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It is certain that the role of Business Angels has increased in the capital markets. According to the information collected in UK for 2008-2009, there were 25 networks of Business Angels in Britain. Their activity included the following:[10]

- 8685 business plans were evaluated
- 824 ventures were further analysed
- 233 investments were made, with average investment of 70 000 €

Lately there has been a rapid increase of online systems aimed at Business Angels and other private investors. These systems provide electronic platforms, through which investors can see many available companies and companies get visibility over many potential investors. However, the business logic and motives of many online investment systems differ from traditional venture financing. Online systems typically charge a small sum (100-800€) from companies to publish their business plans, without much evaluation and due diligence processes. They do often offer speed dating / match making facilities between financiers and companies. Examples of such new online portals are Angels Den, Angelsoft, Angel Investment, See my Pitch, Nature Vents ja Venture Giant.

It is estimated that the majority of Business Angel investments (by number of investments) in UK is already channelled through these online portals.

The Business Angel market is growing fast and organising itself. There are new instruments being developed. Also international collaboration and syndication of funds is increasing.

Mechanisms ensuring competitive selection and dynamism

The culture for providing research and innovation funding on the basis of competition varies in Europe. All EU countries have both **competitive funding** (i.e. funding given on the basis of open competition) and **institutional funding** (i.e. funding directly allocated to state institutions and universities) for conducting research and innovation activities. Some countries have been using competitive funding for years while others have introduced or developed this funding scheme in the past years. The trends in EU to this end are that there are

- Countries, for which competitive funding is very important: Denmark, Estonia, Finland, Germany, Greece, Hungary, Luxembourg, Poland, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.
- Countries for which institutional funding represents the lion's share but that have increasing the share of the competitive funding in the past years: Czech Republic, France, Lithuania, Malta, the Netherlands and Portugal.
- Countries for which institutional funding is central, competitive funding exists but is limited in terms of volume distributed: Austria, Bulgaria, Czech Republic, Ireland, Italy and Latvia.

Overall, the **share of competitive research and innovation funding in the state budgets is increasing**, mainly due to its shown impact on improved focus, relevance and quality of research, as well as positive effects on the competitiveness and growth of economies. A recent study[11] covering nine European countries indicates that around one third of total national public funding of research is project funding, and that European research funding would account for between 20-30 % of the total competitive funding available per researcher in Europe.

Other financial instruments

[10] Colin Mason, University of Strathclyde, BBAA Winter Workshop, January 2010

[11] Lepori B., van den Besselaar P., Dinges M., van der Meulen B., Potì B., Reale E., Slipersaeter S., Theves J., (2007), Comparing the Evolution of National Research Policies: what Patterns of Change?, Science and Public Policy Vol. 34, No. 6, pp. 372-388.

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Most governments have put in place specific, more targeted measures to encourage innovation, including tax relief for R&D, grants and public-private partnerships. Recent developments in this area aim at applying more market-friendly approaches that encourage competitive selection of investments that are likely to have the highest social return. This has been accompanied by a move away from unspecific, single-firm, project-based grants, to more sophisticated designs, in parallel with a rise in R&D tax incentives. Several governments are streamlining public support schemes with a view to increasing focus, delivery and impact. Public-private partnerships (PPPs) are one example of market-friendly focusing devices that can offer a framework for the public and the private sectors to join forces in areas in which they have complementary interests but cannot act as efficiently alone.

In addition to setting broad framework policies that are conducive to innovation, governments may also wish to push innovation more directly through various forms of support to firms. The business sector is the engine of innovation in most national innovations systems, being the major source of financing of domestic R&D in the OECD and also the major performer of R&D. Governments are increasingly attempting to harness the innovative capabilities of firms to help solve challenging problems, including those environmental and social externalities to which firms themselves contribute.

Over time, the use of direct grants to institutions and individual firms has become less important in most economies, with greater emphasis being given to tax measures and the targeting of public funds towards specific projects that are put out to tender.[12] Studies show there is little consensus as to the effectiveness of subsidies and research programmes. One study of 21 OECD countries found that subsidies had a significant positive effect on business R&D expenditure only when past R&D intensity is not taken account of. Subsidies have a greater impact on small firms' R&D expenditures than those of large firms – perhaps suggesting the funding is used by small firms to support activities that would not otherwise be financed. The OECD's Working Party of National Experts on Science and Technology Indicators (the NESTI group) has proposed a research project that aims to assist governments to better assess the effectiveness of support to R&D and to explore the impact of changes in the policy mix on the effectiveness of support (OECD 2008h). Preliminary estimates of direct government assistance to R&D (in research funded by the Canadian Department of Finance) suggest that the value of contracts awarded to firms may be more important in many countries than direct grants and contributions through government programmes.

Government subsidies to the business sector and tax incentives appear to be substitutes. Analysis suggests tax policies can induce higher private R&D expenditure, with estimates of the elasticity of R&D to its price varying from 1 to 1.5-1.8 (Jaumotte & Pain 2005a). However, they do not show that the social gains necessarily outweigh the associated compliance and administrative costs (spillovers from higher R&D to productivity would raise the chances). There is a higher probability of research duplication with tax relief, and research may be less likely to occur in areas of high social returns. In addition, small firms with little taxable income may not benefit. The bigger question is whether the foregone tax revenue could have been better spent elsewhere. There is also a question as to the impact on firm location decisions, and the potential disadvantages for countries that do not offer tax incentives.

Ensuring competition and balance in the financing market

According to the Finnish experience, the stimulating role of competitive STI funding can be instrumental with regard to a) encouraging the initiation and growth of new research areas, b) facilitating collaboration between different stakeholders of the STI system and c) increasing the relevance, quality and effectiveness of research, development and innovation projects. There are several studies and evaluations that support this view.

The design of a modern, well-balanced and strategically oriented set of innovation funding instruments is a complex and continuous development work. As a basic assumption, different parts of the 'innovation life cycle' need their own instruments. Furthermore, a balance should be struck between open application,

[12] Jaumotte & Pain, 2005

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bottom-up funding instruments and strategic, top-down instruments (typically national targeted programmes and clusters). The appropriate funding levels, forms of funding, planning processes and governance mechanisms are typical funding organisation –related development aspects. Fortunately, several benchmarks are well-documented and available, often with evaluated evidence. The most critical part of the STI funding system development is the expertise within funding organisations – administrative, financial and legal competence, project coordination experience, research project and business prospect assessment experience and substance –related professional experience. Much of this experience is transferable from other funding organisations, through for example twinning projects or professional coaching.

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Monitoring and evaluation of innovation financing

Today, progress monitoring and particularly impact assessment is an instrumental part of good governance of public funding of STI system, and in particular it is seen as a means for improving the effectiveness and result orientation of support measures. As a basic principle, the impact of all public interventions should be measured or at least be roughly estimated. A modern STI system impact assessment often includes different kinds of evaluation elements and view points, of which government officials should have a good general overview and understanding for their own purposes.

It is important to start the monitoring of the *efficient and effective use of grants, loans and programmes* along with the ex ante evaluation work, early on in the process when options for project and programme formulation are still open. In many cases the monitoring can be carried out in parallel with or as a part of the programme design, feeding results into the preparation of the proposal. However, when new data needs to be collected, an early start is important.

As elements of the programme are likely to change in the course of its development, it may be useful to leave the detailed specification of output indicators to a stage when the content of the programme has been fixed.

The performance and impact of *equity funding* is surprisingly seldom systematically evaluated, besides the normal investment returns (return on investments, etc). There are a few reasons for that. Equity investments are known to include risks and are considered on case-by-case basis. There are often also other than public investors included and the details of investment decisions are not always public information, nor are private investors always keen to assess their investment performance in the same manner as public investors do. The time span of investments is very long and impact is linked to several decision /funding rounds as well as active management decisions during the life of investment. And so on.

There are a number of generally known target indicators depending on the type of investments (e.g. estimation of deal flow, acceptance rate, management per company, average investment per company, IPO rate, exit times, etc). For some of the public equity investors, there are also annual performance indicators that can be benchmarked. For example, the Finnish Industrial Investment (Teollisuussijoitus Oy) – a government fund of funds, is setting up an annual performance indicator system.

Furthermore, it is normal to government innovation agencies to report their performance with a set of qualitative and quantitative indicators annually, often also semi-annually. The annual performance reporting is typically linked to the government budget negotiations, in which performance indicators function as justifications for further investments.

At the institutional level, the rationale and operations of public R&D funding agencies are typically judged against the added value they are able to generate to the national innovation system. The additionality would normally be defined along three main elements; a) the *input additionality* i.e. its ability to attract and direct more resources to R&D and innovation, b) the *output additionality*, i.e ability to generate more

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innovations, spin offs etc due to the support it has given, and c) the *behavioural additionality*, as to which extent the funding is able to act as a change agent among the innovation system players and generate collaborative effects.
Policies and instruments are always assessed against the set of objectives specifically defined for them. In usual cases the policy objectives are numerous and often closely interlinked. It is therefore typical to formulate the policy objectives in a logic model, which then can be used as the general framework for performance and impact assessments.

Dynamics of financing of R&D and innovation activities in Ukraine in recent years

During the independence years the statistics reflecting financing of innovative activities, research and development (R&D) has changed several times, therefore it remains more or less comparable by structure and volumes data can be only found starting from 1995. It is necessary to mention that the State Committee of Statistics of Ukraine usually provides data in current prices only, which hampered the analysis of the dynamics of real changes in the level of financing.

The methods of formation of the parameters series for indicators of financing of the scientific and technical activities (STA) and innovative activity in Ukraine used in this chapter have been developed in detail in the publication [13]. The volumes of current expenditures were recalculated into fixed prices and into current international dollar based on purchasing-power parity (PPP). It enables the examination of processes on national and international levels for the sake of international comparison. The volume of spending on science (SS) is given until the prices of 1995 when the more or less integral statistics of STA have appeared in Ukraine (strictly speaking it is possible to make a re-calculation for any basic year).

Nominally during 1991-2009 it grew up 101970 times in current prices, however after eliminating the inflation factor the SS dropped drastically 4.48 times during 1991-1996, later from 1997 till 2004 the SS increased 1.51 times, and finally during the last five years the SS decreased 1.40 times against the 2004 level. The historical maximum of the SS volume re-calculated into international dollar in PPP of national currencies was established in 2004 (3085,44 milliondollars), and the minimum (1744,16 million dollars) in 1999, a complicated year for the financial system of Ukraine, the spread of values being 1.77 times. Given the delayed character of reforms in the STA sphere it resulted to be enough for 3.06 times staff reduction.

Examination of these parameters series for the indicator “Unit scientific costs for one person employed in the STA sphere in fixed prices” allows localizing the worst year for Ukraine – 1996 when the value of unit costs per one full-time employee of scientific-technical organizations decreased 3.12 times against the level of 1989 and amounted to 6,671 dollars in PPP (although in the scientific literature of the 1990s usually an ordinal reduction was mentioned and here it is necessary to consider that the number of employees engaged in the STA sphere reduced 2.14 times during the period under consideration). Over time in 2008 the indicator value increased up to 19,036 ths dollars in PPP but yet failed to reach the numbers of the Soviet times.

Starting as early as 2005 the support level of the STA sharply dropped in the country (by 0.37 percentage points), which reflected in the fall of science-intensity level of GDP in 2008 down to 0.85% - the worst value in the country during the last 50 years. For the sake of comparison it should be mentioned that in the

[13] *Bulkin I.O.* Some special features of the dynamics of intensity of financial provision of the scientific system of Ukraine (1989-2004) //Statistics of Ukraine. – 2005. – № 7.

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Soviet Ukraine this indicator exceeded 3% in 1990 which is a program goal for the EU countries still to be achieved in 2010, and in the independent Ukraine in 2003 the science-intensity of GDP amounted to a very decent for a European country level of 1.35% (e.g. in the Russian Federation such a level has not been reached during the last 10 years). It ought to be noted that even if the indicator value is calculated based on an old selection (which includes organizations specializing on the scientific and technical services) the level of 2008 will not exceed 0.94-0.95%.

Annual rates of change of the SS volumes allow to include both: long-term and short-term changes: the overall R&D financing in fixed prices this year dropped down to 14.1% despite of the slow increase of the science-intensity of GDP up to 0.86% in 2009, which almost coincides with the SS reduction by 14.6% in also financially difficult 1998. Interesting that the trends of 2008 when the negative record of the science-intensity level was accompanied by the increase of SS volume by 1.3% were opposite to the tendencies of 1998. The maximal annual growth was observed in 2003 when SS increased by 23.7% in a year, and the maximal reduction - in a transitional 1992 (43.3%). Pair-wise analysis of the direction and intensity of the dynamics of presented absolute and relative values of R&D costs that reflect the attention of the society towards scientific and technical development permits to develop clear stages of evolution of the national scientific system

Stage 1. 1990 – 1996. The reduction rates of SS volume in fixed prices considerably exceeded the reduction rates of the science-intensity of GDP (due to a sharp drop of GDP and growth of a shadow part of economy for which it is unusual to support STA sphere).

Stage 2. 1997 – 2003. Relative stabilization of science-intensity of GDP was accompanied by an advanced growth of the level of absolute costs (due to overcoming of the consequences of the financial crisis 1998-1999 and the beginning of intensive growth of GDP).

Stage 3. 2004 – 2007. The reduction rates of science-intensity of GDP are advancing the reduction rates of absolute costs (due to intensive economic development not based on scientific and technical growth factors).

Stage 4. 2008 – present. The of absolute costs are reducing on the background of stabilization of science-intensity level of GDP (due to the inertia of formed proportions in GDP restructuring for the benefit of science together with the decreasing scale of such a support).

If hypothetically the science-intensity of GDP was kept on 2004 level the value of R&D spending in 2007 (provided the proper control of the inflation level) could have reached the 1992 level and achieve the level of 1991 till 2015 – this is exactly the price of the mistakes of recent years. Unfortunately for the time being it is safe to say that the country have experienced the isolation of the formally sufficiently intensive (during 2003-2007) but lately complicated economic growth from the growing needs in scientific development. Thus an explicit connection between the levels of support of the STA sphere and the specifics of macroeconomic trends is observed mostly during the negative course of events. When the economic dynamics have a positive trend, the strength of the connection substantially weakens, i.e. the proclamation of the transition of economy on innovative way remains solely a political declaration.

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The role of the total business sector tends to decrease regarding both financing and implementation of R&D. Meanwhile a stable reduction of SS in non-governmental business sector during 2003-2009 causes concern (in fixed prices it has shrunk by a record-breaking 54.4% among large sectors). In general a reverse dynamics in the intensity levels of governmental and non-governmental business financing comes under notice, its tendencies being in opposite-phase in 2005-2008. The similar direction of the trends was observed in 1996, 2009 (synchronized reduction) and 2003 (synchronized growth). Hence, 2003 shall be recognized as a most successful year in the aspect of the quality of realization of the scientific and technical policy of Ukraine which foresees not only more active participation of the state but stimulation of non-governmental economic agents.

The higher education sector and private non-profit sector do not play a significant role in the R&D financing as retrospectively so prospectively (their share varied within the range respectively 0.06%-0.11% and 0.07%-0.44% from the total volume with the trend for reduction). The higher education sector as an executing agent of R&D is still extremely dependent from the public financing (the range of the public funds share is 68.7% - 74.7%). In this aspect the role of the higher education sector tends to a progressive growth however during the whole period under consideration it has not exceeded the level of 7% from the total volume of works (its shares in 1995 and 2009 almost coincide). The private non-profit sector as an executing agent showed a drastic increase from 0% up to 0.71% however the conditions of such a restructuring of resources have to be specified.

In 2008 the outflow of foreign capital intended for R&D financing was withheld in Ukraine (in 2006-2007 both the relative and absolute reduction of volume of foreign R&D financing occurred despite a stable economic growth). In 2009 foreign financing even increased by 22.4% in fixed prices.

In the framework of public sector (as an executor of R&D) starting from 2007 mostly its non-profit component is developing resulting in the science closure on itself as the non-profit sector is usually specialized on the initial stages of a scientific-production cycle. Moreover the distribution ratio of public financing between profitable and non-profitable components has increased from 2.24:1 in 2001 up to 4.38:1 in 2009.

Cutback in total financing has various impacts on intersectoral interaction. In the majority of cases this connection is negative because the sectors slowly become more autonomous, unlike the public financing of R&D in the higher institutions which recently tends to increase and the above-mentioned local step-up of the share of the private non-profit sector which was facilitated by public funds.

An extremely negative trend of R&D financing has formed in industry: in 2001 its share in the total financing amounted to 57.94% and in 2009 it fell down to 41.38%. Meanwhile the volume of industrial R&D in fixed prices fell from 1547, 83 million dollars in PPP (historical minimum) in 2003 down to 1019,49 million dollars in PPP in 2009, i.e. by 34.1%. Furthermore the value of annual reduction in 2008-2009 accounted for 14.7% which corresponds to the reduction of GDP of Ukraine and exceeds the cutback of total STA spending.

Privatization processes in the scientific and technical sphere are almost suspended, at least a share of financing by non-governmental business sector in 2001-2207 varied in a relatively narrow range of 22-25% of total STA spending. Despite the mentioned trend the sector of non-governmental science after all has

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been formed in the country but in a specific understanding of this term meaning scientific and technical structures of enterprises legally independent from the government authorities. However its role in the scientific system should not be exaggerated: if in 2003 the share of this sector in implementation of R&D reached 21.9%, then in 2008 it shrank to 14.9%. Mostly it is comprised of open corporations created on the basis of former public enterprises (they implement approximately 10% of the total volume of scientific and technical works), which results in the inertness of the structure of financing channels of this segment of national innovative system. Focusing on the effectiveness of public spending over the last years its sustainable growth as an executor of R&D seems to be troublesome in the future.

Comparative analysis of the financing structure of R&D activities in Ukraine, EU and other countries of the world

In 2007 in the world practice of R&D financing (according the data of the UNESCO Institute for Statistics) a following restructuring of its total volume occurred: Northern America countries approximately 393 billion dollars in PPP (or 35.5% of the total world volume), Latin America counties – 26 billion dollars (or 2.4%), Africa and Middle East countries – 15 billion dollars (1.3%), Asian countries – 343 billion dollars (or 31.1%), and European countries – 313 billion dollars (or 28.2%). The share of the EU countries in 2007 was 22.9% although in 2002 it reached 26.1%, hence the EU's enlargement to the east has not yet brought a desirable effect in the aspect of reinforcement of European competitiveness (though the 12 new EU members have contributed to the indicator growth in 2007 by 1.17%). The share of Ukraine in total world spending for R&D during this period has also reduced from 0.28% down to 0.24%, however during this period the ratio of volumes of R&D financing in Ukraine and in EU has declined relatively moderately: from 1.07% down to 1.05%.

Financing of innovation activities in Ukraine

The volume of financing of innovative activity during 1998 – 2008 has grown in fixed prices 10.2 times but if re-calculated into fixed prices of 1995 the increase would be just 1.98 times. The historical maximum of spending has been fixed in 2007 (4856,83 million dollars in purchasing-power parity of national currency, dollars, PPP) and the minimum has been observed during 1999, a difficult year for the financial system of Ukraine (1342,57 million dollars), thus the real dispersion of the indicator's value has been 3.62 times. Let us mention that actual reduction of volume of spending after eight years of a stable increase has already started in 2008 (despite of catenary growth of the volume by 10.8% in 2008 in current prices), therefore the crisis development in 2009 has only emphasized the negative trends of the recent times. As a result the financing level in 2009 in comparison with 2007 shrunk in current prices by 26.5%, in fixed prices by 48.8%, recalculated into international dollar in PPP by 47.4%. With regard to the correlation of the volumes of innovative spending in industry and GDP the historical maximum of 1.50% was established also in 2007 and the minimum of 0.87% in 2009, having approximated the level of financing of scientific and technical activity which hasn't been observed during 2002 – 2008. Hence, the level of support of innovative activities in Ukraine has turned out to be more sensitive towards economic hardships of the recent years than towards scientific and technical difficulties.

With regard to the sources of financing of innovations the following trends shall be highlighted:

- During the whole observation period the main source of financing for innovative activities have been and remain the companies' own funds. The historical maximum of the self-financing share was recorded in 2001 (83.90%) and a minimum in 2008 (60.56%). Let us point out that the value of share of financing is

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influenced by the availability of alternative financing sources, therefore it is impossible to determine a clear trend in the dynamics of this indicator value. When analyzing absolute spending of enterprises in fixed prices a constant attention is drawn by its sustainable growth during 2002-2007 following which the spending shrunk by 29.3% and 56.5% in 2008 and 2009 respectively against the 2007 level;

- At the end of 2000s the bank credits become an important source of financing. If during the period until 2001 inclusively its share with a moderate increase amounted to 6.26% of the total volume, in 2008 after the stagnation period during 2004-2006 it exceeded a third of the total volume. The fact that from 2006 to 2008 the share of bank loans in the structure of financing has stepped up from 8.48% to 33.72% (historical maximum) demonstrates the intensity of the crediting boom. Let us notice that the hardships related to the global financial crisis and banking sector reforms in 2009 led to a very sharp reduction of the indicator value by nearly 22 percentage points or by 79.5% in fixed prices. The intensity of the lending of innovative activity is directly connected with the rates of general economic development as the biggest structural shares of the lending were observed during 2003-2004 and 2007-2008.

- In 2009, the long-term tendency towards minimization of the role of foreign investors has been broken. If in 2008 their financing share reached a historical minimum of 0.96%, in 2009 a historical maximum of 19.03% has been recorded (the increase in fixed prices amounted to 11.8 times), which made this source the second most important at twice (the first time was in 1998 with the share of 12.32%).

- However the national investors did not follow this trend and their share only in 2003 has reached more or less valid level of 3.66%. The rest of the time the share has varied in the range of 0.2% – 1.5% without pretending at a pronounced independent role. In 2009 the share reduced more then by 1 percentage point and dropped down to the level of 0.39% of the total spending;

- Similar tendencies were observed in a budgetary financing of innovative activities, its share in 1999 being the second most important among all other sources (10%). Afterwards the share of budgetary spending only once has exceeded the level of 3% in 2003 and became nothing than a tool of support of certain productions. Similarly to the share of national investors this share has also dropped down to insignificant 1.69% in 2009;

- Following a liquidation of the State Fund for Innovations (that functioned during 1995-1999 and in 1998 provided 4.72% of the total volume of financing) its functions of supporting the innovative activities weren't resumed to a sufficient extent. As a result the share of financing from the non-budgetary funds amounted to 0.21% in 2002 and then abruptly dropped almost to zero.

The acquisition of the means of production is the main component within the structure of the directions of innovative activities (the share of 55%-74% of the total volume of spending, the indicator dynamics has a complex wavelike form having its minimum value in 2004-2006). Unlike at the end of 1990s the share of enterprises' costs on implementation of internal and external R&D, except for the historical maximum of 16.12% in 2006, has reduced down to 10-11%, although in 2007 it was growing up insignificantly but steadily. After the booming level of acquisition of new technologies from abroad at the beginning of the millennium (6.32%) it became stable on the level of 3-4%, and in 2009 the value of the share has dropped down to the historical minimum of 1.46% provided that the focus on R&D has increased.

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When characterizing innovations costs it is necessary to establish its connection with the scale of innovative output which is per se the objective of innovations. Data analysis demonstrates that the portion of the innovative products sold in the total volume of industrial output in 2000-2009 varied within the range of 4.8%-7.0% and before the global financial crisis the indicator value remained within the range of 6-7%. Only in 2009 the portion has sharply reduced to the level of 4.8% as a result of cancellation by the majority of enterprises of the innovative production for the sake of stabilization of its financial conditions.

The ratio between the sold innovation products volume and the spending on innovative activity reflects the economic effectiveness of the innovative costs. During the whole observation period the level of return of each invested Hryvnia varied within the range from 3.71 UAH in 2007 to 6.90 UAH in 2000. I.e. the increase of the sales volume during the stable economic development resulted in a considerable reduction of its effectiveness which could be explained by both a prospective and thus somewhat excessive character of the investments in innovative activity and by the efforts of the companies to increase the returns from non-innovative production. It ought to be remarked that in the critical 2009 the return on innovative expenses has slightly risen up to 3.95 UAH/per 1 UAH which meant the beginning of the structural re-organization of the market strategies of the manufacturers. This is proved by the analysis of the connection between the rates of change of GDP and returns on innovations costs: relatively increased rates of the GDP growth are correlated with relatively reduced level of returns on innovative costs next year and vise versa.

Conclusions

Ukrainian development over the last two decades has followed more of the transition of the post Soviet countries than that of the EU and its Member States. The over all development of European countries' investment into STI has been more steadily, with slight increases in the long term.
Financing of innovation plays an important role within all dynamic economies which have chosen to follow the knowledge economy path to growth and competitiveness. The general trends suggest as a good policy to set up long-term objectives and to follow a steady and incrementally increasing investments into the innovation systems.
The direct statistical comparison between Ukraine and Europe is difficult. Not all innovation financing related data is available from Ukraine, or it is sometimes not fully comparable with those of EU Member States & OECD. Innovation performance comparisons have been made a few years ago (e.g. European Innovation Scoreboard 2006), which reveals a number of issues that are likely to be still reasonably relevant (see figure).
Increasingly the driver of innovation is within the private sector and in global business, but also national and regional government policies play instrumentally important roles both directly in supporting R&D and innovation, but also indirectly through fiscal incentives and through contextual issues (i.e. innovation system development), as well as through many catalytic activities, such as awareness and setting up collaboration platforms.
Structural analysis of the innovation financing appear to support the statistical findings, however, a more precise analysis of the effectiveness of various funding instruments is still needed. Ukraine faces several challenges related to innovation financing, namely:

- Increasing the overall volume of investment into innovation, both from the public and private sources

- Improving the governance of the innovation system, with consequences to innovation financing
- Filling in the ´gaps´ in the innovation financing, such as development of effective innovation support instruments for the business sector, particularly for SMEs and encouragement of seed and venture capital
- Driving the overall balance of R&D and innovation financing from state institutional financing more towards competitive and transparent, project-based funding with clear innovation objectives.

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Chapter 4
Promoting R&D and innovation: Tax incentives and support services (Christopher Palmberg, Oleksander Butnik-Siversky)

Introduction

Governments have, over the years, supported R&D activities in companies (and elsewhere) through various and increasingly diversifying schemes. One useful distinction for these schemes is one between supply- and demand-sided measures. Supply-side measures may be distinguished further by financial instruments and various service-based schemes, and further distinctions between direct and indirect policy measures are often made. Demand-side measures include systemic policies, regulations, public procurement and support of private demand.[14] It is important to point out that governments increasingly employ broad policy mixes whereby many of these different measures co-exist at national, local and even sectoral level.

Overview of tax incentives to stimulate R&D and innovation

From a market failure perspective, in an 'ideal world', direct support would be the best measure of government intervention in R&D and innovation as a public authority thereby could chose projects to fund which produce the highest societal return while also being those which companies would not undertake without public support. In reality it is highly unrealistic to assume that public authorities possess superior insights to support such optimal projects from a societal view, and direct public support has often been criticised as a policy of 'picking winners' in the absence of any kind of knowledge of which projects, companies or industries will become the winners of the future. In addition to this, direct support measures involve various layers of political decision-making which often adds bureaucracy, complicated schemes from the viewpoint of companies and can distort decisions.[15]

Direct support remains the main policy mechanism in most developed countries. This type of support has had documented and positive effects on R&D intensity and in enhancing the capacity of companies to absorb knowledge generated by public research. And direct public support has also helped industries address important public missions such as defence, health care or energy development.[16] There are also numerous qualitative examples of areas where direct public R&D support has played a clear role in stimulating innovativeness, one of which is the US defence sector that has generated numerous spin-off innovations for civilian use. Further, the case of Finland provides good examples of how direct R&D support can be steered in an indirect way through technology programs which also include strong elements of competitive tendering. In a transitional country context, such as Ukraine, the discussion about direct versus indirect support also introduces alternative considerations. Direct support may, for example, often be especially viable for promoting the emergence of new industries when institutional preconditions are non-existent or weak.

The effectiveness of direct support schemes mainly depends on the priorities and choices that public funding organisation make (it also naturally depends on how companies use their R&D funding but the same is also true for tax incentives). It also depends on the population of projects or companies that the public funder can select across when making decisions. Conversely, companies may not find access to direct support schemes or for other reasons chose not to become involved in these, for example if the costs of applying are considered too high related to perceived benefits, or if the company is afraid that R&D

[14] Edler, J and Georghiou, L. 2007. Public procurement and innovation – Resurrecting the demand side. Research Policy 36, 949-963.
[15] Takalo, T. 2009. Rationales and instruments for public innovation policies. ETLA Discussion papers, no. 1185.
[16] Guellec, D and Pottelsberg 2001. R&D and Productivity Growth: Panel Data Analysis of 16 OECD Countries, STI Working Paper 2001/3.

secrets may leak out to competitors etc. In this context, the main difference between direct R&D support and indirect tax incentives is who makes choices of funding R&D. In the former case this choice is delegated to public funding agencies following overall government R&D priorities. In the second case – of indirect tax incentives – companies themselves make this decision.

R&D tax incentives generally provide a tax credit or allowance for some portion of the R&D undertaken in companies. R&D tax incentives are thereby more neutral than direct R&D support in terms of incentivizing which types of projects and companies are funded. This neutrality is also the main rationale behind tax incentives. Tax incentives are considered to provide better possibilities for governments to include a broad range of companies, industries and innovation activities within the sphere of STI policy influence. In addition, R&D tax incentives are considered more transparent and predictable policy schemes once in place compared with direct R&D support, which involve continuous prioritization and decision-making down to the level of individual project selection. This holds generally speaking even though the complexity of specific terms and definitions of tax incentives types may differ significantly across schemes and countries.[17]

Apart from the neutrality of tax incentives as a rationale for their use, governments have also seen opportunities to engage in tax competition. In particular, a favourable tax incentive scheme can function as an attractor for inbound R&D investments. This issue of the effects of tax incentives on the localisation of R&D has been a much debated in policy circles and researched in the academic literature.

Basic types of R&D tax incentives

The use of tax incentives has increased significantly amongst OECD countries during the last 15 years. One reason has been concerns about including a broader range of companies (especially small companies) and modes of innovation within the sphere of policies. Increasingly globalized R&D and innovation has also lead to policies for attracting inward R&D, whereby tax incentives to reduce the costs of R&D has become an important new policy scheme in many countries. In 1995 12 OECD countries had introduced some type of R&D tax incentive, while in 2007 the country count was 21. Of all OECD countries only Finland, Sweden, Germany, Iceland, Switzerland, Luxembourg and Slovakia have still not introduced tax incentives although discussions towards introducing them have intensified at least in Sweden, Germany and Finland. Table 4.1 presents the extent and types of R&D tax incentives which are in use throughout OECD countries (country acronyms used) as per the year 2007. The table does not include regular tax deductions for R&D expenditures even though these deductions sometime also are referred to as R&D tax incentives.

Table 4.1. Overview of types of R&D tax incentives across OECD countries

	Type of deduction	
	Tax credit on income	*Tax allowance for payables*
<u>Deduction base</u> R&D expenditure volume R&D expenditure growth R&D volume and growth	BE, CZ,DK[18],HU,TR,UK AU,AT	AT,BE,CA,MX,NL,NO,PL, NZ US FR,IE,JP,KR,PT,ES
<u>Eligible costs</u>		

[17] Tanayama, T and Ylä-Anttila, P. 2009. Verokannustimet innovaatiopolitiikan välineenä. ETLA Discussion papers no. 1189.
[18] Denmark dismantled their R&D tax incentive scheme in 2006.

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Variable costs	AU,AT,CZ,DK,HU,TR,U	AT,CA,ES,FR,IE,JP,KR,M
Fixed equity-based costs	K	X,NO,PT,NZ,US
Fixed investments	BE	KR,ES
Amortization	AT	AT,CA,MX,PL,IE
R&D personnel	AU	FR,JP,NZ
		BE,NL
Definition of R&D		
OECD Frascati Manual (FM)	AT,DK,HU	AT,BE,JP,MX,NO,UK
Broader than FM	AU,BE	FR,KR,NL,PL,ES,NZ
Narrower than FM	AU	CA,IE,NL,ES,US
Offshore R&D		
Not covered	DK,BE	CA,HU,KR,MX,PT,US
Covered	UK	JP,NO,PL
Covered with restrictions	AU,AT	AT,BE,ES,FR,IE,NL,NO,N
		Z
Specific terms		
Additional incentives for small companies	UK	CA,JP,NL,NO,PL
		NO
Additional incentives for collaborative R&D	DK,HU	BE
Only collaborative R&D		
Treatment of unprofitable companies	AU,BE,CZ,DK,HU,UK	CA,FR,IE,JP,MX,PL,PT,ES,
		US
Deductions transferred to future years		US
Deductions transferred to past years	UK,AU	FR,NO,NZ
		CA,AT
Direct support		
Direct support only to some companies		

Source: OECD, 2007

The table distinguishes between two basic types of tax incentives, namely those which provide credit or allowances for deductable income and those which do so for payable taxes. Beyond these distinctions tax incentive schemes can also be differentiated by the *deduction base used, eligible costs to be included, specific terms for targeting effects for specific purposes*. Distinctions can also be made between how the incentives treat n*on-profitable companies, subcontracting, foreign R&D, monetary thresholds for receivable credit or allowances*, as well as by which type of *R&D definition is used*. These differences in the types of tax incentives that countries introduce will largely determine which aspects of R&D and innovation the incentives will be affecting e.g. in terms of technology transfer and industrial uptake of research, development of high-tech products, production and so on.

R&D tax deductions can be leveraged on the absolute amount of R&D expenditures or their growth rate, or both of these *deduction bases*. Of these a deduction base related to the absolute amount of R&D

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expenditures has clearly been the more common one while a mixture has been the second most common. A deduction base related to the growth of R&D expenditures can, theoretically speaking, be more relevant in stimulating technologically progressive companies which more aggressively are pursuing innovations of more radical nature. Nonetheless, these types of incentives are difficult to implement in practice as base values have to be defined for R&D expenditure growth thresholds. This cyclicality increases governance costs for public funders and reduces transparency for companies. These difficulties may explain the limited use of growth rates of R&D expenditures as a deduction based when compared with absolute expenditures.

A critical dimension of defining eligible costs claims is also how *R&D is defined.* In this context most countries have adapted the OECD Frascati Manual definition of R&D which then has been expanded or contracted depending on country preferences regarding the scope of tax incentives. The main differences across countries concerns whether socio-economic research, as well as whether R&D related to the final market introduction phases of innovation, is included. The definition of R&D is thereby also an important consideration when designing R&D tax incentives towards achieving specific effects.

Eligible cost claims considerations also relate to the *location of R&D* performed. Companies may perform R&D in their domestic laboratories; they may outsource it to other companies, research organisations, or universities; they may offshore it to foreign locations or undertake R&D and innovation throughout networks and alliances. This aspect of the design of R&D tax incentives has been much debated and researched, especially in the light of accelerating internationalization of R&D and globalisation as well as 'open innovation' as a new mode of innovation. Of these, outsourcing is commonly included as eligible R&D costs for tax credits or allowances although some specific restrictions apply. However, offshore R&D is typically not included as eligible costs in the UK and Japan currently being the only exceptions amongst OECD countries.

Although the neutrality of R&D tax incentives often are their selling point to governments many schemes have, nonetheless, included *specific terms for targeting effects for specific purposes.* Two typical examples of this include additional incentives for small companies and for collaborative projects. The reasons for giving small companies specific attention is that these companies have a higher probability to be excluded from other R&D support schemes, such as direct R&D support, due to additional costs and troubles of applying for this support. Governments may also have a special interest in stimulating innovation and growth amongst small companies. Collaborative projects are attractive since they have a higher propensity to generate spillovers and positive externalities to the benefit of society at large.

Finally, the treatment of *non-profitable companies* has to be given due consideration. Heavily R&D- and innovation-oriented companies may show negative or low turnover and sales during many years of early operation and therefore depend on public support under the assumption that their growth opportunities are higher than average. At the extreme tax incentives may thus not apply to companies which the government may perceive as the greatest potential in the longer term. Countries have introduced various elaborations to their tax schemes to avoid this type of situation. For example, tax credits or allowances can be motivated on the basis of past or expected future income streams and turnover. However, then the differences between direct R&D subsidies and tax incentives also start to become fuzzy in practice and schemes again start to become overly complex to govern and less transparent to companies.

Assessments of effects of tax incentives

R&D tax incentives also bring substantial costs to governments related to administrative issues, intended and unintended tax revenue loss. These costs may also be more unpredictable than those related to direct R&D support as decision to seek to activate R&D tax incentives is made by companies themselves rather

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than public R&D funders. In fact, previous OECD studies suggested that the costs of R&D tax incentives exceed those of direct support in some countries even though comparisons are hard to make as the balance between the uses of these two types of main policy schemes also differ.

Given costs of R&D tax incentives it is also important to assess their effectiveness in terms of various R&D and innovation related activities. Economists have generally been sceptical of the effectiveness of R&D tax incentives as a prevailing view has been that R&D is not very sensitive to changes in its post-tax price (i.e. the elasticity, or responsiveness, of R&D to tax credits or allowances). This was the prevailing view until the 1990s, mainly on developments in the US. [19] Since then there have been additional econometric studies on the effectiveness of R&D tax incentives also in other countries. Since the early 2000s the European Commission has also paid increasing attention to the role of these schemes, especially in the context of achieving the so-called Lisbon strategy which has called for R&D investments to approach 3% of GDP throughout the EU by 2010.[20]

At the outset, it should be noted that it is difficult to disentangle the true impacts of tax credit schemes from other schemes (due to the policy mix employed). R&D activities at company level are naturally also dependant on various other company internal and external conditions, including the specific economic structure, innovation culture, political environment and economic cycle of countries. At national level the overall taxation regime comes into play while, at company level, accounting details and company performance also matters for how effective tax deductions or allowances can be leveraged.

Above some of these challenges were highlighted also in the context of the different types of R&D tax incentives. In addition, it should be noted that most studies merely focus on the effects of the incentives on the level of business sector R&D ("direct additionality"). Assessments of effects of the incentives on the type of R&D and innovative activity ("innovation additionality") are very few to date, as are studies on the broader macroeconomic effects ("macroeconomic additionality of the incentives"). The studies nonetheless provide some insights of relevance for the design and implementation of R&D tax incentives in countries where experiences are more limited/non-existent.[21]

Country examples of the design and aims of R&D tax incentives

Countries differ both by the generosity of their R&D tax incentives as well as by the specific design of the schemes. The generosity of the scheme will obviously affect its potential effectiveness. Overly generous schemes would stimulate R&D projects that from a societal point of view may not deserve to be carried out, and might cost more to the public than the increase in business sector R&D that they incentivize. Too small incentives, on the other hand, may not have much impact of R&D decisions in the business sector.

Due to the large variety in the specific design of R&D tax incentive schemes across countries the approach taken here is to present a brief summary of these designs across a large number of countries based on the most extensive and recent compilation identified.[22] This information is then deepened towards introducing the R&D tax incentive schemes and their aims in some greater detail across a few countries for which reliable data are readily available.

[19] See Bloom, N, Griffith, R and Van Reenen, J. 2000. Do R&D tax credits work? Evidence from a panel of countries 1979-97 and the references therein.

[20] See especially EC. 2006. Towards a more efficient use of tax incentives in favour of R&D. COM(2006) 728 final; EC. 2008. Comparing Practices in R&D Tax Incentives Evaluation; EC. 2009. Design and Evaluation of Tax Incentives for Business Research and Development.

[21] The studies referred to include Atkinson (2007), Garcia-Quevedo (2004), Hall and Van Reenen (2000) as well as those referred to in Bloom et al. (2000) and Hall and Van Reenen (2000) as the main ones for comparative country data.

[22] This compilation is available at http://www.ibm.com/ibm/governmentalprograms/global-rd-incentives-2008.pdf .

From an Ukrainian perspective interesting insights may be gained from the cases of the UK and France as large European countries where relatively generous R&D tax incentive schemes, in some form or the other, have been in place already for a longer time.

In the UK a tax incentive comprising immediate write-off for tax purposes of capital expenditure on assets used for scientific research has existed since the 1940s. Uptake was traditionally relatively low because the definition of scientific research led many to believe that only laboratory-based research qualified, and in any case, the benefit was often cash flow only.

In 2000, an incentive was introduced for Small or Medium-Sized Enterprises ("SMEs") giving an additional 50% tax deduction for revenue spent on R&D with a new definition of R&D replacing "scientific research". This emphasised the inclusion of development in qualifying activities. The 100% tax depreciation on capital continued, but was based on the broader R&D definition. The extra 50% deduction is given to the SME incurring the expenditure whether the work is done in-house or contracted out, although if the SME contracts the work out then only 65% of the payment to the subcontractor qualifies for relief.

As the rate of corporation tax has for a number of years been 30%, this extra deduction had a cash value of GBP 15 per GBP 100 of qualifying R&D expenditure. Crucially for SMEs, if a tax loss arises this can be "surrendered" to the government at the rate of GBP 24 for each GBP of R&D spent. The cash recovery is very important to claimants. This was a policy objective aimed at addressing the difficulty faced by start-up companies in securing funding.

As the objective was to address difficulty in obtaining funding, the SME R&D relief is not available for work where the SME already receives funding, for example a grant or work done as subcontractor for a customer. An additional requirement that the SME owns any intellectual property generated from the work is aimed at ensuring that only R&D done on the company's own account qualifies. The extra deduction has been increased from 50% to 75% for expenditure from 1 April 2008. The rate of UK corporation tax fell to 28% as at the same date.

In 2002, a similar revenue-based incentive was introduced for companies that were not SMEs (i.e., "large" companies), but the additional tax deduction is 25% of revenue spent and there is no opportunity to surrender losses for cash. The incentive is given to the person doing the R&D irrespective of who pays for it, so R&D done by a company for customers qualifies. The policy objective was to motivate multinationals to increase or retain R&D investment in the UK rather than at foreign locations. Further, the rate of extra deduction for large companies has been increased from 25% to 30% for expenditure incurred on or after 1 April 2008.

In the UK R&D tax incentive schemes are the biggest single funding mechanism for business R&D provided by the UK Government. Developed through consultation with business, they are at the heart of the Government's strategy to raise levels of business R&D and encourage business innovation.

The cost of support claimed increased from GBP 0.4 billion in 2002/03 to GBP 0.5 billion in 2003/04 and GBP 0.6 billion in both 2004/05 and 2005/06; more than 6,000 claims were received in both 2004/05 and 2005/06. In total, more than GBP 2.3 billion of support has been given to business R&D through R&D tax relief in the six years since its introduction in 2000.

In 2005/06 R&D tax incentive claims accounted for GBP 6.7 billion of business R&D expenditure. Of this total, expenditure under the SME scheme totalled GBP 1.01 billion and claims including cash back and tax deduction totalled GBP 0.18 billion; total claims thus equated to about 18% of this expenditure.

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Expenditure under the large company scheme totalled GBP 5.7 billion and claims GBP 0.43 billion; claims equated to about 7.5% of this expenditure.

In France, tax incentives are granted in the form of *crédit d'impôt recherche (CIR).* They are provided in the form of a tax allowance amounting to 30% of R&D costs that can be utilised up to the amount of EUR 100 million. Deduction of 5% of R&D costs applies for costs exceeding EUR 100 million. Companies that claim the tax incentive for the first time can deduct 50% of R&D expenditure in the first year and 40% in the second year. Simplification to the French system of R&D tax support was introduced with effect from the beginning of 2008 and tax support is currently only provided on the absolute volume of R&D expenditure. Previously the scheme was based on incremental R&D growth thresholds.

Activities eligible for R&D tax support must comply with the international definition of R&D activities published in the OECD's Frascati manual. In 2004, the decrease of the number of entities claiming tax incentives in their tax returns has led to the introduction of a combination of new volume-based tax allowances (5% deduction) and incremental-based tax allowances (45% deduction with the threshold of EUR 8 million).

Promoting R&D and innovation: Tax incentives and support services in Ukraine. On complexity and entanglement of the tax field in Ukraine

Instability of tax legislation is caused by numerous additions and amendments to current laws and regulations, especially those regarding the payment of taxes, duties and compulsory payments. It makes more difficult the tax settlements and causes tax legislation breaches.

Due to the complexity and entanglement of the Ukrainian tax sphere there had arisen the situation when almost all the enterprises committed breaches of law. Thus, in 2007 the state tax authorities detected the tax law breaches in 95.2% of legal entities of the total number of inspected ones.[23]

In 2007 tax authorities carried out 199 thousand crosschecks regarding VAT reimbursement claim. According to the results of performed activities 30.01.2008 the State Tax Inspection of Ukraine had sent the letter to regional tax administrations "On the Work Situation Regarding Taxpayers' Complaints Consideration", where the following was stated: "Inspectors and heads of certain state tax inspections incorrectly applied the applicable law requirements regarding taxation and caused unauthorized additional tax accruals and administration of fines (penalties)"/ Total 3668 of unauthorized additional tax accrual was detected in 2007, being 21.3 of all decisions appealed against, the latter number being 17204. In 2006 tax officials cancelled 4732 of their own similar decisions that is 29% more than in 2007. At that almost 42% of decisions appealed against are connected with VAT and income tax. In 2007 566 cancelled tax notices-decisions amounted to UAH 3.3 billion, that emphasizes the severity of complexity and entanglement of Ukrainian tax fields.[24]

Types of innovation taxation in Ukraine
Innovation activities and privileges in innovation sphere in Ukraine

[23] H.M.Filiuk. Budget and tax policy influence on the market structures transformation in Ukraine// Finances of Ukraine - №5. – 2009. – p.60
[24] O.D.Vovchak, I.H.Kemenyash. Tax differences in economic security management system of entrepreneurial structures in Ukraine. // Finances of Ukraine. - №11. – 2008. – C.46

Tax facilitation is of wider sphere of influence and is better combined with market conditions that measures of direct financial R&D entities support. It allows the private sector to choose priorities in innovation activities, is more transparent and acceptable for business and significantly tapers the possibilities of corrupt decisions, requires less administrative expenses.

Considering the financial situation in Ukraine we should suppose that financial resources of state budget and credit institutions will be rather limited in the next several years.

Privileged taxation is implemented by increasing standards of R&D expenses write-off and investment tax credits.

Summarizing the world tax facilitation practice we may define the following privilege types:

1) R&D expenses write-off, decreasing taxation basis;
2) investment tax credit;
3) tax rates decrease for innovation activities entities;
4) establishing tax exempt minimum for taxation subject;
5) certain taxes exemption for venture companies;
6) Deduction from the defined tax amount.

The first three privilege types are the most common.

OECD data evidences that more and more countries are implementing innovation activities tax facilitation. Thus in 2006 20 countries not being OECD members provided tax privileges to R&D enterprises, while in 1995 there were only 12 such countries (2004 – 18). According to OECD experts estimation there will be more countries providing innovation enterprises with tax privileges and the amount of these privileges shall increase simultaneously. The data show the diversity of approaches implemented by OECD countries.

Ukraine has several fundamental differences in comparison with OECD[25]:

1) In industrial countries the enterprise is entitled to use tax privileges after having incurred R&D expenses, and in Ukraine the Law of Ukraine "On Innovative Activities" does not provide for the right to receive tax privileges to the ente4rprises having the innovation project state registration certificate, in the amount of 50% of VAT and 50% of income tax, that is providing tax privileges depending on final results of innovation activities. But it is extremely difficult to determine in financial and tax accounting the VAT and income amount from the sales of innovation project in particular. Besides, certain VAT and income amount does not necessarily proceed from the sales of innovative project. They may be influenced by market factors, market situation, resource prices etc. Thus the **qualified R&D expenses criteria** are not implemented. We should note that the **list of expenses** related to qualified R&D expenditures in Ukraine is **absent**. Thus as the condition of their implementation for innovation activities tax facilitation it shall be feasible to develop and approve the Accounting Regulation "Research and Development Expenses" by the Ministry of Finance of Ukraine and simultaneously harmonize it with the revised or added Model Regulation of Accounting Planning and Production Cost of Goods (Works, Services) Calculation in the Industry, as approved by the Resolution of Cabinet of Ministers of Ukraine dated 26.04.1996 No. 473, used for tax accounting gross expenses calculation.

Moreover, it is necessary to take into account the difference between R&D expenses calculated upon their completion in a scientific institution and expenses related to innovative project introduction in production, requiring additional expenses for project implementation technical conditions (development of stands, equipment, respective material resources) and expenses to direct realization of innovative project (project documentation and research plant development, adaptation to the production technological cycle of the enterprise etc.).

2) Incremental privileges, stimulating the enterprise to engage in the innovative activities, became widespread in foreign counties. In Ukraine incremental privileges are absent as a method.

[25] A.Ye.Nykyforov, V.M.Dyba, V.O.Parniuk. Innovation activities tax facilitation. // Finances of Ukraine. - №5. – 2009. – p. 85

3) The amount of tax privileges provided in industrial countries is substantial for innovation entities. Under the condition that fiscal bodies control an enterprise's gross expenses they make innovation development economically feasible. In Ukraine tax privileges amount depends on the tax purpose and payers. Thus the special regime for technology park participants within the registered innovative and investment projects envisaged by the Law of Ukraine "On the Special Regime of Technology Parks Investment and Innovation Activities" dated 17.08.1999 the following measures were stipulated[26]:

- income tax and VAT are not transferred to budget but credited to the special account of project entity (50%) and technology park (50%) and is used exclusively for their own innovation development;
- imported goods necessary for the project implementation are VAT and customs duty exempt;
- projects currency proceedings are not subject to mandatory sales;
- maximum export (import) settlement period is increased from 90 to 150 days.

Positive impact of this tax motivation arose in 2000-2003. The volume of innovative scientific goods production amounted to UAH 2.07 billion, while UAH 65.37 million were credited to the state budget and target state funds for the same period.

During 2004-2006 total volume of investments decreased (including state budget expenses) in the mining, light, chemical and petrochemical industries. Along with this the investments in processing industry, metallurgy and metal-processing industry increased. The state investments increased in engineering, equipment and appliances repair and installation. However, notwithstanding the increase of state investments in engineering, indexes of branch production volume growth dropped from 128.0% in 2004 to 107.1% in 2005 and 111.8% in 2006. This influenced the adoption of the Law of Ukraine “On Amendments to the Law of Ukraine “On the State Budget of Ukraine for 2005” and some other legislative acts of Ukraine” dated 25.03.2005 No. 2505 – IV, which cancelled 87 privilege codes, terminated the laws of Ukraine providing benefits regarding taxes and duties aimed to facilitate investment and innovation activities of technology parks, their participants, subsidiaries and joint ventures, privileges for special economic zones entities. Thus the effect of technology parks lost its prospective due to improper taxation.

Special tax facilitation includes stimulation of small and medium businesses development as important competence participants. Thus it is necessary to preserve simplified taxation system and its development through the improvement of taxpayers’ registration and accounting procedures, elimination of tax payment minimization possibilities, and elimination of tax discrimination effect. Now there are three simplified taxation regimes in Ukraine for small enterprises: uniform tax (for individual entrepreneurs – at a rate from UAH 20 to UAH 200 per month and for legal entities – 6% of the income, if the uniform tax payer is a VAT payer, and 10% if it is not a VAT payer); fixed tax (for individual entrepreneurs at a rate from UAH 20 to UAH 100 per month); fixed agricultural tax (0.03 – 0.45% of the Land monetary evaluation per year). Moreover, the taxation rates introduced in 1998 had not been revised until now while inflation index had grown significantly during the last 10 years. Taking this into account it is feasible to preserve the simplified taxation system, but on condition of the uniform tax rate and products sales revenue indexation according to the inflation level for 1998-2008 with simultaneous responsibility enhancement for small and medium businesses and introduction of motivating privileges for those engaged in innovation activities which will facilitate small and medium businesses economic development.

4) In foreign countries there exists a system of control of investment tax credit funds target use. In Ukraine investment tax credit is not used. Its introduction is hampered by unclear rules of gross expenses formation under different methods whether in financial or in tax accounting. Ukraine dies not facilitate the

[26] Technology parks: international and Ukrainian experience. Second edition, with amendments and additions/ Edited by D.V.Tabachnyk. – Kyiv: ТПІІЕЗ, 2004. – p. 21

counter-expense mechanism of gross expenses formation while calculating the income tax. The data supplied by the State Tax Administration (STA) evidence great extent of income "minimization". According to 2006 results approximately 4.5 thousand of enterprises in Ukraine having adjusted gross income over UAH 50 million were paying income tax that did not exceed 1% of the adjusted gross income.[27]

Taxation system inconvenience evaluation

For the taxation inconvenience for innovation entrepreneurship Ukrainian taxation system has for many years been second to last, losing only to the Byelorussian one. Accrued tax burden in Ukraine almost twice exceeds this index for a group of countries to which Ukraine belongs by GDP level per person, as well as intensifies discrimination of domestic manufacturers against foreign competitors.

Inconvenience of the tax system of Ukraine is defined not only by the tax rates amount but mainly by complexity and instability of the national tax legislation system.

According to the data supplied by Ukrainian experts as of 1.01.2008 there were 26 national and 14 local taxes and duties in Ukraine, and according to sociological research economic entities pay in average 9-12 taxes and mandatory duties. In accordance with the analysis, our system is overburdened with numerous minor taxes, expenses for calculation, control and administration of which exceed the proceeds of their payment. The data contained in Doing Business 2008, the fifth of the World Bank and international Financial Corporation (IFC) publications, companies waste 2185 working hours for taxes calculation and payment annually. For comparison, there are 11 types of tax payments in Estonia, with time consumption for their formalization being only 104 hours annually (21 times less than in Ukraine), and in Kazakhstan – 34 and 156 accordingly (14 times less). Such great number of tax payments and time consumption for their formalization is undoubtedly hampering entrepreneurial activities development, as well as goods and services market competition.[28]

Tax burden increases with respect to the enterprises operating in official economy sector due to the fact that around 50% of the enterprises are "shady". Besides, approximately one-third of the enterprises of the official economy sector were loss-making. In January-February 2009 their share grew to 43.2%. Thus the entire income tax burden is laid onto less than one third of operating domestic enterprises, decreasing their competitiveness against foreign companies and shady domestic enterprises.[29]

Conclusions

Since the 1990s supply-sided policy schemes, and direct R&D subsidies especially, have been complemented with a whole array of new ones, some of which relate more to also stimulating the demand for innovation. These schemes include R&D tax incentives and IPR support services as important ingredients in the overall policy mix of advanced countries.

R&D tax incentives are considered interesting as they delegate the decision about which R&D projects to fund to companies themselves as opposed to R&D subsidy where governments and their funding agencies prioritize across companies, technologies and sectors. R&D tax incentives can be attractive as they thereby may draw new types of companies, technologies and sectors within the indirect sphere of influence of

[27] [27] A.Ye.Nykyforov, V.M.Dyba, V.O.Parniuk. Innovation activities tax facilitation. // Finances of Ukraine. – No. 5. – 2009. – p. 85-86
H.M.Filiuk. Budget and tax policy influence on the market structures transformation in Ukraine// Finances of Ukraine. – No. 5. – 2009. – p. 58
[29] H.M.Filiuk. Budget and tax policy influence on the market structures transformation in Ukraine// Finances of Ukraine. – No. 5. – 2009. – p. 58-59

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policies. Today a large number of OECD countries have introduced different types of tax incentives. Nonetheless, the design of these schemes requires careful consideration about deduction bases to be used, eligible costs to be included (including amortization rates to be used), which definition of R&D to be used, how offshore R&D is treated as well as how other 'outlier cases' are covered. These considerations often tend to add complexity to the schemes for both policymakers and companies as the users, thereby devaluating some of the benefits of the schemes such as transparency and simplicity of use.

A brief comparison between Ukraine and other European (and other) countries highlight the following specific characteristics of the current Ukrainian position with respect to tax incentives for promoting R&D and innovation:

- The overall tax regime is complex and characterized by a broad range of minor taxes, expenses, control and administration the governance of which is challenge.
- Partly due to the complexity of the overall tax regime, and challenges in its governance, tax law breaches are very widespread throughout Ukrainian industry.
- The large size of the "grey economy" is a further complication in enforcing tax regulations. As a consequence, the entire tax burden is laid onto a minority of all operating domestic companies which therefore may compete on unfavourable terms.
- There is no tax incentive system in place which could stimulate R&D and innovation, the only apparent exception being preferential treatment of technology parks through the law "On the Special Regime of Technology Parks Investment and Innovation Activities" from 1999.
- A Ukrainian definition of qualified R&D expenses criteria is still lacking even though the Accounting Regulation "Research and Development Expenses" can provide a starting point. This definition would be an important prerequisite for introducing R&D tax incentives.

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Chapter 5

Innovation culture (Janne Lehenkari, Vyacheslav Solovyov)

Introduction

Culture is a wide-encompassing concept that refers to the common values, beliefs, attitudes and behaviours shared by a nation, region, organisation or other social entity. During the last decade, cultural factors affecting innovation have gained more and more attention among innovation policy makers and scholars in EU and abroad. It is shown that nation's capacity to generate and adopt innovations is dependent on the general attitudes towards risk-taking and entrepreneurship, readiness to accept change, openness to new information, and horizontal connections of individual citizens and groups in society, among others. These factors are expressions of nation's culture and they may act as key drivers or, on the contrary, major barriers of innovation.

European experience

Culture is a wide-encompassing concept that refers to the common values, beliefs, attitudes and behaviours shared by a nation, region, organisation or other social entity. During the last decade, cultural factors affecting innovation have gained more and more attention among innovation policy makers and scholars in EU and abroad.

In EU, a great deal of policy attention is paid to foster innovation culture at national and regional levels. From the organisational point of view, it is well established that companies with a successful innovation management and a sustainable innovation culture perform well in innovation activities, grow faster and are more profitable. Concerning governmental organisations, there are still many barriers hindering the advancement of innovation culture. At the present time, the advancement of e-government, standards and public procurement, as well as public-private collaboration are the main areas of policy support of innovation culture in the public sector.

Positive attitudes towards innovation, risk taking and entrepreneurship among general public can be boosted through information and involvement. Public events and workshops involving all levels of innovators and promoting public-private innovation partnerships help to facilitate the exploration of experiences and attitudes towards creativity, promote new forms of collaboration and support inventiveness.

Concerning educational and training measures, skills needed specifically for innovation have gained more and more prominence in the development of the EU innovation policy. Entrepreneurial skills, innovation management, workers' skills and competences – scientific and technological skills in particular – have been identified as crucial factors for innovation capabilities. Nevertheless, science and engineering qualifications are still of great importance. The key competences of lifelong learning are seen as major facilitators of innovation, productivity and competitiveness, that is, innovation-friendly culture in society at large.

In EU, the importance of culture for innovation performance is recognized as an important area for exploration in recent innovation policy elaborations (EC 2007a). It is seen that innovation performance is more and more dependent on an environment supportive to innovation, creativity and entrepreneurship, that is, on innovation-friendly culture. Readiness to adopt new products and services, attitudes towards entrepreneurship and risk taking, as well as openness to collaboration and change are factors that influence national or regional innovation performance. These factors are expressions of culture that is understood, in general terms, as common values, beliefs, attitudes and behaviours shared by a nation, region, organisation or other social entity.

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From the point of view of innovation process, cultural factors affect performance in two ways (Gee & Miles 2007). First, cultural factors may facilitate or hinder creation of new ideas and their effective embodiment into new products and processes. For instance, negative attitudes towards risk taking and fear of failure impede people from taking creative efforts. Second, culture plays a role in how new products and processes are adopted and put in use. Depending on cultural factors, people may reject or resist new products and processes or, vice versa, accept and even disseminate innovation.

While it is acknowledged that regional or national innovation performance is dependent on cultural factors, the causal relations behind the phenomena are far from straightforward. This should be kept in mind especially when adaptation of EU policy measures on innovation culture is considered in a non-EU context. Foremost, the level of social capital and trust in society, as well as the effectiveness of government – including rule of law and control of corruption – are important background factors that influence on the effectiveness of any targeted policy measures on promoting innovation culture in society (cf. Esser & Hollanders 2007; Uslaner 2007). In international comparison, the EU Member States generally perform well when these background factors, such as the level of corruption, are measured.

Following the policy study of Gee and Miles (2007), we address the relationship between cultural factors and innovation mainly from two viewpoints:

1. Spatial dimension: culture as it pertains to nations, regions and city-regions. This includes issues, such as the readiness of markets to adopt innovations and the amount of creativity and innovative activity carried out in a geographical area.
2. Organisational dimension: culture as it pertains to economic organisations including business and governmental organisations. This means elaborating issues how the culture of firms and governmental organisations facilitate, inhibit, or otherwise shape innovation.

The first viewpoint – spatial dimension – means taking specific geographical context, such as a city-region, into account when the promotion of innovation culture is considered. Not only do countries differ from each other when the issues of adoption rate of new products and processes or availability of creative work force are considered, but also regions and cities even in same country are significantly different in these respects. The second viewpoint – organisational dimension – entails taking into account the different organisational cultures of business and public sector when it comes to advancing innovation culture.

Supporting innovation culture has been on the EU agenda since 1996, when the European Commission adopted the First Action Plan for Innovation (EC 1996). The top priority of the Action Plan was to foster innovation culture through education and training, improved mobility of researchers and engineers, demonstration of effective approaches to innovation, promotion of best management and organizational methods amongst businesses, and stimulation of innovation in the public sector and in government.

The long-standing work to foster innovation culture culminated in 2009, when the year 2009 was celebrated as the European Year of Creativity and Innovation accompanied by a variety of support measures of innovation culture initiated by the European Commission and the EU Member States.[30] Prior to the Year, policy studies and workshops of relevance were arranged.[31] During the Year, both national and

[30] Homepage of the Year: http://create2009.europa.eu/index_en.html.
[31] E.g. The INNO-Views Workshop on "Innovation Culture - Creating a favourable innovation climate in Europe", 13–14 December 2007, Eindhoven. Workshop homepage: http://www.proinno-europe.eu/events/innovation-culture-creating-favourable-innovation-climate-europe.

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EU-wide efforts were made to raise awareness of the importance of creativity and innovation for personal, social and economic development, to disseminate good practices, to stimulate education and research, and to promote policy debate on relevant issues. The overall objective of the Year was to highlight the factors seen crucial for advancing creativity and a capacity for innovation in the present era (see Box 1). The factors indicate that building and fostering innovation-friendly culture requires multiple measures of which most are related to educational and training issues, such as improving personal skills and knowledge-based competences.

In context of the European Year of Creativity and Innovation 2009, the European Commission selected 35 European projects that stand for the best practices in promoting innovation culture and creativity among the current programme activities of the Commission (EC 2009). The selection was based on the deliberation of a panel of independent experts. Examples of best practices embrace tools for training SMEs in the protection of intellectual property, Innovative training programme for neglected education sector, a curriculum for the teaching of innovation, collaboration between regions to develop innovation, or New ways of promoting knowledge-based entrepreneurship.

The role of national institutional frameworks for creating innovation-friendly environments is well-established in research literature (OECD 1997). For instance, social norms and values are reproduced by the education system and historical features of countries are reflected in educational structures, such as in the status of science and engineering. Similarly, cultural factors affect the functioning of the financial system, and ratio between long-term and short-term financing for innovation activities varies between countries due to their cultural differences. National legal institutions are also affected by cultural factors, so that the intellectual property right (IPR) system in one country may encourage reverse engineering and modifications in contrast to other countries where the IPR system spurs radical innovations. Not only are the national institutions important for framing innovation activities, but also the connections and links between institutions are important as well. For example, the small Nordic countries suffer from the disadvantage of small domestic market size and limited number of innovative people, but the connections that exist between institutions have been seen to effectively compensating these disadvantages (Gee & Miles 2007).

The business sector is the main performer of innovation activities within EU and abroad. Building and maintaining innovation-friendly environment is of vital importance to most business organisations due to the continuously increasing competition in the market. The organisational culture of a company may facilitate, hinder or otherwise shape innovation activities. The organisational culture can be defined as a set of core values, behavioural norms, artefacts and behavioural patterns, which govern the way employees and management in a company interact with each other and perform their tasks and duties (Gee & Miles 2007).

While supporting and fostering innovation culture is common practice in the European business organisations, the situation is quite the opposite in the public sector. Governmental organisations often have multiple objectives to fulfil in contrast to the profit-oriented objective of business organisations. Governmental organisations have to address issues that are complex and there is always a possibility that a wrong policy mix may have adverse effects. Moreover, the complex institutional structure of the public sector makes the decision-making slower in contrast to business because of the large chains of command.

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Finally, risk taking in the public sector is particularly different than in business, since in many areas, such as security and health, a failure can have a drastic impact (Thenint 2010).

According to a recent review (Thenint 2010), there are five key areas of policy actions to support innovation culture in governmental organisations in the EU context. First, political push and goal setting are of importance. Policy-makers and high-level managers should first focus on the objectives and expected improvements to public services. Policy-makers' main role should be that of setting goals, while the specific targets, means and resources to be employed are often be better elaborated and implemented by governmental organisations and other stakeholders concerned.

Second, experimentation and upscaling require specific tools and resources that are common in the innovation activities of the business sector. Similar facilities could enable civil servants to feel more comfortable in creating and experimenting without having to cope with everyday constraints and political instability. Experimenting needs to be accompanied by trial and error testing and exploration of feasible routes to upscaling. Third, monitoring and communicating are required for to better communicate good practices, and to provide continuous information on innovation activities in governmental organisations. The governmental organisations need to show the benefits of their innovations to policy-makers, colleagues and to the general public.

Fourth, skills improvement and human resources management are key innovation drivers in the governmental organisations as their performance mainly relies on human capital. While governmental organisations have highly-trained professionals as employees, they are often located in rigid and compartmentalised organisational hierarchies. In this respect, action should be taken in favour of continuous training, rewarding and recognition, mobility and staff exchange, and diversification of leadership.

Fifth, collaboration efforts between public and business sectors should be supported. Governmental organisations generally limit their collaboration to outsourcing or consultation. Long-term collaboration and dialogue between public and business sectors require radical improvements within the governmental organisations, so that they are more able to assess their needs and capabilities for collaboration and learning through partnerships with the business. It is argued (Keys & O'Sullivan 2007) that the key process is an early and deep dialogue between governmental organisations and their business and third-sector partners that aim to create contracts based on citizen-centred services and industry best practice. The dialogue should also comprise direct engagement with service users.

Currently, EU is supporting innovation activities in the public sectors of Member States by using multiple, partly successive measures. Advancement of electronic government (e-government), standards and public procurement, as well as public-private collaboration are the main areas of policy support.

Until this time, the European Year of Creativity and Innovation 2009 that was addressed earlier in Section 2.2 stands for the largest promotion measure of innovation culture to general public in EU. Almost 1.000 events and hundreds of projects were highlighted, promoted and disseminated during 2009 through its communication campaign. The website of the Year received almost half a million visits in 11 months. The media coverage of the Year has potentially reached one fifth of the EU population through the 3.000 online

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and print articles that were linked to the Year.[32] However, analysis and assessment of the promotion measures undertaken in the context of the Year are yet to come.

Besides the education of science and engineering, there are new educational issues that have gained more and more prominence in the development of the EU innovation policy. Entrepreneurial skills, innovation management, workers' skills and competences – scientific and technological skills in particular – have been identified as crucial factors for innovation capabilities. Also, culture and environment supporting skills are on the policy agenda (EC 2007b; Green et al. 2007). Nevertheless, science and engineering qualifications are still of great importance.

Ukrainian experience

Problems of development of innovation culture in Ukraine are not the same, as those in the EU countries. First of all, it is worth to mention, that during the decades of the Soviet power, innovation was separated from entrepreneurship. This means that inventions emerged not in market environment, but within a framework of planning economy, where private initiative was seriously constrained. However, in the Soviet times, a number of inventions were generated by employees of the state enterprises; substantial part of them has been utilized, especially in military-industrial complex. In any case, innovation could mean some personal achievement, but not commercial success.

During the years of independence, new possibilities for development of innovation emerged. According to the World Bank, at the beginning of 1990s, the country had the highest share of persons with higher education diploma in technical and natural sciences in the working population in the world. Ukraine had also relatively developed industrial base. This could create a base for successful innovation development. However, severe economic crisis has led to substantial decline of GDP (by almost 60%) and to destruction of the bulk of high tech sectors. A lot of people had to change their occupations by moving from manufacturing sectors to trade operations. Economic structure has deteriorated: the share of machine – building industry dropped by 3 times in the national economy. The number of registered inventions has also declined by several times, if compare with the beginning of 1990s.

Ukrainian statistics collects data on the number of inventions and propositions, aimed at improvements of production processes. These data show that the negative tendencies could be observed even in the relatively stable pre-crisis period. The number of inventors dropped by almost 10% in 2005-2007. In 2008, the number of inventors per 10,000 employees was 32 (37 – in 2005). The highest levels were observed in Kharkiv oblast (61), Donetsk oblast (52), Kiev city and Ivano-Frankivsk oblast (42 – each).

It is important to mention three phenomena. First, the number of inventors is going down in almost all categories (patent holders, 'ordinary' inventors at the enterprises , who registered their propositions on improvements of products or technologies, and so on). The second, the age of inventors is growing, the share of pensioners among inventors exceeds almost 20%. Women are less active, than men. They are the authors of a quarter of all inventions. The third problem is related to the deterioration of the labor market

[32] Press release: Create. Innovate. Grow: Closing Conference of the European Year of Creativity and Innovation. Available at: http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/1942&format=HTML&aged=0&language=EN&guiLanguage=en.

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for specialists with technical diploma. In contrast with the Soviet times, more than 80% of new graduates from technical specialties in the Universities are working not according to their qualifications. The quality of education in technical and natural sciences is also going down. Life-long education is underdeveloped in the country. Thus, the tendencies in innovation and industrial development in the country are not favorable for innovation culture.

However, the state exerts some efforts to stimulate development of innovation culture in the country. It supports different competitions, especially, among students, arrange exhibitions and lectures and so on.

Recently, the concept of innovation culture has been actively used not only in scientific but also in legal sphere. Ukraine was the first among the CIS Member States to legally set the concept of innovation culture, which is referred to as "a component of innovation potential characterizing the level of educational, overall cultural, social and psychological readiness of a person and society as a whole to accept and creatively implement the ideas of economy development on innovation basis"[33]. In addition, the Verkhovna Rada has set "the development of innovation culture of society"[34] as one of strategic priority directions of innovation activities of Ukraine for 2003 – 2013. This is the particular reason for “innovation culture development” being included into all regional documents on innovations development. In an adequate manner public problems of innovation culture are reflected in the work of experts from the Autonomous Republic of Crimea, where this definition is referred to as "susceptibility of a person, group, society of various novelties ranging from tolerant attitude to readiness and capability to transform them into innovations”[35]

Sometimes, regional authorities take an active part in events, related to development of innovation culture among the population.

So, one of the key activities of Ukrainian regional scientific centers is to foster an innovation-friendly education system in regions. Innovation-related elements are included in the courses of applied economics in regional higher education institutions. Also, expert training that meets the requirements of venture enterprises, launch of innovation projects and provision of consulting services of technology transfer are on the agenda.

The regional scientific centers pay a lot of attention to the creation of a favorable social environment for innovation activities, that is, innovation culture, in regions. Innovation culture is a new form of culture that motivates new type of activities and allows the inclusion of the development and realization of the best human qualities (creative, intellectual, and innovative) in social processes. In order to create a modern innovation culture, it is necessary to reorganize the intellectual sphere of the nation. It is also necessary to support people’s creative efforts and potential to match the level needed to meet the requirements of innovative activities of the near future.

Over the last few years, Donetsk scientific center has carried out substantial organizational work to increase scientific support available in the region and to build a favorable social-economic environment for the development of innovation activities. The center has also fostered innovation culture in the region and involved research agencies in the foundation of regional innovation structures. A Regional Charter of

[33] Act of Ukraine «On Priority Directions of Innovation Activities in Ukraine», Article 2 – The Verkhovna Rada journal, 2003, N 13, p.93 .
[34] Act of Ukraine «On Priority Directions of Innovation Activities in Ukraine», Article 7 – The Verkhovna Rada journal, 2003, N 13, p.93
[35] A Region`s Innovation Development Concept (the example of the Autonomous Republic of Crimea). Simferopol, 2005.

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innovation culture has been prepared and communicated to the regional science and engineering community. A number of R&D projects have been launched to study the subjects of innovative culture and special features of innovation activity. These issues have been included in the curriculum of the regional higher education institutions. Research agencies should, on a regular basis, work with mass media to advocate innovation activities. They should also inform civil servants, manufacturers and entrepreneurs about the results of research work, and to develop innovation projects that utilize new materials, equipment and technologies.

Thus, the country has some preconditions for development of innovation culture but it has to make a lot to reach progress on the way of this development.

Despite level of innovation culture growth is the country`s strategic priority, the issue is neglected in Ukraine that could have negative affect on innovative development of the economy. In this regard, it is suggested to focus major mid-term efforts on three direction of innovation culture development[36]:

- Significant improvement of scientific communication, in particular: organization of state support to popular scientific periodicals, creation of popular scientific radio and TV programs, introduction of special conditions and incentives for drafting and publishing popular science books;
- Educational programs improvement in line with the latest science achievements, in particular: specific communication events for tutors of high schools and universities informing them on the latest scientific and technological achievements, creation of the state system of distance learning with involvement of the most qualified and competent scientists;
- Improvement of innovation culture of managerial staff, in particular: trainings for employees of Ministries and Agencies on innovation management, lectures units for public servants on scientific, technological and innovation policy development and implementation on the basis of foreign and local experience.

Conclusions

To overcome the gap due to their history, transitions economies like Ukraine need to pay attention to organisational capabilities, such as innovation-friendly culture, entrepreneurship and market orientation that are important drivers of wealth creation and growth. Among others, transition economies should focus on 1) the creation of innovation-friendly culture in society at large. Care should be taken to embrace the overarching importance of schools in the innovation structure of a society, 2) the support of small and medium-sized innovative companies to enter innovation activities, 3) the involvement of the business sector in R&D efforts, and 4) increasing the role of the government in stimulating R&D in general.

Fostering innovation culture has been on the priority list of Ukrainian innovation policy since 2003. According to the materials prepared for the parliamentary hearings of July 2009, there are fundamental barriers that make implementation of support measures of innovation culture difficult. The role of science education has greatly diminished in the education system, which erodes the competence base required for R&D and innovation activities.

[36] Final Report of the project "Development of Long- and Mid-Term Forecasts of Scientific, Technological and Innovation Development (in the framework of the State Program on S&T Development Forecasting for 2004 – 2006)".

Moreover, the prosperity of innovation culture is dependent on other cultural factors, such as the level of social capital and trust in the society. If there is lack of trust among the citizens and organisations of the society and the effectiveness of government is not well established, support measures that function well in EU are not likely to succeed in the advancement of innovation culture. On the basis of the parliamentary hearings of July 2009, Ukraine faces great challenges in these respects and supporting the functioning of civic society should be prioritized, since it is a necessary condition of innovation culture, if, for instance, public-private collaboration is considered.

Nevertheless, it is also possible that support of innovation culture may have a positive impact on civic society at large. From the point of view of regional development, there is evidence suggesting that innovation activities are liable to cluster within certain city areas, and cultural factors, such as openness and tolerance of the people in a region, affect this clustering. Ukraine could make use of the finding that this implies looking beyond the provision of supply-side resources, such as investments in training and education at regional level. Regional governments could also search for possibilities to provide a mixture of vibrant cultural spaces and more relaxed urban infrastructures and suburbs that may be attractors of talented work force.

It is well-established that enterprises with a successful innovation management and a sustainable innovation culture perform well in innovation activities, grow faster and are more profitable. It is, however, very difficult to imitate or apply innovation cultures found in business organisations. Organisational research is only about to start to address these issues. Concerning governmental organisations, Ukraine could make use of the lessons learned about the barriers hindering the advancement of innovation culture in a bureaucracy. For instance, the risk aversion and high level of accountability lead to reluctance to undertake or implement changes in governmental organisations both in EU and abroad.

Advancement of innovation culture in governmental organisations is dependent on many factors. Clarification of organisational goal setting procedures, provision of sufficient resources, monitoring and communicating good practices, as well as effective human resource management including recognition and reward mechanisms are found important and mutually reinforcing support measures of innovation culture in governmental organisations. It is likely that situation is not different in Ukrainian governmental organisations.

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Chapter 6
Setting priorities for innovation and technological development (Kimmo Viljamaa, Oleksander Popovych)

Introduction

Setting priorities for innovation and technological development in EU is a combination of activities at the EU level and at the Member State (MS) level. Often these processes are co-ordinated formally or informally but many national differences still exist especially in the way EU level priorities are integrated in the national strategies. There is also still a great variety at the national levels how priorities are set and implemented.

When looking at the innovation policy priority setting at the national level, it can be observed that the governance structures and mechanisms vary considerably. This is evident e.g. in the production of policy documents and strategies, which are key instruments in priority setting. The number of policy documents differs significantly between Member States. Some of the innovation leaders and innovation followers have many documents that directly or indirectly affect innovation policy. This has sometimes proved to be a good method for including a wide range of instruments and sectors in the strategies but has at the same time caused fragmentation. On the other hand some innovation leaders such as the Nordic countries use very limited number of key documents setting the general priorities.

A major challenge of priority setting is that of omitting certain sectors and reaching agreement between different ministries. Various approaches with consultative processes and co-ordination bodies have been introduced. Coordination of strategy and priority setting processes is one of the crucial elements of good inter ministerial/interagency coordination. In some countries strategy processes including several ministries and sectors have been introduced while in other countries the division of labour has been more pronounced.

It has been also noted that **priority setting needs resources** to be effectively carried out. A minimum number of people with adequate skills and resources are needed to launch various background studies and surveys. Top-performing countries have not only the skills but also the tradition of investing resources in evidence creation, while in many other countries there has been a tendency of limiting resources for priority setting processes (especially in times of economic crisis), which has caused problems especially in the implementation of policy priorities. A good evaluation culture also helps to build up evidence for priority setting as well as monitoring the implementation of strategies and to redirect priorities when needed

It is also important to organize a **stakeholder consultation** during the priority setting process. In the past some Member States have lacked this tradition but over the years some kind of involvement has been organized everywhere[37].

In general top-performing countries are characterized by good governance design and effective implementation. In practice this means that the various agencies have had clear responsibilities but also resources for implementation. There has been also a tendency in many countries to reduce the number of instruments as a means of simplifying the implementation of policy priorities.

Recently there have been some changes in many countries as they have found their policy making and institutional set-up increasingly ill-adapted to the challenges of the innovation-driven, dynamic economy. In general the recent trends have been that priority setting mechanisms have become more decentralized, although the degree of decentralization varies. The technological development and policy landscape have become more complex, which has made priority setting a challenging process. Priority setting in innovation policy has also been increasingly connected to broader strategic policy intelligence including forecasts, monitoring, evaluation and assessment of policies and priority areas. One key trend has also been a move

[37] European Innovation Progress Report 2009. European Commission, DG Enterprise. Pro Inno Europe.

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towards limited time instruments (programmes, projects) instead of permanent institutions as means of priority setting.

Setting priorities in different innovation systems

The outcomes and processes of priority-setting differ significantly across countries, and most governments are in search of good practices of priority-setting. The practices in terms of policies, instruments and institutions differ due to different national cultures and historically grown characteristics. Often the rigidities in the institutional frameworks organisational settings also lead to path-dependencies that lead to different priority setting processes despite same kind of general approaches. Still, overall convergence of guiding concepts underlying research and technology policy can be observed especially with the wide use of National Innovation Systems (NIS) approach as a base (Gassler et al., 2004).

Priority-setting is not an issue at the level of overall state innovation policy level alone, but rather a task that is equally of concern for individual funding bodies, research organizations, universities and other key actors in the innovation system (Gassler et al., 2004). As a consequence, ensuring coherence between the various strategic levels and actors becomes an increasingly difficult and at the same time crucial task. It is therefore important to have a clear and transparent division of labour between various organizations.

There is not any single model or best practice regarding the appropriate degree of centralization or decentralization of the priority-setting processes. Despite this heterogeneity some general guidelines can be distinguished. The national policy level is best left with the determination of the overall degree of priority given to innovation in the context of the overall public policies, also reflected in the budget devoted to R&D activities. The national level is also best suited for the determination of system-wide issues, such as IPR, support for SMEs and regulation. The national level is also typically most suited for setting the general functional and thematic priority areas such as general societal issues (e.g. environment, health) and those addressing market or system failure at the national innovation system and leave it to the intermediaries (funding agencies, technology transfer institutions, etc.) and the research performers (universities, research centres, enterprises) to translate these strategic priorities into more concrete actions and operational priorities (Gassler et al., 2004).

Based on the developments in the priority setting process different kinds of priorities exist today in innovation policy (Polt, 2006):

- Mission-oriented priorities
- Functional priorities
- Thematic priorities

The first relates to various targets for innovation policy. A typical example has been the 3% target for R&D expenditure as a share of GDP in the EU RTDI policy priorities or internationalisation of research. The second type of priorities refers to the development of specific functions in the national innovation system such as financing or researcher mobility. Examples of these can be e.g. the recent priorities in the Finnish National Innovation Strategy that emphasize e.g. promoting business R&D investments is to develop more market incentives for firms and other organizations to innovate. The thematic priorities are often related to specific technology or business areas such as nanotechnology, services or eco-innovation.

The priorities can often be “multi-layered”: on the top there are often broader policy goals guiding different priority areas. These are then divided to more specific thematic or functional set of activities/funding schemes which have their priorities at the operative level

The priority setting process differs depending on the hierarchical position of the priority setting institutions. Government white papers and innovation strategies typically tend to be more general in nature and concentrate more on mission-oriented or functional priorities. Priority setting by various agencies on the other hand tend to be more focused on thematic priorities but often include also other more systemic or functional priorities.

The priority setting also varies greatly depending on the nature of the priority setting processes. The priority setting can have more top-down or bottom-up approaches. It can also be more participatory by

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nature involving a wide range of stakeholders or it can be limited to a small group of experts. There can be also a various degree of formalization, target setting and evaluation procedures included in the priority setting process.

Setting Innovation policy priorities in the EU

At the EU level there has been a long time a worry about declining international competitiveness, which has partly been attributed to lack of innovation. As a result in 2000, the European Union set itself the ambitious goal to become "the most competitive and dynamic knowledge-based economy in the world" by 2010. This policy setting has become known as the Lisbon strategy (LS). Supporting innovation and especially leveraging investment in R&D became a key element of this strategy following the Barcelona European Council's objective to raise overall R&D investment to 3% of GDP by 2010. The ways and means to achieve this objective were initially defined in 2002 in the Commission's communication 'More research for Europe – Towards 3% of GDP' and led to the Action Plan 'Investing in research', adopted by the Commission in 2003. The revised Lisbon strategy was introduced in 2005 with a proposal for European Partnership for Growth and Jobs. Knowledge and Innovation was singled out by the European Council as one of the three pillars of the Partnership for Growth and Jobs. This is reflected in the Integrated Guidelines for Member States (MS) implemented by the MS according to 'National reform Programmes' released in autumn 2005.

Currently in innovation policy domain the main Community policy strategy is the "**Broad-based innovation strategy for the EU**" introduced in 2006, which points the way to accompanying industry-led and society-driven innovation with competitiveness and public policies at all levels as a key element of the renewed Lisbon strategy for growth and jobs. The strategy singles out ten priority actions in a roadmap for action at national and European levels.

The Lisbon Strategy (as well as other strategy documents) leaves implementation to a **soft form of coordination**. The implementation of LS is challenging due to the wide range of policy areas being addressed and the number of mechanisms for its implementation[38]. Most of the instruments and mechanisms are also in the domain of the Member States, which makes the implementation more complicated and requires mechanisms for vertical coordination. Various mechanisms such as the National Reform Programmes, Open Method for Coordination (OMC) for benchmarking as well as joint financial and regulatory frameworks agreed by the MS have been introduced.

Recently there have been attempts to streamline innovation policy in The EU. One of the key steps in this process was the naming of the EU's first innovation commissioner in November 2009. The next big step in the process is the new major research and innovation strategy, which is expected to be published in time the 2010 autumn summit of European leaders. The new strategy is expected to be at the top of the agenda in the meeting. For the preparation of the revised innovation policy a new subgroup of "innovation commissioners" has been formed to facilitate coordination and discussions between different policy areas. Another related high level priority setting instrument is also the ne OECD Innovation Strategy 2010, which aims to provide mutually reinforcing policies and recommendations to boost innovation performance in both general as well as country level.

EU research and innovation policies policy has a direct impact on the behaviour of research actors. The framework programmes have increased intra-European collaboration. What is important to know that that the collaboration patterns in the Framework does not only correspond to the thematic specialization patterns of individual countries but that show also convergence towards FP priorities. This is one of the ways in which the European dimension indirectly affects the national priorities in practice.

European overview

In their recent analysis of innovation policy evaluation practice in Europe Edler et al. (2009) found that evaluation has become an integral part of innovation policy especially at operational level of programmes

[38] Willem Molle: European policies for Innovation and Cohesion from loose coordination to partial integration. Paper for the annual international conference of the Regional Studies Association, University of Economics, Prague, 27th -29th May 2008

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and measures etc. It was found that as roughly 50% of the measures that are evaluated had a pre-determined budget for evaluation and two thirds are foreseen and planned in the measure design. It is also almost a rule nowadays that evaluations are carried out by external evaluators, often selected through an open tender process.

The analysis also revealed that evaluations have a limited set of consequences in terms of changes in policy. Radical consequences such as termination of programmes are rare and appear more often as a consequence of principle policy decisions. In contrast evaluations typically lead to minor re-design of measures or learning for other measures and, most often, to prolongation and extension.

It seems that in practice the broader system or policy level are much less frequent than programme or organisational evaluations. A majority of evaluation activities concentrate on various R&D and development programmes and although they assess the outcomes of measures and implementation of priorities through these mechanisms they have typically less value in evaluation the overall policy goals and if right priorities are set in the first place. However, UK is a good example of a country with a strong tradition in the use of strategic reviews of innovation policy as well as a framework for performance monitoring.

One good UK example is putting together the wide range of innovation related activities and their monitoring and assessment. In 2007, the then Department for Innovation, Universities and Skills (DIUS)[39], assumed general responsibility for all UK innovation activities. In practical terms, this meant that DIUS produces an **Annual Innovation Report** which details government departments' innovation- related activities. Given the broad view of innovation espoused by UK policymakers, it is evident that a wide range of government activities may have an impact on innovation. The Annual Innovation Report was expected to bring together the full set of governmental activities that would contribute to UK innovation overall, both in terms of supporting innovation and developing innovative practices within departments (Cunningham and Rigby, 2009).

The evaluation practice is also very well documented and guided. Guides such as the green book and the magenta book give evaluators practical guidance on how to evaluate policy measures. All evaluations have to be contracted out to external evaluators. Most evaluations are conducted at periodic intervals and are rarely ex post (this is mostly due to the fact that many instruments are long-term activities with no set end-date). What is important is that in general recommendations are acted upon, provided they meet the conditions of being realistic and economically feasible.

The use of evaluation has also had very challenges. In Austria, for example, the number of evaluations is very considerable, but at the same time criticism has been raised, that mechanisms ensuring that the results of evaluations are fed back into policy formulation and implementation are missing. This highlights the fact that establishing a sound and extensive evaluation tradition in assessing the innovation policy priorities is not enough alone but thoughts need to be also spent on the concrete **role of evaluations** for policy design and implementation.

Germany has been seen as a good example where evaluations are actually used as tools for policy learning. There are many formative evaluations, methods such as focus groups or workshops are often employed, and the **results of an evaluation are intensively discussed** within government and there seems to be evidence of policy learning within the administration. However, it seems that learning takes place in fewer cases to the evaluated measures themselves, on a more general level affecting the overall policy learning for future policy priority setting and programme design. It is important to notice that this kind of successful use of evaluations requires a particular kind of open and participative approach.

Experiences and role of technology forecast and/or foresight in EU Member States

A number of different mechanisms have been tried and used as support for priority setting in innovation policy. During the 1960s and 70s technology planning and forecasting were widely used. During the 1980s and especially 1990s more broad-based technology foresight and road mapping activities were increasingly

[39] Nowadays the Department for Business, Innovation and Skills (BIS)

used. During the recent decade priority setting has been increasingly a combination of various forms of "Strategic Policy Intelligence" including foresight, monitoring, evaluation (Polt, 2006). This has been supported to an increasing degree by various participatory consultation mechanisms involving experts and stakeholder of various kinds (Cunningham & Karakasidou, 2009).

National level experiences on foresight

At the national level various forecasting efforts have been carried out in most of the EU countries. Although it can be argued that the role of foresight and forecasting has somewhat declined as a tool for priority setting in more strategic level priority setting they typically have stronger role in the operational level where e.g. agencies prepare new R&D programmes. Especially some of the bigger EU countries such as the UK, Germany and France have a long tradition in forecasting and foresight. Following are some of the experiences form the past 10 years in some EU countries.

FutuRIS operation (France)

The FutuRIS foresight platform coordinates think-tank efforts and publishes research work on the topic Research-Innovation-Society, in order to enable informed decision-making and support the deployment of the strategies defined by the players involved. This includes, for instance, analysing the structure and workings of the French research and innovation system (SFRI), its international positioning and its likely development taking into consideration the issues already identified.

The rationale behind starting FutuRIS is related to the changes that have occurred in the political, economic, social, scientific and technological environment in France during the past fifty years. It has been agued that French Research and Innovation System (FRIS) has become too fragmented, with a lack of interactions in its different parts, and therefore it is necessary to bridge gaps between people and organisations and to encourage more common understanding between them. In this way FutuRIS has a more systemic starting point compared with more traditional approaches such as OPTI in Spain.

FutuRIS aimed to consider the FRIS (French Research and Innovation System) as a whole, with a systemic approach (governance, organisation, interactions between players with various backgrounds in all sectors and fields from research, academia, business and society).

Due to the holistic approach, there were no sectoral themes but cross-cutting ones (e.g. excellence in research, competitiveness, science and society relationships, human resources in research and innovation, the governance of the FRIS…). For most of the themes, the actors come from research institutes (and to a certain extent higher education), private companies (big ones and SMEs), government bodies (ministries and agencies) and NGOs.

The objectives of the FutuRIS programme were defined as follow:

- to bring together leading players of the public and private sectors with the aim of laying the foundations for the future of the French Research and Innovation System,
- to review and then launch the debate on the challenges the FRIS is likely to encounter in the future,
- to build a shared vision of the future of the FRIS between research, academia, business and society.

The programme was not launched or managed by the national government, because it was necessary for the scientific, economic and social actors to get more involved in building research and innovation projects and activities together. Nevertheless, public support was important in terms of legitimacy and access to information and resources.

Since 2005, the research and innovation landscape has undergone profound change, through major reforms aimed at providing better-allocated and more effective governance and stimulating initiatives on the part of public and private players. The current focus of FutuRIS is therefore linked with how various stakeholders respond to these reforms and rearrange themselves to take on new responsibilities (alliances, etc.). The foresight process is seen as a tool to identify a wide variety of potential pathways and prospects.

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FinnSight (Finland)

At the beginning of 2005 the Academy of Finland, an expert organisation in basic long-term research funding, joined forces with Tekes, the Finnish Funding Agency for Technology and Innovation, to launch a foresight project under the heading of FinnSight 2015. Its aim has been to identify focus areas of competence for the future in the fields of science technology, society and business and industry, and to establish priorities among them. The project was instrumental in helping to define Finland's Strategic Centres of Excellence in Science, Technology and Innovation (established 2007-2009).

The foresighting work was done in panels where leading research and industry experts contributed their multidisciplinary knowledge and insights on the subjects concerned. In addition, the 120 experts who were involved in the ten panels also communicated the knowledge of their respective networks.

The chairs and members of the ten panels were jointly selected by the Academy and Tekes. They were expected to have strong expertise in all aspects of their own field, a broad understanding of society in general and a willingness to share their expertise.

Each of the ten panels produced their own extensive reports, which are compiled in Finnish in a separate FinnSight 2015 publication.

The themes for FinnSight 2015 were selected with the support of expert groups that are most directly relevant and important to the Academy's and Tekes' operations.

Among the dozens of themes put forward by the Academy and Tekes, those were eventually included that met the relevant criteria of national significance, level and extent of competence as well as potential socio-economic impacts. Half of the panellists were appointed from among candidates submitted by the Academy and half among those submitted by Tekes.

The results of foresight are used by the two primary Finnish funding agencies to focus their activities in the future. The Academy makes use of primarily in strengthening and focusing basic research, for Tekes its main use is in strategic and policy decision-making. In addition to Finnsight, Tekes has also launched other foresight exercises on a regular basis.

Problems of priority setting

In practice it is very difficult to make sure that right priorities are selected for innovation and technological development. However, there are several ways to try to address this difficulty.

Firstly the fast pace of technological and social change has shown that one should avoid making too narrow definition of thematic priorities as these may lead to dead-ends. At the same too broad priorities do not direct the innovation policy sufficiently. One way to avoid this challenge is to concentrate more on functional priorities and framework conditions and let the entrepreneurial and market mechanisms to make the selection. Naturally this strategy needs different kinds of tools as the strong thematic priority setting. These can include e.g. competitive R&D funding based on excellence rather than thematic selection as well as various support mechanisms for private sector R&D (especially SMEs).

Another mechanism is to use programmes and projects as implementation tools instead of permanent structures and existing organisations. This allows quick take up of new activities but also quick closing down of the activity if it is shown that the specific priority area was not the right one. Related to this approach is the need to establish a sound monitoring and evaluation mechanism to assess the need and functionality of each instrument and mechanism that is used to implement priorities. This approach does not prevent wrong choice but enables quick changes in the policy making.

Since innovation policy has many horizontal elements and therefore covers several sectors, in many cases it has been effective to establish good governance processes to optimize the priority setting for each actor. In practice this would mean that more general and systemic priorities are set at the upper level of policy making. These general priorities act as a general framework for the ministry level. The more narrow thematic priorities would be then set at the operational level (agencies, programmes). This strength of this kind of approach is that the more detailed priorities are set at the level that has more expertise from actual technologies or development mechanisms. At the same time this would help strategic level of policy making to concentrate key strategic issues and avoid the complexity at the operational level. In this

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approach it is important that the advisory and coordinating bodies have real tasks in priority setting and real means to pass on these priorities to the operational level. At the same time one needs to avoid establishing too strong agencies, which might reduce the ability to set real strategic priorities at the upper level.

Priority setting can be carried out with various different methods such as closed expert group planning (e.g. Research councils), open stakeholder consultation processes and various forms of strategic planning. The typical method used in most of the countries nowadays is a participative strategy process consisting of high level experts, government officials as well as key stakeholder groups such as private sector representatives as well as higher education and public research institutes.

It is therefore very important that the implementation process is governed by an organisation or body that has good connections and with the main implementing organisations (ministries, agencies) power to influence their behaviours. The power does not have to be formal authority but should be either high-level political support and/or resources that can be used to steer the implementation process. Since priority setting is carried out in many levels and organisations it is of utmost importance to be able have clear reference to overall innovation policy strategy at every level.

Because the need for both horizontal coordination (between various sectors) and vertical co-ordination (between various levels of operation) is high and not all activities related to implementation can be governed through formal public management routines it is important to create wide stakeholder support for the process. This typically requires both consultations of key stakeholder groups to the strategy but getting their commitment to participate in the implementation process. As formal decision making does not work especially with the private actors it is important to get their commitment through agreements but also through various incentives. Public-private partnerships e.g. in the operational programmes implementing the strategy are typically a concrete way to get everybody committed. In other words, the implementation is as much about management of networks as public management.

- Setting up milestones is a good way for monitoring and evaluating progress and to steer the implementation of the strategic documents. However, milestones and targets are not enough (cf. EU 3% target) but also the monitoring of the actual processes is important so that the progress can be monitored.
- Explicit strategic commitment at the Government level with a national mission statement and this commitment should be recognised in all overall strategy documents (not just Science, Technology and Innovation (STI) policy documents)
- White papers and/or strategic documents, which have real (political) power to govern the activities of various organisations and instruments (e.g. linked with budget allocation and concrete performance targets etc.)
- A dedicated overseeing and co-ordinating body (council, committee, key ministry, Office for STI etc.) with real political mandate and actual formal or informal coordinating powers
- A joint framework for horizontal co-ordination to
- Committed resources for implementation both in the general state budget as well as at the operational level
- Participation and extensive consultative processes with real engagement and real possibilities of stakeholder participation.

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Experience and problems of setting and implementation of priorities for innovation and technology development of Ukraine

Ukraine has some experience in setting priorities for science and technology, innovation and technology development. The first of the Ukrainian laws which regulate S&T and innovation spheres, the law "On the fundamentals of the state policy in the science and technology sphere" (1991) set forth that "the government supports science development as a key source of economic growth and inherent part of national culture and education. It creates necessary prerequisites for the implementation of intellectual potential of Ukrainian citizens in science and technology spheres; ensures application of Ukrainian and world scientific achievements for solving social, economic, cultural and other problems". The article 3 of this law envisages that the top priority government support of research works, which ensure settling the most important problems of Ukraine's development through *setting science and technology priorities* and the concentration of resources for their implementation, is among the basic principles of the government science and technology policy. Article 13 lays out the detailed procedure of setting and implementation of state priorities for science and technology development. The basis for setting such priorities should be a complex forecast of social, economic, science and technology development of Ukraine. A detailed analysis of various development scenarios is mandatory. The Ukrainian parliament approves the priorities and the Government implements them through the complex of state science and technology programs.

However, these priorities were approved without any prior analytical or forecasting analytical research. The State Committee on Science and Technology proposed them to the Cabinet of Ministers, and the Government submitted the priorities to the parliament for approving.

Most of the projects included in the state science and technical programs were really substantial and promising. However, it should be noted that there were certain overlapping of tasks in the list of the priority areas aimed at defining and priority development of the most important areas of research, in an attempt to save all competent scientific schools and support as a wide spectre of promising science projects.

It should be admitted that too widely set priorities became one of the reasons why science and technology programs, created for their implementation, as a rule, were coordinative programs, not targeted programs. Such type of programs has their own uses. They are an effective tool for improvement of interagency coordination of tasks close by their nature. Such programs help to achieve a higher level of commitment in their structure. In some cases, financial resources allocated for the implementation of such programs, although very lacking, became "crystallisation centres", attracting resources and researchers from various sources. This allowed achieving significant results. For example, unique batteries for armoured vehicles, highly effective technologies of welding high-precision thin-walled supporting structures for airbus aircrafts, introscopes for the customs control of cargo, and many other unique and necessary technologies were developed using this approach.

There are many cases of successful implementation of projects within the framework of state science and technology programs. However, given the problems of further development of scientific potential and the problems of searching for the most effective ways to utilize its potential for shifting Ukrainian economy to innovation economy, it is more important to analyse if the task to establish a truly effective mechanism of implementation of the priorities set by the state was eventually achieved, and if this mechanism managed to become an inherent part of the system of state science and technology policy implementation. Starting from 2007, the Ministry of Finance even stopped allocating funds for state science and technology programs, justifying it by the fact that the priorities set in 2001 for five years expired, and no new priorities had been set. In another country, the government would likely continue to use old priorities until there would be political opportunities for defining them, but this was not the case in Ukraine. De facto, the general trend

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of diminishing the value of priorities' implementation mechanism, which emerged in 1995, eventually led to the complete halt of the process in 2007.

During this period, several Ukrainian presidents, governments and parliament convocations changed in Ukraine. The Parliament repeatedly announced the course for the development of innovation economy, adopted advanced laws, the National Security Council adopted progressive resolutions. However, the funding for the state science and technology programs, as well as the part of science budget allocated for state science and technical continued to shrink.

It is an evident that neither science in general nor the priorities of science and technology development, set by the Parliament, were real priorities for numerous Ukrainian governments. There was no significant policy of prioritisation of science and technology development since Ukraine became independent in 1991. None of Ukrainian governments took the priorities of science and technology development set by law as the key priority of their work. At the best of times, following the priorities was as an internal task of the Science and Technology Ministry, later it became the side task of the Science and Education Ministry of Ukraine.

For example, in 2004, the funding of one science and technology project totalled over 55000 Ukrainian grivnas (UAH) , the financing of a "priority" project totalled 20000 UAHs, according to expert calculations.

It should be noted that the new priority appeared, which appeared in 2001, "blue-sky research in key areas of natural sciences, social sciences and humanitarian sciences", changed almost nothing to increase the support of fundamental science. This priority did not fit into the existing mechanisms of priorities' implementation. There were no S&T programs within the framework of this priority and the State Blue-sky Research Foundation, which in principle could do something in this direction, had been underfunded for several years. Practically, including this direction as a priority of science and technology development was a noncommittal, symbolic sign of respect for the National Academy of Sciences of Ukraine.

By 2002, the priorities of the S&T development encompassed innovation activity as well. However, the Ukrainian law "On innovation activity" set forth the definition of specific priority directions of innovation activity in Ukraine. By that time, numerous research were carried out on the policy of the state priorities of science and technology development, from studying the specifics of the term "priority" applied to this sphere, to the definition of reasons why this sphere is ineffective in Ukraine. As a result, a methodology of hierarchical classification of the priorities, with the mechanism of implementation specific to each level of hierarchy, was developed. Such methodology was partially used in preparation of the draft law" On the priorities of innovation activity in Ukraine" .

This law envisages defining strategic and short-term priorities of innovation activity. Strategic priorities are long term (not less then 10 years) key focus areas of innovation activity to ensure social and economic development, which were developed on the basis of science and forecasting analysis of the global trends of social, economic, and science and technology development, taking in into account the Ukrainian innovation potential. Short –term priorities set the directions of innovative reconstruction of industrial, agricultural and service sectors for introducing science heavy products and services, competitive in local and global markets, to be implemented in 3-5 years. The law also envisages setting med-term priorities of innovation activity on the country, branch and regional levels.

The Ukrainian Parliament set the following strategic priority areas of innovation activity in Ukraine for 2003-2013:

- Modernisation of power plants; new and renewable sources of energy, new resource- saving technologies;
- Machine-building and instrument-making as a basis for the high-tech renovation of all branches of industry; the development of high-quality metallurgy;
- nanotechnologies, microelectronics, information technologies, telecommunications;
- improvement of chemical technologies, new materials, the development of biotechnologies;

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- The technological development of agriculture and agriculture processing industry;
- transportation systems: construction and reconstruction;
- health protection and environmental protection
- the development of innovation culture in the society

In 2007, another law (which, however, violated the Ukrainian constitution, as was defined by the Constitutional Court) added another item into this list:

- Development of means of the surface, air and sea transportation and corresponding equipment and components. The development and implementation of new technologies for their assembly (manufacturing)

Article 8 of the law set mid-term priorities per each of the abovementioned directions. An expert of the National Academy of Sciences of Ukraine recommended charging the Ukrainian Cabinet of Ministers with the setting and implementation of priorities (this would allow to create policy of priorities more flexible and dynamic). However, these recommendations were rejected. The consequences of such approach can be seen already: the mid-term priorities expired in 2007, and the Ukrainian Parliament failed to consider and approve them for another 5-year term due to political collisions.

However, the main flaw of the law was a non-detailed mechanism of implementation of priority areas in all levels. The mechanisms at all levels are almost similar and obliged no one because of the way they were formulated. The priorities of S&T development specified the general structure of state science and technology programs, the implementation of these programs is defined in the law, which allocates budget funding. In contrast to this, innovation priorities were formulated only as recommendations for implementation in practice. In reality, the authorities and other subjects of innovation activity neglected these recommendations.

Given such approach, the methodology of setting the hierarchy of priorities loses its practical sense, because a clear definition of the scale of government support and responsibility for priorities implementation at each level of priority hierarchy is the key idea of the methodology. As a result, the draft law "On the priorities of science and technology development, prepared by the Science and Education Ministry of Ukraine and submitted to the Parliament in 2007, became another example of too formal an unjustified approach to the setting of priorities. The formulations of the priority areas in this document are diluted:

1. World-class blue-sky research;
2. Applied research, science and technology projects, which best of all can facilitate the development of Ukrainian high-tech industry and services for maintaining national security and competitive economy;
3. Information, material and technical assistance to research, science and technical projects.

In other words, instead of setting specific priority directions, the draft law once again set forth the state obligations to support science, declared in the Ukrainian Constitution (article 54 paragraph 3) and the law "On science and science and technical activity"(articles 31 and 34). Such "priorities" do not change anything and do not oblige anybody to do anything. Because of that, in April 2007, the parliamentary committee for science and education stated that there was no sense in approving the proposed list of priorities for any other reason then to give a "bureaucratic satisfaction" to its authors. Despite the objections, the Parliament passed this version of the priorities on condition that a special commission would be created to improve the draft law. However, the commission never gathered for a single meeting because of political problems. The draft law with the same priorities, only with slightly changed formulations, was heard in the parliament again in 2009. In 2010, the web site of the Ukrainian Parliament published comments to this draft law by the Main Science and Expert Administration of the Parliament. The key comment coincides with the opinion of the National Academy of Sciences experts. The Main Science and Expert administration of the Parliament said that the draft law was aimed at stripping the Ukrainian parliament of some important powers envisaged by the Constitution.

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However, setting the thematic priorities of S&T development on the highest level instead of just general declarative priorities, as seen in this case, has become a world trend.

As was mentioned above, some Ukrainian laws emphasise that the priority direction of S&T and innovation activity should be set based on forecasting and analytical research, although the priorities were adopted without prior forecasts. An attempt to step away from this practice was made during the implementation of the State program of forecasting S&T and information technologies development for 2004- 2006. It was a typical foresight research. Its authors tried to unite old tradition and vast experience in science and technology forecasting accumulated by Kyiv science school, the capabilities of well-known Delphi method of handling experts and the world experience in foresight research in the last decades.

Implementation of this program was the de facto first real attempt in the independent Ukraine to set S&T and innovation priorities based on forecasting and analytical research, according to the Ukrainian legislation. The Science and Technical Committee of the Program defined 15 thematic areas. A research supervisor and a leading research institute were appointed for each of the areas. (The list of main research institutions comprised the National Academy of Sciences, the Ukrainian Academy of Agricultural Sciences, the Academy of Medical Sciences, and three other universities). Over 700 experts (scientists and industry specialists) were involved in the implementation of this program.

The joint order of the Education and Science Minister and the president of the National Academy of Sciences established the supervising bodies of Program's implementation, the Science and Technology Council and the Secretariat of the Program, as well as the membership of these bodies. Taking into account experience of modern foresight research most of which use the various modification of Delphi method, the Program's task was to attract as many experts and use the same selection criteria, which proved themselves in modern forecasting and analytical programs. Another task of the program was to take into account trends which started to become dominating, for example attracting many high-quality specialists in a certain sector and adjacent sectors, and even representatives of the public to the Program's implementation.

Despite very unstable and partial funding, the research was completed in time. It proved that Ukrainian science was not dead, in spite of the substantial loss of its potential, and allowed to identify the spheres where Ukrainian scientists remained on par with the world research, and to identify projects which are capable of entering the world market. The main results of the programme were published at the web site. Based on the results, proposals on the abovementioned system of S&T and innovation priorities and establishing the system of constant forecasting were made.

The new program of forecasting research, the "State programs of forecasting Ukrainian science and technology development for 2008-2012" was adopted in September 2007[40] .Setting priorities of innovation development is not a key task of this program. It was implemented by the Ukrainian Institute of S&T and economic information of the Science and Education Ministry technical. The angle of research was narrowed significantly: in 2008, it was only in the area of "energy and energy effectiveness", in 2009 in the area of "Nanotechnologies and nano-materials". Instead of foresight research, the emphasis was shifted to marketing research.

As a result of the work, 14 critical energy saving technology projects were shortlisted. The list of the project was published on the web sites of the Science and Education Ministry, and Ukrainian Institute for Scientific, Technical and Economic Information

At the beginning of 2010, the program was halted because of economic reasons and restructuring of government bodies.

It is evident that the abovementioned mechanism of setting and implementation of priorities does not completely meet the need of the country and requires improvement.

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[40] Unfortunately, this Programme was terminated by the Decision N704 of the Cabinet of Ministries of Ukraine on June 22, 2011

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Conclusions

Looking at the activities and experiences related to innovation policy priority setting in Ukraine and other countries some basic conclusions can be made. Looking at the development in Ukraine it is obvious that a lot of effort has been done to setting priorities in activities for science, technology and innovation. However, some differences to other countries can be observed. The first is related to the process of priority setting itself. In several European countries a typical process of strategic level priority setting typically involves a wide set of actors from various stakeholders participating in strategy or foresight processes. These actors typically involve experts from academia, industry and development organizations. Another issue is the level of priority setting. In Ukraine a lot of priority setting goes through parliamentary processes as in many other countries many priorities are increasingly set by various agencies responsible for funding R&D efforts. The advantage of the latter is often a better implementation of priorities.

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Another difference seems to be in the implementation mechanisms of the key STI policy key priorities. It seems that a lot of effort is put into legislation and parliament adoption of priorities but less is done on the instruments and implementation processes as well as resources. In many other countries the process of implementation has been very effectively organized in the way that the priorities set by the responsible bodies (councils, agencies, committees etc.) are effectively implemented by a responsible agency or council and that this council and funding is also allocated to these organizations for implementing the priorities. Moreover, established mechanisms for evaluating the implementation mechanisms (e.g. R&D programmes) have been established. This ensures that the priorities are properly implemented but also that the quality of implementation is adequate.

It also seems that in Ukraine the main emphasis in STI policy priority setting has been thematic priorities (physical and chemical biology, agricultural technologies) or in mission based priorities (e.g. energy security and renovation of machine building) but less discussion has been on functional priorities although the functional topics have also been under discussion (e.g. R&D funding, tax incentives etc.). In several European countries the emphasis of innovation policy priorities has shifted more towards functional priorities, although thematic and mission based priorities are also used.

When looking at the instruments and tools used for priority setting it can be concluded that during the past 20 years the instruments that have been used in Ukraine have become quite developed and can be in many cases compared to those in other European countries especially in foresight exercises. Based on the data available from Ukraine there is less information available on the instruments and mechanisms used for evaluation and monitoring of activities.

Promotion of innovation culture to general public has been on the agenda of many EU projects. On the basis of the parliamentary hearings of July 2009, this issue is also on the agenda of the Ukrainian innovation policy. The measures undertaken in the context of the European Year of Creativity and Innovation 2009 provide a great deal of examples of events and other communication actions addressing general public. It is recognised that the use of media like TV and games helps to raise public awareness of innovation, especially in case of lower income groups that are hard to reach by conventional promotion measures. This finding should also be kept in mind in the Ukrainian context if promotion means are called for reaching the widest audience possible.

Concerning education and training, science and engineering qualifications are of great importance in the EU policy agenda. Nevertheless, entrepreneurial skills, innovation management and vocational skills and competences have gained prominence as policy issues during recent years. Ukraine could make use of these findings and reflect on the conditions to diversify educational provision in the Ukrainian context. The key competences of lifelong learning that are required in knowledge-based society are central part of modernisation of educational systems in the EU context. It is likely that advancement of these competences, including communication skills, mathematical competence and skills in the use of ICT, is important for innovation and competitiveness both in EU and Ukraine.

Promotion of innovation culture has to be prioritized in the national innovation policy of Ukraine. A key lesson learned from the European experience is that advancement of innovation culture is time-consuming and the pace of change varies between different domains of society. For instance, promotion of innovation culture to general public has resulted in considerable results in terms of the number of audiences reached both at national and EU level. At the same time, however, advancement of innovation culture in governmental organisations has yielded few good practices or tangible results in spite of the long-term efforts made by EU and the EU Member States.

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This implies that implementation of a general scheme for promotion of innovation culture is not a fruitful starting point from the point of view of policy development. Policy efforts should be differentiated in accordance with the different requirements and timescales of the domains addressed. In case of scarcity of resources, it is possible to rely on light policy measures, such as monitoring and disseminating good practices, or concentrate the resources on the domains deemed strategically important.

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Chapter 7

Networking innovation and business support infrastructure (Gudrun Rumpf, Nina Isakova, Igor Yegorov)

Introduction to innovation and business support infrastructure

Economic conditions have changed considerably in the world's industrialized nations in the last decades. The combination of technologies and economies of scope has emerged as an important source of job creation and growth.

Support policies increasingly depend on the capacity of innovation and business support infrastructure to contribute to the development of entrepreneurship, to participate in cluster initiatives, to generate spillover effects, and more generally to enhance the regional culture of innovation. For policy makers, innovation and business support infrastructure is not to be developed for their own sake but must contribute to the building of learning regions and knowledge-based territorial economies. The bursting of the high-technology bubble at the end of the 1990s made clear the need to respond to local and regional demand rather than systematically embarking on high-technology research.

The issue is to transform innovation and business support infrastructure so that it benefits the countries' economy sustainably. This report provides decision makers with a number of tools to help them identify suitable international networks and connect Ukrainian counterparts to them. Regarding its more practical aspects, the report presents a number of checklists which can be used when assessing feasibility to adhere to international networks.

Introduction to Networks

Networks are characterized by geographically dispersed communities of practice with common interests, shared needs, and participants with a similar identity. The sum of the parts benefits the whole network. Network members have functions within the group, and the flow of communication between communities of peers contributes to synergy and achieving best practice.

Innovation is a function of changes in technology, organization, and social practice, and the pace of knowledge exchange and uptake of new ideas and technologies are extremely important. Because networks facilitate speedy diffusion, they are helpful to innovation. Innovation networks are communities of technological practices: they support organizational learning, and they allow for increased specialization and the combination of resources. Such networks act as "innovation thought collectives" and can facilitate the paradigm shifts which are important for innovation uptake and disruptive technologies.

Networks usually organize information exchange mechanisms: meetings, conferences, training, access to experts, websites, databases, and newsletters. They stimulate activities such as technology transfer, and access to clients or finance across geographic boundaries. They establish benchmarks of best practice, against which members can rate their performance against their local or international peers. They support professionalization of organizations and individuals within their sphere of interest. The networks themselves become learning organizations which promulgate good practice.

Networks vary greatly in scope: geographic reach, thematic focus, size, and organization. They may include: an industrial cluster with a shared technology or market; a group of innovation actors from one region or country; and an international network of science parks; or special service providers. Networks relevant to innovation and business support infrastructure usually have specialized interests: a technology, such optics or bio-technology, or a special interest, such as sources of finance, for example the European Private Equity and Venture Capital Association (EVCA).

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Establishing a new network involves formalizing relationships and developing financial models to pay for services, establishment of management structures, and formalizing procedures for service delivery. Sometimes networks are formed with public support, and members join the network by responding to calls for proposals, and are evaluated by the organizing public authority. Joining a network usually involves paying a membership fee and satisfying specific selection criteria.

Several checklists, linked to establishing and joining networks, are provided below. It should be noted that innovation and technology actors participate in networks in different ways: the level of participation is determined by the organization's strategic intent and the resources it can contribute as a network member. This includes the important resource of human participation.

Origin of networks

Networks emerge in different ways. They may arise organically or from a top-down policy stimulus. Organically emerging networks are those that evolve naturally from a perceived common need among a group of actors. They may be companies in industry clusters coming together to agree standards, or organizations in an innovation park coming together to identify common service needs. A network that emerges from a top-down policy initiative is one for which a perceived "gap" exists. Policy-setting organizations allocate resources to provide support, through a network, to fill this gap. It is important to know how networks emerge, since their origin has a fundamental impact on their ownership and governance, and on how they function and grow.

When networks form spontaneously it is usually around a common interest. When companies share a common location, or interact in a supply chain, they may quickly co-operate on shared issues, and networks emerge rapidly. Inside innovation and business support infrastructure, companies often come together and form local networks to promote their interests. Industry clusters frequently emerge when large corporations are surrounded by subcontractors and/or component suppliers. Clusters can go beyond regional and national boundaries. International industries, which require large investments and high-technology rigor, give rise to networks of clusters across borders. International cooperation among networks of clusters becomes increasingly important in a global economy, especially when industries compete for limited resources, including access to expert knowledge. Supra-national clusters are found, for example, in the aviation, biotechnology, optics and pharmaceutical sectors. One example of public support for international clusters is the project, Clusters Linked over Europe (CLOE), a European network of excellence for cluster management, matching and promotion, supported by EU programs. Networks also form to support specialized functions: for example patent marketing and technology transfer; turning innovative entrepreneurial projects into successful businesses, coordination with research organizations; or support on innovation finance. The possibilities are linked to needs of innovation and technology actors and their clients.

Policy initiatives support the formation of networks. In the European Union (EU), SMEs represent 99% of all companies in the EU. They are the biggest sector of the EU economy, with 23 million enterprises employing around 75 million people responsible for the creation of one in every two new jobs. SME produce considerably more than half the EU's GDP. However SMEs find it very difficult to operate outside their local market, although their participation in a European marketplace would be beneficial for global trade. Therefore, many public initiatives organize specialized networks to support SMEs' operations beyond national boundaries. For example, public initiatives have formed networks: to support technology transfer between SMEs; to introduce venture financiers to small high-technology companies; and to help

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high-level researchers move between universities and specialized high-technology companies. Sometimes, public-private interests cooperate to develop groups of incubators or science parks in a country, which lead to national networks. The focus here is often on technology-led urban development, and on synergy between universities and industry.

Networks of innovation and technology actors operate in parallel in some countries: some are formed on a purely commercial basis, and some with public funding and public objectives. These networks can co-exist and offer different types of services to their members. The overall intention of all these networks is similar: to come together to share knowledge and resources and to improve outcomes. The manner in which networks develop is different: outcomes prove that there is more than one path to success for network-based development.[41]

Networks are often organized in tiers: first as small consortia organized on a regional or national basis, and then into super-networks at international level. In many countries, innovation and technology actors form national or specialized networks, such as the United Kingdom's Science Park Association (UKSPA). Representatives from these national bodies also meet with those from other countries in international networks. Finally, networks coordinate internationally in organizations such as the International Association of Science Parks (IASP) and the World Technopolis Association (WTA).

Connection between innovation and business support infrastructure and networks

Innovation and business support infrastructure forms, or links into, networks to: formalize relationships that bring synergy and benefits to stakeholders; benefit from connectivity and synergy across the network; enhance services provided to clients of innovation and technology actors; develop network members through professionalizing services; and undertake benchmarking between network members. Each of these aspects of network membership is examined below.

Networks tend to emerge from shared interests and the need for a common exchange platform. The shared interest may be a shared goal, proximity, a common client, or a single technology. Shared interests may include, for example, cooperation on the design of components for a common client or industry. Networks can grow organically, formed by a group of actors with shared interests, such as clusters of companies or a group of business support organizations. At some point, the decision is made to formalize the structure. Networks serving this type of group are characterized by an interest in industry standards, a common technology, or streamlining delivery cycles. These clusters may be small, and deal with local interests: agro-food technology or common tourism campaigns, for example. Clusters can evolve into worldwide industry supply chains: aviation, optics, petro-chemicals, pharmaceuticals, telecommunications, etc. The differences in network needs are scaled to the size and scope of the cluster.

The creation of new networks can also be stimulated by top-down actions. Regional agencies and commercial innovation-support organizations can provide budgets or infrastructure to bring companies, or other relevant organizations, together. Urban development programs frequently bring industries together in one geographic location to profit from common infrastructure and to share state-of-the-art resources, including access to university knowledge. This can encourage the emergence of innovation and technology actors, which in turn bring together innovation actors and support them in their common objectives. Networks that emerge in this situation may address: local infrastructure issues; national and international

[41] See on this point the conclusions of the workshop Innovative Metropolitan Territories: Technology Parks and Competitiveness Clusters organized in June 2007, in Tunis, Tunisia, by the **World Bank, Marseille City Council and GTZ,** in partnership with the Urban Community of Marseille-Provence Metropole, Marseille Innovation and the Marseille-Provence Chamber of Commerce and Industry, and under the patronage of the Tunisian Ministry for Research, with the support of Tunis City Council.

topics such as legislation on taxation or trade tariffs; or support for clients of the innovation and technology actor. Networks that have emerged from this environment include, for example, specialized networks of science parks and incubation centres, and networks for assisting high-technology companies to access finance.

More recently, governments have undertaken innovation policy development, including foresight analysis, and the selection of specialized technologies. The intention is to pick fast-growth, high-technology sectors, to leap-frog industry cycles, and to have clean industries that provide local employment and support modern economies. Planning on innovation brings together high-level actors from research, education, industry, and many layers of government. The outcome may be islands of high-technology best-practice that peg themselves to international standards. These high-technology nodes must be linked to their international counterparts. In this case, networks may emerge from international research teams and universities, and public programs that support research. These high-level initiatives have given rise to specialized networks and exchange platforms, such as international technology platforms, or integrated industrial projects.

All networks, regardless of their size or focus, need some formalized agreement and structures and common exchange platforms (Internet forums, etc.) to reduce the costs of knowledge exchange. Some of the tools a network will need to manage its internal processes and services to clients are mentioned in the attached checklist. Developing new tools and platforms is not a trivial investment. How tools and platforms evolve, and are paid for, is linked to how the network emerged.

Networks emerging organically from industry clusters commonly have membership subscriptions. Local initiatives that bring industry together in one location, or a common network, may involve paying a rent or a membership fee, but may benefit from local government support. Top-down initiatives are commonly supported during both the inception and development phases. Financial support may take the form of paying, fully or partially, for research, network meetings, and a central secretariat. Over time, these initiatives may be expected to generate sufficient revenues to allow public sector support to be discontinued. Sometimes networks are not intended to be permanent and are discontinued when an initiative has reached its logical conclusion.

In addition, a number of networks address special innovation issues. For example, the struggle to grow experienced by small companies is largely dependent on access to finance. Two specialized networks in Europe support the innovation sector with mechanisms to improve access to finance: the European Business Angels Network (EBAN) and the European Venture Capital Association (EVCA).

Some networks also directly serve companies and individuals as well as innovation and technology actors. The European Association of Research Managers and Administrators (EARMA) and the ProTon Europe initiative both seek to support innovation management professionals through training, organized employment exchanges, and professionalization of individuals and organizations working to support innovation. They publish guidelines and training manuals for their members. Specialized networks offer services both to innovation and business support infrastructure and to their end-users. For example, the services may be the identification of technology transfer opportunities. Services may be targeted at SMEs as in the case of the INSME network. Network services are as varied as the clients of innovation and technology actors.

Given that so many networks serve innovation and technology actors, the issue is often how to identify which networks to join, and how to select the appropriate networks, given resource limitations, so as to

optimize the exchange. Getting the best results from network membership depends on the network processes or exchange tools, and also on who acts as an interlocutor to the network. Exchanges with the network must involve a sufficiently high-level representative from the innovation and technology actors to allow for strategic exchanges and high-level decision making. Moreover, the interface between the network and the innovation and business support infrastructure must be sufficiently active so as to bring decisions close to local actors and to create dynamic activities. Open exchange and knowledge sharing is the key to success.

Funding and Governing Networks

When networks formalize their existence they must chose a legal form (or legal personality). A legal personality is tied to an address, and therefore is governed by a legal framework. The type of legal personality adopted is commonly determined by the geographic base of the network, the intended scope of its activities, its stance regarding risk, and its intention regarding profit taking and taxation. Common types of legal personalities for networks in the European Union include: limited companies, charities, foundations, European Economic Interest Groups (EEIGs), and consortia or projects funded by public organizations. In some countries, public sector support networks are established under special, non-profit-making government charters. When EU public authorities seek to help establish new networks, they may publish calls for proposals or calls for tenders. This process is often governed by public procurement legislation.

It is quite common for networks to adopt a non-profit-making legal personality. The network can make profits on individual activities, such as training or annual meetings, but the overall objective of the network owners is not to tip profits out of the network but to reinvest any profit in network operations and development.

Having determined the appropriate legal personality, networks must choose the internal organization of their governance and control systems. Traditionally networks establish governing boards, executive boards, and/or secretariat services. In addition, they may have external expert advisory bodies. Board membership is determined by the legal personality and statutes, or charter, of the network. It is common for board members in a network to change over time and to reflect the distribution of stakeholders within the network. For publicly funded networks, the central secretariat is commonly fully funded by the interested public actors. Financial control is commonly ensured through mechanisms including a clear division between the governing and executive boards, financial audits, publication of financial reports, and rules on incurring costs.

The scope of a network's activities determines the costs it will incur. Network costs may include: IT tools (including an exchange platform, a website, a database); meetings (including training and annual conferences); the development of the network's common agreements or standards; publications (including promotional brochures and benchmarking reports); network administration (including a central secretariat). Networks with a private legal personality generally cover their costs though membership or subscription fees. Within networks that emerge from a public-sector call, members' integration in the network is partially or fully subsidized. It is possible to combine different funding mechanisms; for example, members whose network participation is paid for through subscriptions or public support receive core services free, but may be required to pay to participate in special services or events, including training or annual conferences.

The governance and funding of networks is rarely static. In fact, networks lend themselves to changing structures. For example, the European Commission (EC) established two networks: the Innovation Relay

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Centre (IRC) Network, and the European Information Centres (EIC), both of which were organized on a regional basis though national and regional nodes. These networks had separate central secretariat services following calls for tenders. The secretariats were made up of private organizations organized in consortia. At some times, the secretariats were responsible for members' contracts and at other times for network members' performance review and support, but not contracts. In 2008, the two networks were combined into a single network called the Enterprise Europe Network (EEN), and its governance was assigned to the Executive Agency for Competitiveness and Innovation (EACI). The network is open to non-EU members. Partial funding of members by the EC is possible, based on their location, if the interested country has a cooperation agreement with the EU.

Examples of networks of innovation and business support infrastructure actors

Innovation and business support infrastructure has formed a variety of networks which are organized regionally, nationally, and internationally. In addition, innovation and technology actors group themselves into networks that offer special support. Technology transfer, business services or incubator support, industry clusters, and innovation finance are just some examples.

National science park associations form networks. For instance, the mission of the United Kingdom Science Park Association (UKSPA) is to be the authoritative body on the planning, development and the creation of science parks that facilitate the development and management of innovative, high-growth, knowledge-based organizations. However, membership of UKSPA is not restricted to UK-based organizations. UKSPA members are involved in the following networks: EBAN, EVCA, and IRC, and the International Association of Science and Technology Parks.

In many cases, science parks are involved in more than one network. AREA is a predominately public initiative in Italy which brings together research and public organizations and was founded in 1978 as Italy's national science park coordinator. AREA is a multi-sector science and technology park that carries out research, development, and innovation activities aimed at achieving excellence. It is a reference in Italy for technology transfer. AREA is a member of APRE, an Italian network that promotes the creation of partnerships enabling research bodies and regional companies to take advantage of European research programs. To support technology transfer, AREA joined the IRC Network, relabeled EEN, by responding to an EC call for proposals. To provide services to new entrepreneurs, it joined EBN European BIC network. To support exchanges of highly qualified researchers, AREA joined ERA-MORE, the European Network of Mobility Centers. AREA is finally a member of HiCo, Hi-tech Integrated Cooperation, and a technical and economic development network in the border regions of Friuli, Venezia, Giulia and Slovenia.

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Institutions and public programs

United Nations Industrial Development Organization (UNIDO)

http://www.unido.org/

World Bank Private Sector Development Program (PSDP)

http://www.worldbank.org

European Commission, DG Enterprise (EC DG ENT)

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http://ec.europa.eu/enterprise/index_en.htm

Seventh Framework Programme for Research and Technological Development (FP7)

http://cordis.europa.eu/fp7/home_en.html

Competitiveness and Innovation Framework Programme (CIP)

http://ec.europa.eu/cip/

Innovation portals

European Association of Research Managers, & Administrators (EARMA)

http://www.earma.org/

European Business and Innovation Centre (BIC) Network (EBN)

http://www.ebn.be/

Enterprise Europe Network (EEN)

http://www.enterprise-europe-network.ec.europa.eu/index_en.htm

European Business Angel Network (BUSANET)

http://www.eban.org/

European Private Equity and Venture Capital Association (EVCA)

http://www.evca.com

International Association of Science Parks (IASP)

http://www.iasp.ws/publico/intro.jsp

International Network for Small and Medium Sized Enterprises (INSME)

http://www.insme.org/page.asp

World Technopolis Association (WTA)

http://www.wtanet.org/

Networking innovation and business support infrastructure in Ukraine

Capitalizing on desk work and interviews with Team Leaders and Experts of the three parallel innovation projects (Inno Enterprise, Inno Finance, and Joint Support office for enhancing Ukraine's integration in EU research area) in Ukraine, the following overview of Ukrainian innovation and business support infrastructure is given.

Table 7.1

The innovation and business support infrastructure in Ukraine

Innovative infrastructure components	**Quantity**
Techno parks	16

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Innovation business incubators	24
Innovation centres	15
Centres of IP commercialization	14
Innovation and TT Centres	4
Centres of science, engineering and economic information	14
Science educational centres	3
Education-research-production centres	4
Investment (innovation) venture fund	1
Non-bank finance and credit organizations	15
Research implementation enterprises	21
Consultancy centres	2
Innovation research centres	4
Total	147

Source: Ministry of Education and Science during innovation forum 2.10.2009

To many, the figures stated by the Ministry of Education and Science are overrated: According to the Ukrainian Association of Investment Business Association (UBICA) only 8 Techno parks (out of 16 registered ones) are operating. Experts estimate out of these only 2 or 3 of them are performing well. Furthermore, according to UBICA, to date there are only 10 active business incubators in Ukraine.

According to the opinion of Ukrainian experts, business incubators and business centres have not been working successfully in recent years in the innovation sphere[42]. They were focused much more on general commercial activities than on support of innovation enterprises. Innovation projects were few and small; they could not compete with projects in property development or merchandise trade. A similar situation presented itself with other forms of innovation and business support organizations. Partially, this could be explained by the fact that there are no special (indirect) incentives for creation and utilization of innovation in the country. Also state finances for innovative enterprises are scarce.

Due to the economic crisis new forms of innovation and business support infrastructure have not been developed in spite of sound declarations. Likewise the State Agency for Investment and Innovation (SAUII) had to create a number of regional innovation and business support centres in 2008-2009. However, in reality only first organizational steps were taken, and no innovation projects were supported.

Technology Parks

According to experts the most (and to some: the only!) successful measure in stimulation innovation was the creation of techno parks. The country's first techno park created in the early 90s in Brody, Western Ukraine, was not successful due to the lack of a sustainable business strategy. In addition, disputes relating to property rights for land and buildings created an insecure business environment, which discouraged the creation and expansion of new companies. In 1999 a new attempt to create techno parks was made. It is important to mention that according to the legislative documents on techno parks, only innovative projects

[42]. Strikha M.V., Shovkaluk V.S., Borovich T.V., Dutchak Zh. I., Sedov A.O. Information and Analytical materials of the Ministry of Education and Science to the Parliamentary Hearings ' Strategy of Innovation Development of Ukraine in 2010-2020 in conditions of Globalizing Challenges' – Kyiv, MON, 2009 – 39 pages (in Ukrainian)

with the overheads they transfer to the techno park management were exempted from standard taxation procedure. Not companies themselves can receive different types of state aid.

In July 1999, another Law on Special Regime of Investment and Innovation Activities for Technological Parks was passed through Parliament. According to this Law, three new techno parks with some real financial privileges for innovation companies were created – Techno park in the Paton Institute for Welding (Kyiv), Techno park in the Institute of Semiconductors (Kyiv), and Techno park in the Institute of Mono-crystals (Kharkiv). The key features of these techno parks are:

1) they were created on the basis of leading institutes of the National Academy of Sciences of Ukraine with strong technological orientations, and

2) tax and customs privileges could be received not by the institutes themselves but by specific (specially registered) innovation projects.

Tax incentives included the possibility to import all materials and equipment needed for the innovation project without paying custom duties; the possibility to obtain tax credits; reduced taxes and access to cheaper credit (with state guarantees), and the possibility of compensation of bank's interest rate by the state. Bearing in mind the high bank interest rates in Ukraine, the last step was especially important for the new techno parks.

Techno parks could also pay some taxes with substantial delays; the same applied to the extension payments on export-import operations (from usual 90 days to 150 days). Techno parks could also use accelerated amortization of equipment.

The control over financial activities of techno parks was strict, as they had to deploy all profit from innovation projects on special accounts, not to 'mix' it with profits stemming from other activities to avoid unfair privileges.

Later 13 more techno parks were created in Ukraine, most of them in 2003-2004. Some techno parks have not been created on the basis of institutions or organizations with real S&T and innovation potential of the organizations but as the result of forced decisions, lobbied by influential politicians and businessmen.

At the beginning of 2005, almost all the privileges granted to techno parks were abolished. As a result, only 8 techno parks out of16 have re-started business activities. The other techno parks had neither resources nor incentives to commence operations following the ban on their special treatment. Some of them have not finished the stage of formation. In 2007, 11 techno parks reported about their activities to the Ministry of Education and Science, which is responsible for the collection of data on techno parks since 2006.

In May 2007, a new law on techno parks passed its first hearings (Draft Law N1064-V on May 22, 2007). However, due to political disputes, this law has not passed the second hearings. The new law inter alia determines IPR, the rights and duties of the park's management, definitions of the basic elements of techno parks. It also establishes zero- level custom duties on the import of new equipment and raw materials that are not produced in Ukraine.

In 2008, techno parks had even higher volumes of production in Hryvnas (not in Euros due to devaluation of the national currency), than in 2007 but this was the result of inertia, not new development.

Despite their privileges, techno parks contributed almost 905 million Hryvnas of different taxes to the central and local budgets in 2000-2008. They also created more than 3000 new jobs. However, the number of employees in techno parks dropped by almost 10 times in 2007 and in 2008. This means that techno parks worked in 'inertial mode' in 2007-2008[43].

Business Incubators

[43]. Mazur O,A., Shovkaluk V.S. Technological Parks: Ukrainian and Foreign Experience. - Kyiv, MON, 2009 – 71 pages (in Ukrainian)

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According to UBICA, the most active business incubators in Ukraine are:
1. Slavutich Business Incubator
2. Lviv National Polytechnical University
3. Kyiv National Economic University
4. Kyiv National University of Technology and Design (Student Innovation)
5. Kyiv National Trade and Economic University
6. Khmelnitsky Business Incubator
7. Kharkiv Technologies Small Business Development Centre
8. Belaya Tserkva Business Incubator
9. Kyiv Business Incubator
10. Ternopol Business Incubator

Overall, in Ukraine there is a shortage of supporting the creation of new innovative company set ups. Many business incubators are not primarily focused on innovative start ups but on other commercial projects, a tendency that had also been observed within SAUII. The provided range of innovation and business support services is not complete compared to their Western counterparts.

Contrary to the EU, in Ukraine higher education institutes only rarely are among the founders of business incubators. The provisions of law prohibit universities to participate in almost all types of entrepreneurial activities, including the right to create companies, which are working on commercialisation of R&D results. The establishment of the Science park KPI could open the way for changes in the legislation, if it could show substantial positive results of its work.

Typically business incubators are supported by public sector schemes with modest contributions by entrepreneurs who avail of their services to create new businesses and jobs hereby providing an increased tax base. However, in Ukraine public private partnerships are largely underdeveloped. Also companies hosted by business incubators are observed to have an “all inclusive” mentality expecting 100 % funding from the state.

While it is desirable to foster the entrepreneurial spirit and propensity towards co-financing among tenant companies it remains the role of the state to fund the lion’s share of business incubator operations. However, in Ukraine the share of financial support from the side of local authorities is small. Some experts estimate NGOs account for 50 - 80 % of business incubator financing. Without systematic support by local authorities and the state most business incubators cannot count on sustainable development. Business incubators have to choose either to transform into purely commercial enterprises (this may lead to loss of clients who hoped for certain preferential terms at the first stage of running business) or to reduce the volume of services they render to their clients (by refusing to lease business space, or by reducing other services). This limits their possibilities to obtain additional financing from donor organizations which connect the criteria of sustainable development with interest of local community and authorities in assisting and supporting projects financed by them.[44].

Technology transfer infrastructure

In spite of the fact Ukraine has a patent portfolio, university technology transfer offices and some acting technology transfer players, the existing initiatives are not working together. Rather, universities explore

[44]. Sipos, Zoltan, and Szabo, Antal, Benchmarking of Business Incubators in CEE and CIS Transition Economies, (ERENET and Sintef, Budapest, Hungary), 15 June 2006, available at:
http://www.erenet.org/papers/download/benchmarkingbusinessincubation.pdf

their IP in an isolated approach so that it is difficult for companies to compare technology solutions offered by various universities. Technology transfer agents are not pro-active in matching technology needs with technology solutions. Rather technology transfer is understood as publishing publicly funded research results in databases without the active promotion facilitated by technology brokers. IT based technology transfer platforms do exist but they are not interconnected with each other hereby impeding user friendly access to all of them. It seems no player in the infrastructure is dedicated to assessing and promoting technology demands of companies to universities. Also there are not financial incentives promoting SME-university research cooperation. Overall, technology transfer actors facilitate few technology deals.
The gap between the higher education sector and industry in Ukraine is substantial. Current legislation does not allow universities or research institutes to be founders of a spin-off company with non-state ownership. The introduction of the Law on KPI Science park (2008) could, probably, change the situation but it is too early to make conclusions about the effectiveness of changes.

FP7 contact points - National Contact Points (NCPs)

The national authorities do not ensure the funding of the NCP system. The national coordinator NCP in Ukraine is hosted by the Ukrainian Institute for Scientific, Technical and Economic Information (UkrISTEI) and also holds the legal and financial and INCO NCPs. In addition there are thirteen thematic NCPs hosted by NAS Institutes, the State Space Agency, a Technopark in Kharkiv, and the Lviv CSII. NCP staff provides NCP services on a part time basis and is predominantly offering support to its host institutions. Also there is no systematic training of NCP staff. Overall Ukrainian researchers are not provided with comprehensive FP7 consulting services spanning all regions. There is no focused support to participate in FP7 projects like in EU countries. Researchers only seldom engage in international FP7 consortia and projects.
NCP services are provided by regional NCPs. The network of Local Information Points was established in 2003 and it is composed of regional state centers for science, technology and economic information as well as universities. NCP services are provided by a total of 9 physical persons on a part time basis and coordination of the regional NCPs is performed by the NCP coordinator. The NCP coordinator's activities are funded through a state financed project and some European funded projects whereas LIPs have been selected on a competitive basis and are directly contracted by the NCP coordinator for performing NCP services at agreed fees.[45]
No thematic specialization is established. Each LIP handles inquiries relating to all priorities. When advanced technical issues arise, informal signposting is activated on the basis of the professional background of the individual NCP or the research focus of its hosting organization. The NCP has a rather small access to academic clientele (if the NCP target group identity is compared against that of the Ukrainian research performers). This could be partly explained by the strong ties of the regional NCP individuals with their hosting organization. This implies that there might be a significant percentage of research performers which are not satisfactorily accessed. The links with the industry, SMEs and private enterprises are limited and vary depending on the region and the research focus of the host organization. Access and dissemination of information to potential clients that are located in remote areas is limited. Not

[45] IncoNet EECA: Analytical report on the NCP structure of Ukraine

all LIPs make a final proposal check mainly due to lack of human resources. The level of the FP expertise required also varies among LIPs.
Statistics prove the NCP has already linked some Ukrainian researchers to the Framework Programme (FP): In FP7, 107 Ukrainian organizations participated in 79 projects incurring 8,44 million € EU co-financing (information obtained by head of NIP on 11.6.2010). The promising results could be enlarged by setting up and maintaining NCPs across FP7 thematic areas.
The decree of the Cabinet of Ministers in Ukraine "On approval of State Target Economic Program on Creation of innovative infrastructure in 2009 - 2013 ", 14.05.2008 No 447 is the legal basis of innovation and business support infrastructure other than the NCP system. The program is administered by the Ministry of Economy. The total budget is 280.35 million Hryvnas, including 104.25 million Hryvnas state budget. This program could be an element to facilitate stimulation of innovation infrastructure in Ukraine under the tutelage of the Ministry of Economy.

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Conclusions

National economies are increasingly interlinked. Innovation and business support infrastructure should be, too.
There is no comprehensive provision of innovation and business support services in Ukraine. Innovation and business support infrastructure actors in Ukraine is underfunded and not equipped with tools, methodologies and knowledge to provide state of the art support services. Start ups and SMEs are most affected by this lack as they often cannot develop international networking on their own hereby often not being able to tap into knowledge needed to innovate and to develop commercially viable products and services at the speed and quality imposed by increasingly competitive and complex markets.
Also Ukrainian business support infrastructure actors are "undernetworked" when compared to their Western counterparts both bilaterally and within networks. Indeed the feedback following the project presentation on international networking at the project innovation conference on 16./17.6.2010 confirmed Ukrainian innovation and business support infrastructure is not actively engaged in networks they are mostly unaware of. Having in mind the chronic underfunding of most business support organizations missing international links might seem as a minor problem. However, being cut out from accumulated international learning experiences, best practices, methodologies and tools ignites a virtuous circle. The downward spiral of professionalism of provided innovation and business support services makes it increasingly losing their raison d'être for assisting Ukrainian business in becoming more competitive. Likewise the gap to state of the art business support infrastructure widens and its actors are less and less able to provide state of the art business support services designed to help client organizations become more competitive in the globalised economy.
International networks vary in geographic reach, thematic focus, special interest, size, organization, funding, emergence, and level of member participation. They stimulate activities in specific areas, such as

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formulation of common services or standards; technology transfer; patent marketing; access to clients or to finance; internationalization; driving creation of start-ups; facilitation of international research consortia: promotion of mobility of researchers; or representation of member's interests to regulators and standard setters. They organize information exchange mechanisms by meetings, conferences, websites, platforms, databases, or newsletters. They support members' professionalism by access to experts, trainings, guidelines, good practices exchange and benchmarking, or performance rating and enhancement. Network membership requires membership fees (often), adherence to criteria, and time. Therefore adherence to networks must be carefully selected in order to make best use of scarce resource.

When selecting networks likely to fill gaps within Ukrainian innovation and business support infrastructure, questions should be considered like: What local, regional, national, and international networks exist and are open and of interest? Can the Ukrainian innovation center provide resources to participate fully in the network? What criteria have been established to choose between different networks? Who in Ukraine can be contributing to the network? How can exchanges be diffused form the network to Ukrainian innovation centers? Have measures been established on outcomes expected from participation in the network?

Missing commercialization of research results to industry is one of the Achilles verses of the Ukrainian National Innovation System. There currently are no functioning technology transfer broker mechanisms or structures that assess, audit and matching technology needs and surplus of technology providers and consumers. The technology gap of already innovation adverse Ukrainian firms compared to international players is widening as a result. Business support infrastructure must be equipped with appropriate resources and with international state of the art business support services methodology and tools to help minimize and close this gap. The fastest way to do this is to adhere to partner with organizations that have a successful track record in brokering technology. A best practice is the Enterprise Europe Network (EEN) which success stimulated governments in four continents to fund EEN centres outside Europe. To date EEN spans the EU, Armenia, Bosnia and Herzegovina, Chile, China, Croatia, Egypt, former Yugoslav Republic of Macedonia, Iceland, Israel, Montenegro, Norway, Russian Federation, Serbia, South Korea, Switzerland, Syria, Turkey, and counting.

There is no legislative base for creation of innovative spin-offs from Ukrainian universities and there are no tools to stimulate innovative start-ups. However, experience and practical support to start up companies would be needed to improve efficiency, to avoid unnecessary work and mistakes. Also start ups need to be introduced well selected and prepared investment opportunities.

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Chapter 8
Coordination, roles and responsibilities within National Innovation system (George Strogylopulos, Oleksander Popovych)

Introduction

Today in a globalised environment faced with the ills of the global economic crisis, as well as broad social and environmental concerns related to growth and welfare distribution innovation-driven economies require from governments to find new ways to promote a policy environment that is conducive to greater dynamism and change. Innovation policy involves today a broader set of actors and runs across a wider number of governmental or policy areas, taking a more horizontal form by providing a strategic framework across ministerial and institutional boundaries.

In this context of increased interactions the need for coordination has also increased, as innovation policy became the cornerstone of economic development. Initially, coordination took place between the fields of innovation and science on the one hand and innovation and the business sector on the other, i.e. between a couple of ministries. Gradually, as the role of human capital became central, and theories such as the 'Knowledge Triangle' emerged, the Ministry of Education was also integrated in the RTDI policy agenda as were also sectoral policies (i.e. defence, health, agriculture, etc.) that in the past were managed independently by the competent ministries.

Moreover, governments have become organizationally complex, made up of a multiplicity of Ministries, comprising many sectors and units and decentralized bodies, as well as agencies, commissions, and international representations. Horizontal policy coordination is thus necessary because modern government and administration are complex organizations with complex tasks.

To make diverse players o-ordinate their activities in and beyond their policy field (horizontalization) is a **complex and dynamic** processes that must take into account both **internal and external** factors and influences. Thus, coordination is treated as a **process**, not as an **outcome**.

Furthermore, since the adoption of the Lisbon Strategy in 2000 by the EU member states, which aimed at making the EU “the most competitive and dynamic knowledge-based economy in the world”, all member countries had to formulate various policy initiatives and proceed to reforms in terms of RTDI governance and policy coordination in the line of:

- Incorporating the education policy to a more comprehensive innovation policy and also making improvements on the framework conditions (e.g. competition, international openness, mobility) instead on concentrating on measures and institutions directly involved in science and technology.
- Moving away from fragmented public interventions towards coordinated and consistent interventions derived from a vision which specifies economic objectives, external and internal challenges and the market failures which call for public intervention.
- Shifting policy priorities from a portfolio of a multitude of narrowly defined financial programs, to a flexible and dynamic policy defining broader tasks and priorities. This further implies that some broad technology and research fields important for society continued to be defined top down, but projects such as clusters and centres of excellence would grow bottom up, necessitating a change in decision making that would incorporate “users” into the policy formulation process.

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- Coordinating blurred division of responsibilities between and within ministries (and other "players") to well defined responsibilities. Ministries were forced to devise strategies for their area of responsibility from the top-level vision, which are coordinated on the government level by a "high level commission" or a "Council of Science, Technology and Research" or other governmental bodies at the highest level including the prime ministers and "parliamentary committees for science and technology".
- Moving away from managing public intervention by bureaucratic procedures towards more efficient public management techniques. These goals have been pursued either by internal competence centres in ministries or by delegation to outside agencies (agencification) in many countries. Agencies are free to choose instruments and are controlled according to pre-defined output criteria without micro-interventions.

This latter process of agencification has also increased the autonomy of these agencies. This was achieved by a systematic build up of competencies in these agencies so that they could actually manage and coordinate the intra-ministerial processes of policy development.

The main target of agencification is to provide professional and flexible administration in the sense of an increased alignment to criteria such as flexibility, change and innovation. Therefore, the main characteristics by which the system can be measured are effectiveness and efficiency of the administration and implementation of RTDI policies.

Furthermore, decisions in research and innovation policies are increasingly being negotiated in a multi actor's arena and across multi level politico-administrative systems. As a result there is a new variety of actors and agencies at multiple layers of governance are involved in the formulation and implementation of policies. This poses challenges in regard to the need for coordination between different scales of policy making, across different agents involved with sometimes conflicting goals.

Finally, this chapter will focus mainly on the innovation leaders (based on the European Innovation Scoreboard 2009) within the EU that is Denmark, Finland, Germany, Sweden and the UK where innovation performance is well above that the EU27 average. The aim of this report is to highlight how RTDI policies are coordinated in these counties in four policy areas affecting directly the Innovation System and provide a comparative analysis of how these countries organize and coordinate the organizations responsible for the aforementioned policies.

Innovation policy and coordination mechanisms

For the implementation of new policies in the EU, several dimensions have to be coordinated, vertical and horizontal. Vertical coordination of innovation policies is the harmonization of European, national and regional instruments and strategies towards achieving the stated objective. In the horizontal dimension, different policy areas must be co-ordinated in order to exploit synergies. Such policy areas can be the competition policy and trade policies, policies concerning the ability of handling change (human resource development) and other policies concerned with the potential redistribution of income.

There are several taxonomies covering the rationale and the characteristics of innovation policy instruments since this is a policy area frequently debated in the EU with the aim of developing "best practice policy models'. However, despite the extensive literature covering the area, the selection criteria

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proposed remain static. For example a common categorization is that between specific and general instruments. For example, the term specific indicates that an instrument is designed to influence a specific technology area or a particular group of innovation actors (firms, researchers, etc), while more general purpose instruments can refer to policies affecting the property rights or the education system.

By the term policy instruments we refer to '*the programs, organizations, rules and regulations with an active involvement of the public sector, which intentionally or unintentionally affect R&D investments*". This usually involves some public funding, but not always as, for example, regulatory changes affect R&D investments without the intervention of public funds. More analytically such instruments include subsidies, tax incentives, loans and regulations (e.g. environmental regulation can have a significant impact on innovation). Most frequently the above policies are not implemented in isolation, i.e. every country promotes its own policy mix through the implementation of several instruments simultaneously. This is a highly complicated task and requires advanced level of coordination between the various policy instruments.

Finally, it must be stressed that coordination does not happen on its own, but requires management. In the context of government work, coordination does not mean central control, and it does not mean eliminating Ministries' autonomy in developing policy. Coordination is an interactive process, and the best results are achieved when it is seen as a common search for optimal solutions through openness, sharing information, and cooperation rather than through applying authority and control.

Core issues on state coordination mechanisms

According to OECD '*the new role of the government is to secure framework conditions, remove barriers to innovation, enhancing technology diffusion, promoting networking and clustering and leveraging research and development*' (OECD, 1999: 10). This systemic approach of the management and coordination of innovation requires comprehensive and coherent policies that are characterized by a good match between individual instruments and objectives as well as close coordination of instruments and objectives in different policy areas in order to void overlaps and exploit synergies.

Taking into consideration the above "knowledge space", the policy objectives for policy coordination can be summed up to the following:

1. Avoidance, or at least minimization, of duplication and overlap.
2. Avoidance of policy inconsistencies.
3. Minimization of conflict, both bureaucratic and political.
4. Quest for coherence and cohesion and an agreed ordering of priorities.
5. Promotion of a comprehensive or 'whole government' perspective against the constant advocacy of narrow, particularistic or sectoral perspectives.

The first three objectives aim at achieving efficiency by reducing the costs of bureaucratic action, while the last two objectives refer to the coherence of decision-making process. This highlights that two steps need to be taken in order to arrive at policies coordination. First, a common strategy must be developed, and then the cooperation of actors in the 'government' is needed in order to put common strategies into action.

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Throughout the EU the issue of RTDI governance and the coordination of the policy interventions aiming at strengthening the National Innovation Systems (NIS) are pivotal for economic development. However the coordination of the policy mix is a very complex issue. Moreover, there is no best practice model that could be universally applied, so EU countries have tackled the difficulties with different approaches, depending on the sophistication of their economy, political structure, competencies of the actors of the NIS (government agencies, funding institutions, firms, Higher Education institutes etc). Despite this complexity, policy domains are crucial for the creation of an efficient National Innovation System.

Government's role has shifted from investor to facilitator-promoter of public/private partnerships and interface management. However this change entails the danger of fragmentation of innovation policy so that there is an increased need for intra-government policy coordination and national-regional policy coordination. The main rational is to achieve greater horizontal and vertical policy coordination between the various policy areas and administrative levels and this in turn implies changes towards:

- More efficiency through "Policy packages" rather than isolated instruments
- Need for more policy intelligence
- Monitoring and evaluation of policies
- Sound analyses of innovation systems
- «Intelligent» benchmarking practices
- Long term views
- Inclusive policy design processes

Levels of governance

Moreover, the coordination of policies usually takes places along two dimensions, or alternatively along two axes, a vertical and a horizontal. Vertical interactions depict relationships between different layers of government bodies, for example, between ministries and agencies or between ministries and regional administrations. On the other hand horizontal interactions refer to those between same levels of government bodies with complementary policy objectives.

Further on, in order to coordinate efficiently the above 4 policy areas a clear strategy is necessary for the designing, coordination and management of the RTDI policies. An essential precondition for an effective policy design and coordination of the various levels of administration is the elucidation of the role of the various organizations and institutions in the system, the development of intermediary coordination mechanisms. A potential combination of the above functions that ensures the above is the creation of a three levels organization structure as presented in table 8.1.

Table 8.1. Organization of functions

Level 1	Coordination – Policy formulation
Level 2	Validation and detailed design of policies

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Level 3	Programming and monitoring (Financing, Evaluation, Setting targets and supervision of research organizations)

Source: Technology Foresight in Greece – Synthesis Report – March 2005

Moreover, without the integration and responsibility of the political level which secure the coherence and effectiveness of the measures and the overall sustainability of the national innovation system, no new structures and cultures of cooperation can be achieved. This in turn requires an integrative approach.

This model is based on the analysis of EU27 RTDI governance systems and represents common denominator of these systems. However, the institutional set up will vary in each country and some functions will transcend the above clear cut levels. This is the case particularly vivid with regard to the involvement of regions in the strategy formulation, design and implementation of policies that differs for example in federal states (i.e. Belgium, Germany) from those centrally administered (i.e. Greece).

Moreover, the need for coordination of policies can come up at various levels within the National Innovation System such as the National or Regional level or the interdepartmental level as can be seen in the picture below:

The strategic steering in the RTDI policy governance system requires comprehensive organizational changes and development of new management techniques in the ministries with research agendas and therefore includes a longer-term implementation perspective. The organizational (e.g. in respect of steering capacities and inter-ministerial problem solutions) and personnel development (e.g. permeability in the career development) in the ministries therefore represents a success-critical factor.

There is also a tendency for revising the working principles regarding the division of labour between ministries and funding agencies, the former strengthening their function as supervisory authority of the agencies in a more strategic way. This is mostly based on agreements on monitoring the actual goals and output of the agency's work by adding output indicators to input and performance indicators.

Moreover, strategic multi-level policy, demands a better understanding of the roles of stakeholders, multi-protagonist policy, policy learning and a policy changing process for the national innovation systems. Processes that coordinate policy development activities across departments in order to avoid overlaps and conflicting assignments to the agencies should be implemented. Furthermore, broad tasks should be delegated to the agencies instead of narrowly defined programs and the delegated tasks should be monitored according to output goals whenever feasible.

The EU member states experience with RTDI governance coordination

There are dissenting approaches to the multi – level governance proposed by many researchers as is the case with the OECD. The OECD Country Survey for Austria of the year 2007 for instance suggests that the responsibility for specific innovation policies should lie within a single Ministry. This line of policy was followed by Denmark where the overall responsibility for both R&D policy and innovation policy has

become concentrated under a single body, the Ministry of Science, Technology and Innovation, who has become the lead agency responsible for the governance and coordination of all RTDI policies.

In contrast, in the UK that also had a designated lead agency with overall responsibility RTDI (namely the the Department of Trade and Industry - DTI), DTI was split into the Department for Innovation, Universities and Skills and the Department for Business, Enterprise and Regulatory Reform, creating a new need for coordinating the various elements of the policy mix.

However, almost in all EU27 member counties at least 2 ministries are responsible for RTDI policy formulation. Most often these are Ministries of Economics (or Finance and / or Development) mainly responsible for innovation policies and strategies and Ministries of Education and Science, usually responsible for education and research issues. Additional Ministries are constitute important players in the RTDI system, but are usually sector specific e.g. Ministries with portfolios and competences in areas like Health, Environment, Agriculture and Transport.

Moreover a plethora of coordination or Advisory Committees exist with various functions, from the provision of authoritative, negotiated policy recommendations to the coordination of horizontal policies. In some cases these bodies work under Prime Ministers, Parliaments or refer to inter ministerial councils. The role of these coordination mechanisms vary from having full responsibility for the coordination of innovation policy design and implementation actions across the ministries, public organizations and industrial associations, to the other extreme as in the case of Greece where their role is marginal and symbolic.

In Finland for example, the Science and Technology Policy Council created a legitimate basis for the priorities set by the Finnish government, but it failed to lead to the establishment of a comprehensive, horizontal innovation policy incorporating more actors into the process of policy formulation. Thus despite its influential role in directing the process of priority setting, and its comprehensive membership, with key ministers, representatives from other institutions and agencies, as well as stakeholders it has not been able to develop more comprehensive horizontal economic development strategies that integrate many ministries.

The situation is more complicated in federal countries, where Regional governments have the legislative autonomy to implement diversified RTDI policies. This is the case with the Lander in Germany, or with the autonomous regions of Wallonia and Flanders in Belgium.

Complementary to the above, in most EU countries there is an increasing tendency to include stakeholders into policy design and priorities setting, a process that has proven to have both positive as well as negative effects. Among the positive aspects is that it increases the user orientation of policies and consequently their effectiveness, it leads to more transparency, it enables the circumvention of cross -departmental frictions and it facilitates networking between different stakeholder groups. In contrast, the most important negative aspects are that on the one hand such processes lengthen the decision-making process and the ever present danger that the composition of stakeholder groups can be skewed in favour of certain interest groups and interests.

The following table presents a snapshot of the Ministries responsible for the RTDI policies affecting the National Innovation System as discussed above. In addition, the second column describes the use by these

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countries of relevant agencies under the ministries that are responsible for policy implementation, while the last column discusses whether countries use agencies for the implementation of their strategies.

Increased use of agencies throughout the EU - Agensification

Moreover, in most EU countries there is a strong use of Agencies for the implementation of strategies. Notable exceptions are almost all South European countries (Greece, Spain and Italy), where agencies play a secondary role in policy implementation, as well as in some former east European countries such as Poland, Lithuania and Romania.

This trend represents a shift from managing public intervention by bureaucratic procedures to more modern public management techniques. Goals are pursued either by internal competence centres in ministries or by delegation to outside agencies (agencification). Agencies are free to choose instruments and are controlled according to pre-defined output criteria, not by means of micro-interventions. Such an example is Sweden. In Sweden many functions held by ministries in other countries fall under the responsibility of government agencies, particularly Vinnova, the Innovation Agency. These agencies are formally independent, and there are constitutional limits on the amount of micromanagement ministers can exert.

This trend toward agencification is gradually catching up in most new member states. For example, the Slovak Innovation and Energy Agency (SIEA) was created in 2007. Innovation and R&D policy measures are also implemented by the State Agency for Development of Investment and Trade (SARIO), the National Agency for Development of Small and Medium Enterprises (NADSME) and the Structural Funds (SFs) Agency of the Ministry of Education. In Slovenia, each of the ministries has executive agencies through which most of the policy measures are executed. The Slovenian Technology Agency and the Public Agency for Promotion of Entrepreneurship and Foreign Investment are the most important agents.

A vivid illustration of the extended use of such agencies with diverse objectives and roles can be exhibited by the Key State Sponsored Bodies & Agencies Supporting and Promoting Research, Technological Development and Innovation in Ireland under the Irish National Development Plan 2000-2006

The organisational set-up and reformation

With the main actors responsible for RTDI policies formulation and governance shaped in the last decade for EU15 member countries changes are mostly incremental and derive from the need to adapt to new challenges. In contrast, the new member states present vivid example of the complexity of the coordination of RTDI policies and of more radical reformations of their RTDI governance systems. Accession to the EU, followed by the SFs funding and the open method of coordination (OMC) of the Lisbon Agenda constitute for these countries the most significant drivers of their reforming their governance structures.

However for both sets of countries there is always a trade-offs between continuity and stability and adaptation to changes. Most top performing (innovation leaders) countries have more stable structures than the new member states. For example, TEKES in Finland established in 1983 is one of the most stable organizations for managing RTDI issues in the EU. Similarly, the system of innovation governance in Germany is stable and oriented towards incremental changes of well-established and efficient governance structures, in response to changing technological paradigms.

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A counter example for the innovation leaders however is provided by the UK where new organizational set us and reforms reflect a change of priorities, from manufacturing towards services. Thus the prominent DTI was split into the Department for Innovation, Universities and Skills and the Department for Business, Enterprise and Regulatory Reform.

Moreover, while reforms may be necessary, they should not be too frequent and when introduced they need to be well founded, rapid and effective. Often, moderate innovators and catching-up countries recognize the need for adaptation and system redesign but inertia and vested interests (reactions from the status quo) delay or even cancel decisions.

Such an example can be provided by Cyprus, where a well-designed coordination scheme was announced in 2006 while implementation started in 2009 and as a consequence the new system is still not fully operational. Similarly, in Lithuania a model imitating Vinnova or Tekes has been announced but no action has been taken yet. In Hungary, following a series of reorganizations of the governance system, a new science, technology and innovation (STI) policymaking structure was launched in March 2009 by government decree. But, while the previous coordinating mechanisms ceased to exist, none of the envisaged new ones have been established, thus creating more difficulties in the coordination and implementation of RTDI policies compared to the previous inefficient system.

The Netherlands is another example of a country with continuous reforms in an attempt to improve coordination. The most prominent change since 2007 has been the establishment of an interdepartmental 'Knowledge & Innovation' (K&I) programme department in which all relevant ministries collaborate on joint issues in innovation policy. In 2008, the K&I department published a long-term strategy to knowledge and guide investments in innovation. Similarly in Italy, since 2006, the Department for EU Policies, through a technical committee called CIACE, has been appointed by the government to give political direction to the Lisbon Strategy and has been in charge of drafting the National Reform Program 2006-2008.

In addition, as mentioned above, most new Member States face difficulties in ensuring coordination between the various stakeholders and bodies responsible for RTDI policies formulation. In order to overcome these difficulties most new member countries have tried to reforms their systems by assigning the overall responsibility to a single coordinating body, either a ministry or an agency. Thus, in the Czech Republic, the review of policy led to the design of a new governance system with a single coordinating body for RTDI and the establishment of a Technology Agency. In Slovakia, this organization is the Commission for the Knowledge-based Society (CKBS), established during 2006 and headed by the Deputy Prime Minister.

Further reforms of the RTDI system also include attempts for making governance leaner and clearer for beneficiaries, by reducing red tape and the organizations with whom the beneficiaries of RTDI policies have to transact. Thus in the Netherlands, three implementation organizations of the Ministry of Economic Affairs (SenterNovem, Netherlands Patent Office and the Netherlands Foreign Trade Agency (EVD) are being brought together in one implementation organization, so that firms and other beneficiaries will have to deal with a single organization. In a similar fashion, the in the UK, the number of existing instruments reviewed and realigned in order to include only a few instruments with sub-programmes.

Competencies and governance of the Ukrainian National Innovation System

Since its independence, Ukraine lost more than two thirds of its scientific potential, mainly due to insufficient financing. The law "On science and technology activity" set forth that at least 1,7% of the GDP should be allocated annually to civil R&D projects.
However, this norm has never been used, although the government support was by far the only way to save the scientific potential in the first years of independence. It is often said that the Ukrainian science was not prepared for market economy, was not geared up for cooperation with manufacturing facilities, did not have infrastructure ready for this; that Ukrainian science used to state financing and because of that failed to attract industry funding for research and development. However, these complaints could barely be relevant to Ukrainian science, since even the Academy of Sciences of Ukraine received more than half of its funding from the industry in the late 1980s.

Ukraine managed to achieve this due to own research and development base of the Ukrainian Academy of Sciences, built on the grounds of self-financing. In mid 1980s, the research base comprised 78 institutions: 29 construction bureaus, 10 research factories, 29 pilot production plants, 5 computing centres. However, Perestroika in the late 1980s and disintegration of USSR in the beginning of 1990s lead to destruction of the industrial complex, especially its high-tech sector, which caused sharp fall of industry demand for research and development. As a consequence, most enterprises of the pilot production base of the Academy had to be liquidated. The remaining R&D sector was also found in the same situation, since its high-tech part was closely tied to the military and industrial complex of the former Soviet Union. Only sectoral innovation organizations, created by the ministries and funded by fees from enterprises, managed to cope with these dramatic changes at some extent. However, after the Ukrainian President Leonid Kuchma disbanded these foundations, the ministries lost all their financial sources for funding R&D.

In order to increase R&D share as a % of GDP t is necessary to stimulate effective demand by firms for research and development and utilize the still significant science potential of Ukraine. The Ukrainian government can use several complementary instruments in order to achieve this goal from complete or partial exemption of R&D expenditures of firms, the provision of grants for innovation projects and the provision of funding for the modernization of enterprises. Some of these methods have been already inserted into Ukrainian legislation. However, the financial and economy sector of the Ukrainian Government actively opposes implementation of these methods. Eventually, none of such norms worked in Ukraine, even if it was supported by the Parliament.
It is reasonable to revive the State Innovation Foundation. It could be partly financed from the state budget and partly from the revenues from innovation programs and projects.
It is necessary to strengthen the role of the state science and technology programmess i***n priority areas*** of the science and technology development in Ukraine as the main mechanism of state influence on development of applied research and development. The share of such programmes in total public funding of science should be at least 30%.
It is also very important to introduce a separate and complementary programme to those funding research, namely "financing of priority areas of ***innovation*** activity", which should total no less then 1,5% of the GDP. Such a programme should finance at least 50% of innovation activities of firms that will provide the corresponding matching funds. Finally it is necessary to develop a mechanism for funding large-scale innovation programs financed by the Government on par with the concerned enterprises.

Conclusions The main difficulties in coordination of the various structures of any RTDI system arise due to political reasons. Among these are issues such as the large number of agencies involved with different jurisdictions that are competing for scarce resources inhibiting the partnership and the natural reluctance of agencies to give up management and control of their operations. This is true in most cases in the EU both between the responsibilities and jurisdictions of the National and the Regional Level as in the case of

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Catalonia in Spain as it is also often when restructuring of the public research system takes place as with the case of the indented reform of public research centres in Greece which was faced with vested interests creating problems for any future reform. This is also true in the case of Ukraine where the governance of the innovation system in Ukraine comprises a number of different ministries, agencies and committees but none of them is responsible for innovation policy as a single representative of the government.

To make diverse players co-ordinate their activities in and beyond their policy field (horizontalisation) is a **complex and dynamic** process that must take into account both **internal and external** factors and influences, as described below. RTDI policies, as all other policies, are a product of an evolutionary development process within which governance is a major driver and where the balance between various instruments applied will be an equation of the impacts of existing measures, available resources and wider policy objectives.

A good level of coordination can be also witnessed in countries with dense linkages and frequent discussions within coordination bodies in which all stakeholders participate. In Ukraine no formal linkages are present, as is the case with other weakly governed and organized National Innovations Systems like Greece where these linkages are informal, created only during projects implementation and are disrupted at the end of these projects.

Most top performing (innovation leaders) countries have more stable governance structures than the new member states. For example, TEKES in Finland established in 1983 is one of the most stable organizations for managing RTDI issues in the EU. Similarly, the system of innovation governance in Germany is stable and oriented towards incremental changes of well-established and efficient governance structures, in response to changing technological paradigms. This is not however the case in Ukraine where the system is characterized by permanent change, especially at the highest executive level. This is mainly the result of the transition from a centrally controlled system where no user – producer relationships existed, with the exception of the military sector and due to the fact that Ukraine has not yet restructured its National Innovation System in an integrated manner related to the globalised economy and value chains.

Significant changes in policy paradigms or external shocks (EU accession) can lead to restructuring. Countries with mature NIS proceed to incremental changes/reforms, while new member states to more systemic reforms. However, radical transformations entail high risks. The tendency in most EU countries, it to shift away from fragmented public interventions towards coordinated and consistent visions with specific objectives. However coherence goes beyond coordination and encompasses issues such as the effectiveness and impact of measures.

Another strong tendency in EU countries is the increased use of agencies for overcoming rigidities and increase efficiency and the increased participation of stakeholders and bottom up measures in order to increase effectiveness. The former tendency is also reflected in Ukraine with the creation of the State Agency of Ukraine for Investment and Innovations (SAUII) whose responsibility was assigned during 2008 to the Ministry of Economy. Moreover, after Parliament decision all specialized state agencies became dependent by different ministries.

Throughout the EU there is an increased tendency for revising the working principles regarding the division of labor between ministries and funding agencies. The former are strengthening their function as supervisory authorities of the agencies while the latter have proven more efficient when given control over design and implementation.

Different policy areas might apply diverse and conflicting instruments: For example, innovation policy might in some cases be in conflict with environmental policy even in the case of sustainable development projects, since innovation policy is usually promoted through incentives for growth while instruments for sustainable development are typically regulations that place limitations on economic behavior. Such differences increase tensions among policy areas. This is witnessed in Ukraine in the case of the attempts to provide tax incentives to companies for innovative or R&D projects, where legislative reforms have been strongly resisted by the Finance Ministry, despite the fact that tax incentives could provide an alternative method to grants for financing innovation at the private sector.
Division of labor between policy areas might be unproductive: A coherent innovation policy may imply the take-up of innovation policy goals by other policy areas. This is often referred to as a multi-goal policy. While this in general could beneficial, in some cases a given policy area could lose its effectiveness or lead to duplication of efforts. Moreover, this can often lead to competition for scarce resources between ministries that are responsible for similar or complementary policy areas, as in Ukraine where the governance of the national innovation system remains fragmented and ineffective, as the roles, responsibilities and financial obligations of the different state bodies remain poorly defined. Thus in Ukraine there were over 200 programmes launched over the period 1998-2008, which officially claim state financing. More than half of them do not receive any financing due to lack of corresponding procedures during the approval phase by the Parliament, and due to rigidities of state budgeting. The financing, approved by the Parliament for implementation is thus quit often neglected during allocation funds.
A general trend, particularly present in the EU countries, exacerbated by the tendency for decentralization affected by community policies has lead to an increased number of agencies and to the devolution of powers. Changes often occur through additions to policies and institutions rather than major reformation of the system, and hence add to the complexity and fragmentation already in place. Significant changes in policy paradigms or external shocks (economic crisis, globalization, accession to the EU) might lead to a significant restructuring of the innovation system and of it components (sub – systems). These paradigm shifts often lead to different institutional set ups and thus to different equilibriums.

Funding agencies in most cases have been proven to be more efficient when given control over programme design and implementation, a situation not found in Ukraine where in many cases even funding of approved programmes is not guaranteed. As stressed in the report above *'Real funding allocated for implementation of a programme, as a rule is very insignificant and is hardly related to the funds negotiated during justification and approving of the programme.'* In addition it appears that there in Ukraine it prevails a weak management structure of programmes implementation, where programme directors have almost no real influence on the implementation. According to current legislation, the state body, which funds the programme, appoints the programme director. However, the status of the director remains undefined. Operation management and supervision the development and the implementation of the program are the main tasks of the program director, however the director has no real mechanisms to achieve this objective.

It is puzzling and disturbing that the formation of public science and technology programs in priority areas of science and technology was stopped in 2006. Moreover, the adoption of several, in fact, mutually exclusive, laws of the formation of such programs makes it almost impossible to initiate new programmes. At the same time, in accordance with the law "About scientific and scientific-technical activity" they have to be the primary mechanism for the implementation of government priorities.

Good governance should ensure effective prioritization and agenda setting for innovation policy. This function may suffer in the absence of an explicit body for long-term strategic policy making such as a science and technology policy council or framework policies. In the case of Ukraine the lack of procedures regarding prioritization has lead to the submission for funding to the Science and Technology Council of a large number of poor projects with weak correlation to programme's goals. Moreover, State

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science and technology programmes are often treated as common programmes due to the low level of innovation culture of many Ukrainian government bodies' employees.

The above trends occur despite the fact that the parliament defines basic principles and directions of public policy in the field of innovation and technology activity and approves priority directions of S&T and innovation development of Ukraine, since this prioritisation happens top down and there is no efficient vertical coordination between the organisations responsible for policy formulation and those responsible for the implementations of these policies.

Policy priorities are often deeply rooted in political economic systems so that traditional practices for implementing new policies are relatively rigid. Counties with policy logic of annual state budget might not be able to launch long-term investment programmes in RTDI. Such countries in order to become more flexible and adapt to new needs, often adopt new institutional solutions, as is the establishing of new funds for research and innovation with long term perspectives.

Policy making is dominated by heavily institutionalized processes, often influenced by tensions between government agencies and units. In such cases, networking arrangements could provide a useful arena for mediation and negotiation in achieving horizontal coherence. However in the long run new governance structures will be needed to ensure integration and consistent agendas. This might also be the case for Ukraine where distribution of functions between the ministries and the state agencies is not well-defined. This creates problems on the state governance and the unnecessary competition between the ministries.

Priority setting involves not only the identification of priorities but also the establishment of criteria allowing choices to be made between competing priorities. Moreover, priority setting is not a one-off process so that changes in external circumstances (e.g. new scientific breakthroughs) can challenge existing priorities. Thus, a sound strategic intelligence infrastructure (forecasting and foresight tools) is necessary.

Finally, institutional changes and the establishment of new coordination mechanisms must ensure that the designed changes will not be disruptive for the National System of Innovation. Thus the example of Ukraine where the total number of laws, passed in Parliament during the 1992-2009 period related to innovation are estimated at 85, which is a practice rather disruptive to the Innovation System.

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Chapter 9
State programmes in research and innovation (Kimmo Halme, Gudrun Rumpf, Igor Yegorov, Yuri Shkvorets)

Programming is a generic method used for a set of targeted actions and, in principle, state research and innovation programmes could focus on any of the above categories of measures, however typically state research and innovation programmes concern only thematic and generic innovation support measures.
State programmes in the EU countries are normally understood a set of actions that are put in place to reach a certain strategic objectives of the government. Sometimes the actions constituting a programme are well predefined and detailed, but in other cases only general objectives are set, and actions left open (e.g. so called umbrella programmes).
Typically, with a state programme is understood that

- It has an overall, pre-defined strategic objective (i.e. to increase the competitive advantage of some specific industrial sector), with a clear rationale behind.
- It is an open or semi-open platform for collaboration. Typically among research, business and government.
- The main function of a programme is to generate research and innovation projects and collaboration in identified priority areas, with available government funding instruments (grants, loans, equity).
- It includes a set of actions, such as work components and research and innovation projects that are implemented to reach the strategic objectives.
- The actions of the programme have synergies and complementarities. There are also often joint activities. The programme activities are coordinated and managed.
- Programmes are limited in time, having a clear start and end date, as well as a budget.

Usually the progress of programme implementation is monitored continuously and its outcomes and impact are evaluation after the completion of the programme.
Typically state R&D and innovation programmes have duration of 3-5 years. Small programmes have a budget of a few million Euros with a dozen of projects, while large programmes reach several hundreds of millions and can include hundreds of R&D and innovation projects in them.

Focus areas of state programmes

As mentioned above, state programmes are sometimes horizontally focused (generic) or vertically focused (thematic), depending on the policies of countries. According to Erawatch studies, these priorities vary in member states in the following way:

- Differing funding priorities exist depending on the nature of the research (i.e. strategic, basic, and applied) and on the target of the funding (researchers or industry).
- Predominantly generic: Austria, Belgium, Bulgaria, Cyprus, Czech republic, Denmark, Ireland, Lithuania, Luxembourg, Poland, Spain, the United Kingdom
- Predominantly generic but shifting to more thematic: Hungary, Portugal
- Predominantly thematic: France, Germany, Greece, Sweden
- Predominantly thematic but shifting to more generic: Italy
- Mix of generic and thematic : Latvia, Malta, the Netherlands, Romania, Slovakia, Finland

Many EU countries have pointed out the **public-private collaboration** is the key research and innovation policy issue for a decade at least. This is the case for Austria, Belgium, Denmark, Finland, France and Spain. To this end, several countries have recently introduced instruments aimed at reinforcing the collaboration between the public and the private sectors[46]. Similar concern is present in Cyprus and in the

[46] i.e. Czech Republic, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Romania, Slovenia, Sweden and the United Kingdom

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Netherlands. Very often, the public-private collaboration public support schemes have a thematic orientation.

The most common themes of national R&D programmes in EU Member States in 2009 were (not in order of importance):

- Nanotechnologies (inc. new materials, microtechnologies)
- Biotechnology & Life Sciences (inc. genomics)
- Agro-technologies and Food
- Bio-medical and Health
- Information and Communication Technologies
- Transport, mobility, logistics (inc. aerospace)
- Energy
- Sustainable Development (inc. Water resources and technologies)
- Environment and Earth science
- Security and Defence Research
- Social, Cultural Sciences & Humanities: (inc. Knowledge Society, National identity and cultural heritage)

Programmes addressing new challenges

According to the Member States, the key challenges for national research policies were:

- Increasing the level of public R&D funding
- Maintaining or enhancing the quality of research
- Increasing the level of R&D carried out by enterprises
- Restructuring and development of the public research base, including regenerating infrastructures
- Ensuring a supply of highly trained R&D personnel
- Enhancing the transfer of knowledge from the public sector towards the private sector
- Improving the research governance system
- Developing key strategic areas of research for economic and societal goals.

In particular the economic and societal challenges have gained importance over the last few years. The former largely due to the global economic crisis and how innovation and knowledge economy is seen as a stimulus to growth and basis of sustainable competence.

The most important societal challenges influencing research and innovation policies in Europe are related the demographic challenges in Europe (ageing of population), globalisation and unrest, as well as addressing the climate change and ecological sustainability.

These challenges are clearly reflected in the European and its Member States' research priorities and programme designs. The majority of new programmes are somehow linked to addressing global challenges, and far more mission-oriented in their approach than earlier.

Overall, there is a long-term trend in national programming **towards broader priorities** and approaches. Earlier programmes were more narrowly focused on specific technologies or scientific areas. Today, the focus is more often a combination or a portfolio of priorities and themes, all falling under some greater challenge being addressed. These challenges are usually addressed in public-private collaboration. Similarly, the national research and technology programmes are more and more named as cluster programmes or innovation programmes, emphasising these broader priorities, particularly those related to the application and commercial utilisation of knowledge.

Increase of cross-border programmes

The degree of internationalisation of research programmes has increased substantially during the past decade in Europe. There are more and more provisions for international cooperation within national research programmes, joint calls, bilateral funding agreements as well as other forms of activities with international partners. However, most of these activities are still mainly based on partnerships with foreign

funding organisations rather than actually opening up funding opportunities for foreign research performers.

Very few programmes can be qualified as open in the sense of allocating funding to foreign based research performers under conditions which are close to the ones applied to domestic actors. Linking national research programmes to EU priorities under the FP, or planning large infrastructures according to EU directions, and using EU-level instruments such as ERA-NETs, are various ways to encourage international collaboration in R&D: the prevailing national approaches to ERA are to use EU-level instruments rather than opening national funding sources to foreign-based research actors.

Some national programmes are established in partnership with foreign funding agencies, so that international projects can be jointly funded, each agency funding its own nationals, notably in Finland and Poland. ERA-NET initiatives are playing an important role to develop such coordinated programmes across countries.

Joint funding practices are also developed outside ERA-NET scheme, like the tripartite agreement between Germany, Austria and Switzerland. International openness is in the overwhelming majority of cases not limited to European countries. The rationale for favouring openness is to enhance research quality and hence there is no a priori reason to limit the list of eligible countries to European ones. Exceptions exist, such as the CIR-CE programme in Austria which targets Central and Eastern European countries. There is also a phenomenon of favouring non-EU research partners to complement actions by the EU Framework programme. This reflects somehow a division of labour where ERA collaboration is mainly carried out through ERA-NETs and EU framework programmes.

Barriers for opening up national R&D programmes to foreign participation, with funding possibilities, seem to be mostly political. It is very sensitive to transfer money to foreign research actors, when the benefits and spill-overs of research are not going to be captured domestically. While this represents a rather narrow and short-term view on research, this seems to be a very important barrier for opening up domestic research funds to foreign contributors. Opening up of national R&D programmes to overseas participants without funds transfer appears also problematic. The problems here include the necessity to obtain matching co-funding and the issue of double jeopardy (i.e. the need to ensure complementarities and agreement between differing peer review mechanisms and processes). Joint R&D programmes covered under the next topic are an effort to respond to these problems. For international collaborations with industry, issues such as intellectual property rights (IPR) and differing legal regimes are also significant hindrances.

Joint R&D programmes are initiated or launched, funded and managed by at least two EU Member States, and fall into the broader framework of inter-governmental science and cooperation (S&T) cooperation agreements. The programmes should be characterised, as a minimum, by shared goals identification, and at least mutual information on implementation procedures.

Implementation mechanisms can go as far as taking the form of joint programmes with common funding pot, joint calls, and common selection procedures with no “juste retour” considerations. Joint programmes which result from the coordination and integration of existing national (and regional) research programmes - rather than from the setting up of entirely new joint programmes - also fall into the range of initiatives covered.

Most national governments in the EU have signed bilateral, or less frequently, multilateral cooperation agreements with other governments to stimulate scientific and/or technological international cooperation. Intergovernmental bilateral or multilateral R&D agreements fall into one of two broad categories:

- Goodwill agreements, where the motivation is to express a willingness to collaborate and to facilitate collaboration over broadly specified range of scientific and technological areas;
- Strategic agreements, which have a specific scientific objective. This type of bilateral or multilateral agreement might include joint facilities, joint research centres, funds for joint projects, for mobility of researchers, etc.

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Under these broad agreements, specific initiatives, cooperation or programmes are supported, sometimes by dedicated budget lines, and are managed jointly by at least two governments in the form of joint R&D initiatives.

Linking state programmes to the ERA

Linking national research and innovation activities closer together is one of the key objectives of the EU Lisbon Agenda, formulated as the European Research and Innovation Area, ERA. Under this objective a number of measures has been set up, mainly initiated from EU towards its Member States.

National participation in EU schemes supporting long-term research coordination and collaboration like the ERA-NET, ERA-NET Plus and other related schemes under the broader EU umbrella such as those adopted under Art. 169 (e.g. the Eurostars programme promoted by EUREKA) are included. In fact they receive particular focus as in several countries they are currently the most important, if not the only means, for getting involved in joint research initiatives.

This collaboration can take various forms and intensities, such as[47]:

- *Providing mutual information on scientific and research capacities* (e.g. Austrian Science and Research Liaison Offices). This element is not necessarily the most visible or reported part of agreements, but is likely to form part of most of them, as a core pre-condition for more in-depth forms of collaborations;
- *Fostering researchers exchanges and mobility schemes* (e.g. through Visegrad Fund);
- *Sharing of facilities and infrastructure* (e.g. NERC shared marine facilities agreement between UK and several countries, joint use of Nordic infrastructures under NordForsk, European Mouse Mutant Archive, German-Dutch Wind tunnels, etc.);
- *Transnational R&D funding programmes* involving features such as joint or coordinated funding, joint peer reviews, bilateral research awards, etc.: this element is the most frequent in the cases studies, and occurs at any geographic scope (e.g. the multilateral initiatives as the German-Austrian-Swiss cooperation agreement between national funding agencies D-A-CH, NordForsk joint research funding programmes and the national participations in Article 169 initiatives such as JTIs and Eureka; and bilateral initiatives as the Finnish- Swedish Wood Material Science and Engineering Research Programme, the French-German DEUFRAKO agreement in the transport area; Polish-French research programme on cancer, and the NERC Rapid Climate Change of Economic and Social Research Council agreement in the UK, etc.);
- *Joint funding of research centres* (e. g. Dutch-German-Flemish Holst centre, Nordic Centres of Excellence, AWIPEV French-German research base).

Generally it can be concluded that programme funding for R&D is becoming more international. It shows the increase of funding in intergovernmental cross-border funding, funding in framework programmes as well as a third increasing dimension, 'Joint Calls' (ERA-NET, Article 169).

Types of state programmes

State programmes for R&D and innovation can take many forms. Below are described some typical forms of currently running programmes.

Technology and R&D programmes

State financed technology programmes or research and development programmes that are targeted for the industries, government research institutions and often also universities are the basic form of programmes. Within these are further variations with regard to, inter alia focus on the innovation life-cycle (i.e. how much emphasis on basic research and researcher training, applied research and technological development, or commercialisation and business development).

These programmes are typically clearly focused on certain technological fields (such as nanotech, biomaterials, etc), often selected on the basis of existing competencies (i.e. on the basis of the strengths of targeted research institutions and groups of companies).

[47] ERAWATCH REPORT: monitoring progress towards the ERA

Commercialisation and business promotion programmes

Effective commercialisation of research results and competence created in publicly funded research is challenging and often benefits from public support activities. Hence, there are numerous programmes in EU that are targeted to support academic spin offs, new business creation or other means of commercial utilisation of research investments.

Mission-oriented, strategic innovation programmes

The objectives of mission-oriented, strategic programmes stem from national strategies and other top-level ambitions. A traditional example has been the US 'Man on the moon' programme in the 1960s. Similar programmes, but on smaller scale are launched at national levels. The challenges can well be economic (such as revitalising certain national industries) or societal (national healthcare, security, climate change) or combination of those.

The key characteristic of these programmes is that at the outset, the challenge is identified and typically set at the top-down principle from national policies, while solutions and competencies to address it are yet to be developed.

Cluster programmes

National cluster programmes are found in basically all EU countries. In a study by the European Cluster Observatory, in total 69 national cluster programmes were studied (in 31 countries studied). The majority of the countries have one or two programmes, and the main source of finance is national budgets.

- Thirty six of the sixty nine cluster programmes have no particular focus on clusters in a certain life cycle. The programmes that focus on particular life cycles tend to focus on emerging and embryonic clusters.
- Almost half of the European cluster programmes are classified as related to either industrial & enterprise policy or science & technology policy. Approximately one in four of the programmes are related to regional policy.
- Almost all of the European cluster programmes have private businesses as their target group. The other major target group is research and development institutions.
- The research and development involvement in the European cluster programmes are high in general.
- Half of the European cluster programmes includes some sort of cross border activity, but only a few are defined as cross-border programmes.

There are currently more than 1200 cluster coordination organisations in Europe.

Regional innovation programmes

Many of the state supported innovation programmes are implemented at the regional level. Furthermore, national administrative structures vary and in particular in Federal states, the regions have assumed large responsibilities in supporting R&D and innovation. Regional innovation programmes are often very closely linked to the specific needs of the regional industry and competencies of the research, and can therefore be quite effective.

EU Structural Funds programmes for research and innovation

EU Structural Funds form a major source of funding, particularly for the new Member States and their regions. The Structural Funds are implemented through Operational Programmes and managed by the national authorities.

There is a general trend is to use a larger share of EU Structural Funds research and innovation. These funds are used for a variety of purposes: for research infrastructure, training and human capital, R&D, industry-university collaboration, to promote innovation and competitiveness in SMEs, and furthering R&D commercialisation to mention a few.

In the older Member States (with maybe the exception of Greece and Spain) Structural Funds are mainly used for innovation and competitiveness promoting activities (including the promotion of university-industry collaboration), while in the new Member States they are used for a larger variety of purposes

ranging from university R&D or research training to the building of basic infrastructures for research and innovation, and to the promotion of innovation and competitiveness of enterprises especially SMEs.
In the older Member States, the relative size of Structural Funds to R&D is generally very low as compared with total national R&D resources. Greece is an important exception. In Greece, the Structural Funds are the main instrument for funding R&D. With general university funds excluded, the Structural Funds is equal to 42% of direct government funding of R&D. In the current programme period, 75% of the budget of total R&D measures is financed from the Structural Funds.

Monitoring and evaluation of programmes

Programme monitoring is continuous assessment of the activities carried out by the programme with regard to the panned objectives, achieved results and used means. Monitoring enables the stakeholders to review progress and proposed action to be taken in order to achieve the programme objectives. Through monitoring, actual or potential successes, as well as failures will be identified, which will enable adjustments to be made in the implementation.
It is quite essential for the programme monitoring and evaluation that the programme objectives and means are well-defined at the very start of implementation, and that information is systematically documented during the implementation process. This will facilitate a thorough and transparent evaluation during the later stages.

The analysis of state S&T and Innovation programmes in Ukraine (Yuri Shkvorets)

In the terms of transition of Ukraine`s economy to the innovative development model, the program-targeted management methods are the major and for the moment being the single tool of the public influence on social, economic, scientific, technological and innovative processes.

The major factors for scientific and technological programs effectiveness are such features of the program-targeted method (PTM) as the necessity and possibility to choose the most priority problems for program solving and to focus the resources on them, the clear overall program`s final objective setting, the integration and coordination of the executors` activities, control and operational management functions concentration within a specially established agency. These factors let shorten the works period while problems addressing, enhance the coordination of program activities as regarding resources and time spending, and result in higher scientific, technological and economic outcomes.

But reaching the targeted programs efficiency is only possible with sticking to the major principles of the program-targeted management. In its turn, it demands the establishment and efficient functioning of organizational-economic mechanism of development and implementation of the abovementioned programs and projects.

It is worth mentioning, that for the last 30 years the work on development of scientific, scientific and technological, social and economic programs on the state, regional and industry levels has been active in Ukraine.

This process should historically be considered in two periods. In 1981 – 1990 the programs were developed and implemented within the directive administrative system, and in 1991-2010 they have been developed and implemented in the period of economy transition to the market conditions. Each period is characterized by its positive and negative sides and specific features.

When Ukraine became independent and after creation of the Committee on Scientific and Technological Progress (CSTP) at the Cabinet of Ministers of Ukraine in 1991, a new state targeted scientific and technological programs (STSTP) development and implementation order was introduced, according to which the programs were implemented in the framework of STP priority directions. Herewith much

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attention was paid to STSTP competition procedures. The competition held in 1992 resulted in 49 STSTPs. After CSTP reorganization and the State Committee on Science and Technology of Ukraine (SCST) creation the number of STSTPs increased to 70 as the result of competitions held in 1994. Over 5250 not coordinated projects for a two-year period were developed within those programs (average 75 projects per a STSTP) which were implemented by almost 800 scientific organizations. For the reason of underfunding this programs implementation cycle was ceased in 1996.

In 1997, the State Committee on Science, Technology and Industrial Policy of Ukraine (organized on the basis of liquidated SCST) developed the following cycle of 62 STSTPs for 1997-1998. Based on the experience of previous years and considerable targeted state funding decrease, the number of projects shortened by 5 times (from 9 thousand proposals about 1100 projects were selected). In average, 18 targeted projects were implemented in the framework of one STSTP (4-13 projects in some programs). 410 scientific organizations, Universities, enterprises and unions of almost all regions of Ukraine participated in STSTPs implementation. But for the lack of financing the programs implementation in the planned scope was moved to 2000-ies.

For the same reason, STSTPs were almost not implemented in 2001-2002, despite the list of 29 state scientific and technological programs for 2002-2006 approved by the Government Decree № 1716 dated 24.12 2001. But for the lack of financing the SCTP projects competition was only finished in the I quarter of 2003. Of 2000 proposals 514 projects were selected and divided into 3 groups:

- group A for 2003-2004 - 103 projects
  and average project funding of 40-50 thousand Ukrainian grivnas (UAH)
- group B for 2003-2005 - 163 projects

and funding of 40-50 thousand UAH

The rest of the projects were included to C group and it was supposed to start their financing in 2004, and finish their implementation in 2006. But for the funding absence their implementation was not even initiated[48].

It`s worth mentioning that implementation of the State Program on Scientific, Technological and Innovative Development Forecast for 2004-2006 was completed in 2006. Despite the fact that actual state funding of program`s implementation was reduced twice (to 1 million UAH), its implementation in 2007 resulted in the Draft Law "On Priority Directions of Science and Technology Development for 2007-2012", but until recently it was not considered by the Parliament. In parallel, the validity of the previous similar Act, being in force till 2006, expired. That is why the new STSTP cycle on priority directions of science and technology development has not yet been started. Only on 1.06.2010 the Verkhovna Rada of Ukraine adopted the Law on the priority directions of science and technology development till 2020. But it was given back by the President to the Parliament with some comments.

Each year, during 2007–2010, from 6 to 11 STSTPs have been implemented under state budget funding; their chief coordinators and manages are the MES, the NASU, the Ministry of Industrial Policy and other Ministries and Agencies, as well as scientific parts of other directions state targeted programs. Besides, in 2008, the Government has approved by its Decrees the State Targeted Program "Innovation Infrastructure Development in Ukraine for 2008 – 2012" and the State Program on developing the system of informational-economic provision of state targeted policy implementation and economy's innovative development monitoring, but no state budget funds were allocated for these programs in 2009. Together with this, some funds are included in the state budget of Ukraine for the implementation of the State Program on scientific, technological and economic development forecasting for 2008 – 2012.

After Ukraine became independent, the SCST of Ukraine initiated creation of an organizational structure to manage and control the STSTP and projects development and implementation.

The structure included scientific councils on priority directions of science and technology development

[48] MES of Ukraine information on implementation of the Law of Ukraine «On Priority Directions of Science and Technology Development», 2006 – 20 C./ The Letter of the Cabinet of Ministers of Ukraine to the Committee of the Verkhovna Rada of Ukraine on Education and Science dated 25.10.2006 № 7509 / 2 – 06 – 20 c.

(PD STD), the groups supporting STSTP at the relevant PD STD which were targeted at technical provision of the above mentioned councils` activities, and the working groups on STSTP.
In addition, according to the SSTP formation, financing and implementation procedures, the chief organizations on programs could be defined if necessary.
A working group on STSTP was a collegial body that directly managed and controlled projects implementation. It was composed of programs initiators and separate projects leaders. The SCST of Ukraine contributed to the working groups and support groups activities through organizational and financial assistance. The SCST of Ukraine approved the composition of scientific councils on PD STD and of the working groups on STSTP.
The study on organization of projects progress reports control and expertise directly by the working groups proves that much attention was paid to control from the scientific community side (on the contrary to the previous management systems).
With this aim the working councils together with projects managers within the reporting period held scientific seminars, where the state of scientific problems addressing was discussed at the first place, and the projects` progress was examined, recommendations on further works funding were given. Such seminars, as a rule, were held during half a year's projects` progress check (or earlier).
Due to the above mentioned projects implementation control procedures the reached result were considered with democratic approach, and the combination of independent anonymous projects expertise with their open discussion by wide scientific and experts community gave possibilities for more objective assessment rather that when administrative control.
It is worth mentioning that even the mentioned above control organization failed to avoid formalism. Its multi-level structure was evident (working council-working group-scientific council on PD STD- bureau of the National Council on Science and Technology-SCSTU). Only at the last levels the contents was controlled, and at the others – there was mostly formal documents checking, because the scientific council on PD STD were not always able to assess the essence of numerous projects.
In recent years, the STSTP implementation has practically not been comprehensively monitored and analyzed. For the discrete and dramatically lacking funding of programs, the councils on priority directions of science and technology development do not consider the reports of programs` scientific leaders.

Analysis of STSTP on priority directions of science and technology development and their effectiveness.

The analyzed scope of STSTP of Ukraine for 2003-2006 and their projects is the most representative in recent years. The conclusions on the programs contents and quality, major problems are characteristic for the program-targeted management of scientific, technological and innovative development of Ukraine as a whole.
The number of STSTP on separate PD STD implementation was 3 to 7. Generally, about 18 projects (selected on competition basis) were supposed to be implemented in the framework of one program. In fact, about 9 projects were implemented.
The STSTP target orientation analysis proves that none of 29 programs had in its title quantitative objectives defined, but only served an "umbrella" to gather some projects not coordinated and not subordinate to one objective. The latest were formed by proposals "from the bottom", that is by those of separate scientific institutions and Universities.
As regarding the technological orientation of STSTP projects, only 49 of 266 of them (that is less than 15%) supposed new technologies, equipment, materials, plants and animal breeds creation.
The most characteristic for the analysis is 2004, when the maximum number of projects financed from the state budget was implemented (266).
They were implemented by 143 establishments, organizations, and enterprises. An average program budget was about 200 thousand UAH, that of a project – around 22 thousand UAH per year.

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A rather low involvement of the potential of branch science and industrial (agricultural) enterprises to the implementation of STSTP affects the process of giving a "trade dress" to the created scientific & technical products and its wide-scale use.

According to the data of the Ministry of Education and Science of Ukraine only 24 or less than 10% of 267 STSTP projects completed in 2003-2006 have a significant importance for the national economy and their implementation into production may be referred to innovations. But in order to bring these innovations to the stage of implementation preparation it's necessary to have extra budget (particularly, 7 million UAH in 2007). The "novelty" of developments under all the implemented projects is proved only by 17 patents received by their authors and 4 invention applications.

In our opinion, the main reasons of extremely low efficiency of program-targeted planning and management of scientific and technological development lie in the institutional plane, namely, legislative and organizational provision49.

As a rule, a low effectiveness of the STSTP implementation is resulted from, first of all, insufficient financing, systematic failure to execute the provisions of the Article 6 of the Low of Ukraine "On priority areas of science and technology development" regarding the volumes of the STSTP state budgeting for the priority areas of science and technology that shall make up not less than 30% of the total volume of total budgetary funding for science[50].

If the Ministry of Education and Science of Ukraine had distributed the allocated money, for instance, among 30-50 most perspective projects (not among 266), the effectiveness of their use would have been significantly higher.

In the course of development and implementation of the STSTP the main principles of program-target planning and management are not met and typical stages and procedures are not applied.

[49] Shkvorets Y.F. Institutional problems of the program-target planning and scientific and technological development in Ukraine and the ways of solution //Newsletter of the Khmelnitsky National University , 2007 - №4 T1(94)Economic Sciences – p.84-88

[50] Law of Ukraine "On priority areas of science and technology development" // News of the Verkhovna Rada of Ukraine, 2001 -№48 – p. 253.

In the framework of the projects it was not envisaged the stages on results commercialization, implementation and widespread use in the production.

None of the STSTP was developed on the alternative basis with the use of alternative, dynamic methods of their gradual formation following the principles of successive iterations and optimization.

Under the formation of the STSTP authority, the strategy and tactics were not combined. Over 90 famous scientists, including 64 academicians, corresponding members of the NAS of Ukraine were engaged to the work in Scientific and Technical Councils of the STSTP. However, due to their occupation with scientific and administrative work in the institutes, they were able to solve only some strategic issues.

For the time being, the program managers and members of Coordination (Scientific and Technical) Councils of programs usually don't have special education on these issues. Mostly, an amateurish approach to program management is prevailing.

Regarding the tactical issues of the STSTP management, it's necessary to create the regulatory body such as a command unit, for example, working group, association, consortium that would consist of specially trained project managers, and envisage money for their operation in the program budget.

The Ministry of Education and Science of Ukraine receives scientific reports from each program manager that, as a rule, preliminary discussed on the meetings of Scientific and Technical Councils of the STSTP, arranged 1-2 times a year.

At it was mentioned above, in 2007 through 2010 annually 6-11 STSTP were implemented in Ukraine. Although, the mentioned programs have not implemented the officially approved priorities of science and technology development, the volume of budget financing was higher compared to the STSTP on priority areas of science and technology development (PASTD) in 2003-2006. Thus, in 2007 actual average cost per one R&D in the framework of STSTP and state order made up 61.5 K UAH, in 2208 – 71.5 K UAH., and in 2009 – 164 UAH.[51], that correspondently in 3, 3.5 and 8 times exceeds the index of average funding of the projects STSTP and PASTD in 2004. The annual cost of some projects was greatly higher. Thus, in 2007 the average cost of the STSTP project on micro and optic-electronic technologies development for 2005-2007 reached 4326 K UAH.

Bigger volumes of financing allowed getting better results. Thus, in 2007 in the framework of the 409 completed projects it was created over 100 new types of technical devices, technologies and materials, nearly 70 methods and theories. Specifically, about 20 new types of technical devices and technologies, 16 new methods falls on the STSTP "Resource" completed in 2007.

Thus, according to the joint Order of the Ministry of Industrial Policy and NAS of Ukraine it was created the Program Interagency Scientific Council consisted of the leading scientists and specialists. The Council is headed by the Vice President of the NAS of Ukraine.

The Interagency Council reviews the reports of project managers and creates expert commissions (working groups) that analyze and evaluate the scientific and technical level of projects in comparison with the global achievements, monitors the compliance with the law in the sphere of intellectual property objects

[51] Reports of the Ministry of Education and Science of Ukraine on budget program execution dated 2007,2008,2009

created in the framework of the program, prepares the recommendations on improvement of the procedure of program execution and project results application, and files it to the state customer.

On the seminar not only theoretical results are reviewed, but also the areas of their most effective practical application are determined. The meetings of the seminar take place twice per month.

Somewhat other system of the management was adopted regarding the STSTP "Nanotechnologies and nanomaterials" for 2010-2014.

Under the joint Order of the Ministry of Education and Science of Ukraine and NAS of Ukraine dated 10.12.2009 No 1118/635 it was approved the staff of Scientific Coordination Council of the mentioned above program, bureau of the Council and Research & Technical Councils on 9 scientific directions of the program.

The Hierarchical system of the Scientific Coordination Council allowed solving both strategic and tactical issues of the program implementation

But, in our opinion, it would be better to create the working body at the Council for prompt solution of the issues related to program tasks execution, and assign main scientific organizations for each area.

For grid technologies implementation and application for 2009 – 2013 under the Order of the MES of Ukraine dated 08.02.2010 No 89 the Scientific-Technical Council was created that accounted 14 people. The analysis of the Council staff showed that it mainly consists of senior officials overloaded by their direct functions. Particularly, they are: Deputy Minister, Rector and two Vice-Rectors, seven Heads of Chairs and Deans of Faculties, two managers of companies and computer centers.

Thus, without a working body the Scientific-Technical Council, in our view, will fail to carry out fully all the functions according to the Provision on state scientific and technical program approved by the Order of the Cabinet of Ministers of Ukraine dated 10.10.1995 No 796.

As one of the solutions to this problem is an optimization of the staff of Scientific-Technical Councils of the STSTP by means of involvement of scientific and technical employees of middle level.

The results of the STSTP could be better if the Ministry of Economy and Ministry of Finance had envisaged an annual funding in the state budget in accordance with the programs approved by the Parliament and Government.

Thus, in 2008 the percentage of financing of the national complex program of high knowledge-based technologies development compared to the volume of money envisaged by the budget of the Ministry of Industrial Policy made up only 1%, and State program of high frequency technologies development for 2005-2009 – only 0.7%[52]

For example, the program "Science in universities" was funded only 1.1%. In result, one of the program objective (the most significant in terms of money (13.5 million UAH) was not carried out, namely the equipment of material technical base for researches of the research-type universities.

[52] Gorbulin V. Ukraine needs new industrial policy that would meet the national interests // Zerkalo nedeli, 15.01.2010 - №1(781) – p. 8

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The main objective of the State program of scientific and technological development forecasting for 2008-2012 is to create a unified system of forecast, analytic and strategic marketing researches of scientific and technological development (period of implementation is 2008-2009)[53]. However, due to incomplete financing in 2008 (53.7% out of the amount envisaged by the program) two program tasks were not executed, which had to provide the system principles of the coordination of scientific and technical activity.[54]

In 2009 the STSTP received from the State budget only 3.6% of the budget expenditures for science. Considering the scientific parts of the STP this index made up 7.1% in 2008, and 9.6% in 2009[55].

Besides the incomplete financing, another negative factor in the STSTP implementation is not stable allocation of the required resources during the program life cycle. Thus, the State budget for some reasons did not envisage money for the implementation of the State program on researches in Antarctica for 2002-2010.

In 2007 the STSTP on development and implementation of the technologies of soya products production for 2005-2007 was not also funded.

It's necessary to remember that the process of targeted program formation must envisage typical technological schemes of iterative mode execution of separate stages, phases, procedures that are characterized as serious forecast and analytical researches, project and planned developments with the help of modern methods of forecasting, economic and mathematical modes. In other words, this process is a large-scale and time-consuming research work that must be used only in order to solve the most priority problems and those that can not be solved in a traditional way. That's way this work must be executed by leading scientific and project organizations and fully funded, as it is practiced in the post-industrial countries. Such organizations should have the status of main scientific organization (developer) of the STSTP in the system of program management. In Ukraine it's widely considered that the targeted programs even on the state level must be developed by the employees of the relevant ministries and agencies.

The drawbacks in the STSTP development and implementation mainly result from imperfection of the current legislative, legal and methodological basis as well as a number of organizational problems.

The Law of Ukraine "On state targeted programs" (2009) [56] doesn't envisage a range of main principles of the program targeted management and there is nothing about program management body.

If the STPs are monitored only by the Cabinet of Ministers of Ukraine, state customers and program managers, the issue of organization, coordination and operative control will not be solved dramatically.

There are no articles on statistical reports on STP progress. The Law doesn't envisage the financial mechanism of program development and implementation, mutual responsibility of state customers and achievement of program targeted indexes.

[53] The Programme was terminated according to the Decision of the Cabinet of Ministries of Ukraine N 740 on June 22

[54] On the results of the audit on how efficient the Ministry of Education and Science of Ukraine uses the money of the State Budget of Ukraine for the implementation of state targeted scientific and technological programs in 2008.
Kyiv: Court of Auditors, 2009 – http // www.ak-rada.gov.ua/contro/main/uk/publisharticle/16722660

[55] Information on the execution of the main provisions of the Law of Ukraine "On scientific and technical activity/ Letter of the MES of Ukraine to the Committee of the VRU on Science and Education dd 20.05.2010,№1/10-1225-25p..»

[56] Law of Ukraine "On state targeted programs" // News of the Verkhovna Rada of Ukraine, 2004 - №25 – p.352

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The Article 4 states “events, tasks and indicators of the state targeted programs shall be considered while the draft state budget of Ukraine is prepared for the relevant year”.

Thus, the financing of the STP is not complied with the possibilities of the budget during the whole period of program execution.

The Law envisages the obligatory state expertise of the STP projects, but there is not any article on objective, content and mechanism of this expertise. Only regarding the scientific and technical programs it is envisaged that their state scientific and technical expertise shall be done by the central executive authority on education and science, in other words, this authority makes an expertise of the programs that forms.

In the classification of the STP there are not investment and innovation programs irrespective that their implementation is envisaged by the Law of Ukraine “On innovative activity”. Besides, the notion “scientific programs”, for some reason, is restricted only by basic researches.

In particular, the item 22 states that the state customer appoints the program executive manager, it may be managers, Deputy Heads of central executive authority, NAS of Ukraine, Council of the Ministries of Crimea, regional state administrations.

Furthermore, under the Article 8 of the above mentioned Law the main tasks of the program executive manager are operational management and control over its development and implementation. Taking into account the stated functions, it would be more logical if the program managers were the Heads of big enterprises, corporations, concerns, senior officials of scientific organizations, famous scientists.

Under the i. 41 the state customer is allowed to create, if it’s required, Coordination (Scientific-Technical) Council headed by the program executive manager. But the functions, rights and duties of the mentioned Council are not envisaged. Moreover, it is not envisaged the following: specific executors and distribution of financing between them, only between the main spending units”.

In general, the process of the legal provision of state TARGETED scientific and technological programs carried out in Ukraine was far ahead in time compared to the STP of other area, but their methodical level is not perfect.

The Provision “On state scientific and technical program”, approved by the Cabinet of Ministers of Ukraine dd 10.10.1995 № 796, states that the central executive authority, Academy of Sciences (upon consent), National Scientific Center and only in some cases the leading State Scientific or design organization may become the program authority body. In our view, the central executive authority, Academy of Sciences may be a state customer on scientific & technical program, and management functions must be delegated to the program manager and main (not obligatory state) scientific organization. In the market environment the functions of state program management may be delegated to the association, consortium, or joint stock company, that are created with the view of implementing the program. The mentioned above Provision envisages other sources of the STSTP financing at expense of innovation funds and concerned enterprises, organizations and other investors, but there is not a mechanism of motivation.

According to the Provision the agreements (contracts) on program execution shall be signed by the program regulatory body and its executors. However, all the central executive authorities on scientific and

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technological development, including the Ministry of Education and Science of Ukraine, conclude the agreements (contracts) directly with each targeted project manager.

The Law of Ukraine "On state targeted programs" states only that the STP development and implementation is funded by the state budget and other sources envisaged by the Law, without their specification. The "Order of state targeted program development and implementation" doesn't envisage the financial mechanism of program development and implementation. Consequently, all the STSTP projects during 2003-2006 were funded only by state budget.

In Ukraine there are no any mechanisms of the STSTP project co-financing at the expense of enterprises, private investors, business angels, population.

Due to meager state support the project results are not "marketable" and can not evoke the interest of business organizations. It is "contributed" also by a discrete funding of the STSTP. In result, there are a lot of programi and projects which are not funded by the state.

There is no clear cooperation and coordination of theses issues between the Ministry of Education and Science, Ministry of Economy[57] and Ministry of Finance. As a result, the problem solving is in a vicious circle. On one hand, the effectiveness of the STSTP projects is a very low, on the other hand, the Ministry of Economy and Ministry of Finance knowing about the poor results of projects implemented in the previous years, gradually, decrease the volumes of financing.

The formation, financing and management of all the STSTP implementation on the priority areas of science and technology development by one state customer – the Ministry of Education and Science of Ukraine – doesn't contribute into enhancing the coordinating role and responsibility of other ministries and agencies, the organizations of which are the executors of STSTS projects, for resource provision, execution and practical application of the project results.

In the market environment, according to the Law of Ukraine "On state targeted programs" the events, tasks and indicators of the STSTP as well as other state targeted programs shall be a part of the state program of economic and social development of Ukraine for the relevant year, and the volume of expenditures for the STSTP implementation shall be envisaged by the relevant budget programs. However, in fact neither tasks nor indicators of the STSTP were a part of relevant State program and the program itself had only informative character, since it was not reviewed and approved by the Verkhovna Rada of Ukraine.

The State program for 2010, approved by the Parliament, envisages in its appendix only the list of STP which are planned to finance by the State Budget, and there is nothing stated about the program objectives and program indicators.

On the other hand, as it was demonstrated above, there were no any indicators that could be a part of the State program, since the majority of the STSTP and projects had not quantitatively expressed objectives.

Taking into account the experience of the EU and some countries of the former USSR (Belarus, Kazakhstan), the institute of framework programs significantly increases the level of inter-program

[57] The Ministries have changed their names during 2011 after the Administrative reform, initiated by the President of Ukraine in December of 2010

coordination. Nevertheless, in the beginning of 2000 the attempt to develop the Framework State Program of Scientific and Technological development of Ukraine failed.

The state program on scientific, technological and innovation development forecasting for 2004-2006 played an integrative and coordinative role. In the framework of this program the expert groups of higher lever were organized for 15 thematic areas, and these groups' proposes were based on polling of about 700 scientists and industry experts[58].

On the stage of the STSTP formation only some projects are evaluated. All the programs are not evaluated on the subject of their relevance to the priority areas of science and technology development. If it was not a case, there would be a possibility to be focused only on the most relevant programs and allocate money only for really high-tech programs and projects.

The interim and final results of the STSTP are not monitored and evaluated with the purpose of getting reliable information on 1) actual costs for the program (project) implementation, 2) achievement of the objectives 3) evaluation of management quality 4) improvement of the means of program implementation.

The legislative acts and official methodological recommendations on problems selection for program solution, program development, their evaluation, or monitoring are either not updated or are missing altogether.

Conclusions

State programmes are strategic instruments of governments to target scientific competence and other development resources into areas and topics of national importance. State programmes have become, thus, one of the main science, technology and innovation policy instruments ever used in Europe and much beyond. At the same time, each country (or region / agency) has its own way of defining, targeting and most importantly conducting its programmes. In the overall mix of innovation policy instruments in Europe, state programmes have remained as one of the key policy instruments, but have also been complemented with a number of other instruments. Furthermore, as a general trend, the nature of state programmes has broadened over the years, seldom only focusing on mere scientific discoveries, but more and more on technology, business cooperation, innovation and cluster development. When looking at the current programme practices in Europe and Ukraine, the following differences can be noticed:

Budget volume: The allocated budget in Europe is higher than in Ukraine: In Europe projects of smaller programs can be around 90.000 € or in the case of bigger programmes is around 2-3 Mio €. In Ukraine, even in the most funded programmes the financing of each project was between 15.-18.000 € (2007, 2009 data).

Budget security over programme lifecycle: In Europe, researchers and research institutes can plan with the allocated programme budgets. In Ukraine the Ministry of Economy and the Ministry of Finance do not jointly envisage annual funding in the state budget in accordance with the programs approved by the Parliament and Government. In Ukraine it often happens that Programmes adopted and announced by Parliament still unexpected do not receive the foreseen budget. The budget law has superiority to laws

[58] Forecast of scientific, technological and innovative development of Ukraine / Collection. – К.: Fenix, 2006 – 160 p.

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related on implementation of programmes. It can easily happen programmes only receive only 1 % of the promised budget.

Participation enterprises: In Europe, the participation of enterprises in research and innovation programmes and projects is often a prerequisite of funding allocation. In Ukraine, enterprises participate in less than 1% of state Science and Technology (S&T) and innovation programmes.

Public-private cooperation: In many EU countries pubic-private collaboration is promoted. Project co-funding by the private sector is often a criterion for funding decisions. In Ukraine there are neither effective instruments nor mechanisms to install public-private-partnerships.

Internationalisation: Framework Projects are only granted to international research consortia. Funding decisions in the Member States also increasingly depend on the degree of internationalisation of the R&D proposals. In Ukraine international research projects are rare phenomena.

Monitoring/ evaluation: In Europe, the monitoring of programmes is foreseen in the programme design. Often programmes are monitored several years after programme completion as sometimes results might show after longer periods of time. In Ukraine, monitoring/evaluation is not a key element of programme implementation. Not all projects are being evaluated. Also there are no relevant indicators in State programs (e.g. no parameters of new technologies, economic viability, or commercial usage of technology). In many cases, neither interim nor final programme results are monitored or evaluated with regard to budget spending, achievement of objectives, or quality. Also in the State program for 2010 programme objectives and programme quantitative indicators are not mentioned

Evaluators' selection and competences: Evaluators of Framework Programmes and projects are selected based on their experience in the subject matter. Also evaluators sign documents declaring they have not conflict of interest. In many member countries evaluators are from foreign countries. In Ukraine evaluators receive no training on how to carry out evaluations. Often evaluators can be participants in another project of the same programme. As a result, evaluations are often carried out in an amateurish way and are not objective. Foreign experts do not take part in the evaluation process.

Programme development: In Europe, programmes are often designed by funding agencies in close collaboration with industry and researchers (e.g. Tekes or Academy of Finland). In Ukraine, programmes are developed by ministry, state committee and agency staff.

Programme management: In Europe, programme management is a key criterion for funding decisions and it is evaluated during the programme delivery. In Ukraine, the programmes are not well designed with regard to financial planning, co-ordination between different projects or general implementation.

Programme manager selection: In Europe programme managers are often mangers of enterprises or leading scientists. In Ukraine programme managers are appointed by the state and are high ranking officials of state bodies such as central executive authorities, top officials of the National Academy of Sciences (often level of Vice President), regional state administrations or the like.

Funding criteria: In Europe funding decisions are taken by groups of independent decision makers, according to transparent procedures and selection criteria. In Ukraine funding decisions are not transparent enough.

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Resolving the issue of involvement and attractiveness of state programmes towards business sector should be started from the definition and design of the programmes themselves. Fortunately, there are a wealth of examples and practices availble in European countries on how this can be achieved. A benchmarking exercise into this topic would be beneficial.

Monitoring and evaluating programmes and their results is, most importantly, the means for government and programme financiers to learn and upgrade their programme competences. It is also a way to secure that ongoing programmes are reaching their targets or being adjusted to changed operating conditions when necessary. Systematic evaluation practice should be in place in all programmes and properly taken into account already at the inception of programmes (in terms of defining success and performance indicators and resourcing mid-term and ex post evaluations).

It would be beneficial to carry out a constructive assessment of Ukraine state programmes, with the aim for developing a set of concrete measures on how to address and involving business sector innovation.

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Chapter 10

State and regional policy for SMEs on research and innovation (Nina Isakova, Gudrun Rumpf)

Introduction

In the contemporary knowledge economy the competitiveness of enterprises depends on their innovative ability and technology[59.] Innovation is no longer seen as the exclusive domain of technological leaders. The latter remain crucial for international competitiveness, but at the same time sustainable economic growth requires innovative approaches in all the spheres – knowledge-based services, organisation of business, marketing and so on. In a knowledge-based economy innovation in low and medium technology firms is no less important than that in high-technology enterprises for the sake of a better balance in industrial policy. [60.] To this end, companies need to co-operate with different actors – suppliers and users of new technologies, public research institutes and others [61].They need to have access to knowledge, and intensify innovation strategies, which are based not just on internal innovation (which might be difficult, especially for small enterprises), but also using the strategies described as 'open innovation'. In a world of widely-distributed knowledge, companies are advised not to rely entirely on their own research, but should also access processes or inventions from other companies. [62]

The relationship of progress in SME sector development and innovation in enterprises has recently received considerable attention of scholars and policy makers. For instance, the impact of firms' technological capabilities and wider environmental characteristics on the overall growth of SMEs was studied by Hashi and Krasniqi [63,]who compared three advanced Central Eastern European countries (Poland, Hungary, the Czech Republic) with three laggard countries in South Eastern Europe (Albania, Macedonia, Serbia and Montenegro). This international research proved that technological capability is directly related to the ability of firms to use new processes, produce new products, develop new organisational structures conducive to growth, and network in external economies. Developing an innovation-driven economy is crucial for Ukraine's competitiveness if it aims to gain a competitive advantage which is potentially more sustainable than that based mainly on price [64] (Porter 1990).

[59] Brown, T.E. and J. Ulijn (eds) (2004), Innovation, entrepreneurship and culture: the interaction between technology, progress and economic growth. Cheltenham: Edward Elgar.

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[63] Hashi, I and B.Krasniqi (2008), 'Entrepreneurship and SME growth: evidence from advanced and laggard transition economies', http://ssrn.com/abstract=1125130.

[64] Porter, M.E. (1990), The competitive advantage of nations, New York: Free Press.

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European experience

Recent experience has shown that some governments have been able to engender a climate where SME innovation can flourish, creating a more dynamic economy and greater employment opportunities. In fact, the national climate for private sector innovation has an impact on businesses of all sizes, but public policies and attitudes that constrain creativity, competition, risk-taking and appropriate financial returns on successful ventures can particularly affect small and medium-sized enterprises.[65]

SMEs in general and especially innovative SMEs are facing a set of challenges that are explained by their rather general limitations based on their size in terms of financial and human resources. Government support is necessary to place innovative SMEs in a position where they can fulfil the role they have been assigned with in innovation systems, i.e., to seek technological and economic niches; to adopt and utilise research results and to transform economy to be more knowledge-based and competitive. By innovation policies governments should create a framework and context in which SMEs are being more innovative.

The importance of small and medium-sized enterprises (SMEs) for the economy has received increasing attention during the last years. Around 21 million SMEs exist in the EU-27, representing more than 99 % of all enterprises. This share is similar in other major economies, such as the US or Japan. As the main engine of net employment growth, SMEs employ two thirds of the total workforce. Micro enterprises, which employ less than 10 employees, constitute the majority of all companies.

Achievements in innovation policy in the EU play a significant role in innovation development of European countries. They are also of importance for countries in transition, including Ukraine, as governments can use the experience and draw on best practices of state policies and support in advanced market economies. National and regional authorities have established initiatives to support R&D and innovation for SMEs. The European Community policy instruments complement and enhance the many current national and regional initiatives by facilitating, for example, tax incentives, access to finance, grant schemes, and information points.

In the EU following the Oslo Manual (OECD), innovation is understood as the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations. A product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics. A process innovation is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software. A marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing. An organisational innovation is the implementation of a new organisational method in the firm's business practices, workplace organisation or external relations.

[65] Enhancing the Competitiveness of SMEs through Innovation. Round table 1. SME conference business symposium. Bologna 2000.

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Ukraine has accepted the EU definition of innovation which is reflected in the law of Ukraine "On innovation activities" (40-IV of 04.07.2002 with amendments of 03.06.2010) and applied by the State Services of Ukraine on Statistics (State Committee of Ukraine on Statistics till December 2010) in the collection of data on innovation, including innovation in enterprises.

Following the EU Competitiveness Council conclusions of 04.12.2006, innovation policy is understood "as a set of instruments aiming at improving access to financing in support of innovation, at creating an innovation friendly regulatory environment and demand for innovation as well as at reinforcing the activities of institutions relevant for innovation, including the links between research institutions and industry". Based on this definition, innovation policy typically "addresses horizontal issues, consisting of various public policies, thus requiring effective governance".

In Ukraine this definition of innovation policy is broadly accepted at the national level, which is also reflected in official documents and legal acts related to innovation. This definition served as base for the structure and contents of the "Strategy for innovation development of Ukraine for 2010-2020 in conditions of global challenges", which is under discussion in Verhovna Rada.

Innovation support is defined as any action or initiative instrumental to implement innovation policy which is taken or (co-)financed by the public sector with the aim of influencing innovation processes and capacities in enterprises and thereby enhancing their competitiveness. Innovation support can be provided in a direct or indirect form. Direct innovation support affects innovation processes in enterprises through the provision of specific resources (e.g. financial, human or organisational) or information which is geared towards innovation activities. Direct innovation support publicly supports measures that are developed for the benefits of enterprises. Indirect innovation support affects the legal, economic, social, cultural framework conditions that influence innovation processes in enterprises.

The process by which innovations are generated is related to a variety of factors outside companies, and the combinations of these are referred to as innovation systems. In the process by which technology is commercialized and launched onto the market, the social and economic systems, which are different in individual countries, have a great impact, so the innovation systems of countries are referred to as national innovation systems[66]

In the contemporary knowledge-based economy it is essential for government, R&D institutions and business to cooperate in strengthening the innovation system so that the abilities of the nation are utilized to the fullest extent in order to continuously and effectively achieve innovation. It is crucial to prepare a variety of funding schemes to correspond to the various stages of R&D development, and to build the mechanisms to develop promising research results from the basic research stage through the creation of new products and services.

In Europe with small and medium-sized enterprises (SMEs) being its main target, the Competitiveness and Innovation Framework Programme (CIP) supports innovation activities (including eco-innovation), provides better access to finance, and delivers business support services in the regions. It encourages a better take-up and use of information and communication technologies (ICT) and helps to develop the

[66] Ministry of Education, Culture, Sports, Science and Technology of Japan www.mext.go.jp/.../hpag200201_2_006.html

information society. It also promotes the increased use of renewable energies and energy efficiency. This programme (CIP) runs from 2007 to 2013 with an overall budget of € 3621 million and is divided into three operational programmes. Each programme has its specific objectives, aimed at contributing to the competitiveness of enterprises and their innovative capacity in their own areas, such as ICT or sustainable energy:

- The Entrepreneurship and Innovation Programme (EIP)
- The Information Communication Technologies Policy Support Programme (ICT-PSP)
- The Intelligent Energy Europe Programme (IEE)

The Entrepreneurship and Innovation Programme (EIP), one of the specific programmes under the CIP, seeks to support innovation and small and medium enterprises in the EU, focusing on:

- Access to finance for SMEs through "CIP financial instruments" which target SMEs in different phases of their lifecycle and support investments in technological development, innovation and eco-innovation, technology transfer and the cross border expansion of business activities.
- Business services: the "Enterprise Europe Network". Business and innovation service centres all around the EU and beyond provide enterprises with a range of quality and free-of-charge services to help make them more competitive.
- Support for improving innovation policy: Supports transnational networking of different actors in the innovation process and innovative companies, including benchmarking initiatives and the exchange of best practice.
- Eco-innovation pilot and market replication projects for the testing in real conditions of innovative products, processes and services that are not fully marketed due to residual risks and that are aimed at reducing environmental impacts, preventing pollution or achieving a more efficient use of natural resources.
- Support for innovation and SME policy-making through contracts and grants: Analytical work and awareness raising activities (i.e. conferences and studies) on certain industrial sectors, SMEs or innovation policy are organised to inform and support policy-makers, and make policy suggestions to increase cooperation between EU Member States.

As also deliberated in chapter 7, the Enterprise Europe Network is the largest network of contact points providing information and advice to EU companies on EU matters. It is made up of close to 600 partner organisations in more than 40 countries, promoting competitiveness and innovation at the local level in Europe and beyond. The Network offers support and advice to businesses across Europe and helps them make the most of the opportunities in the European Union. Services are specifically designed for small and medium enterprises but are also available to large enterprises, research centres and universities across Europe and beyond.

Europe INNOVA is an initiative which aspires to become the laboratory for the development and testing of new tools and instruments in support of innovation with the view to help innovative enterprises innovate faster and better. It brings together public and private innovation support providers such as innovation agencies, technology transfer offices, business incubators, financing intermediaries, cluster organisations and others. Launched in 2006, Europe INNOVA was designed to identify and analyse the drivers and barriers to innovation within specific sectors, to lead to sound and targeted support policy measures. Its

sector-based approach reinforced cooperation between business clusters, finance and standardisation practitioners in Europe through the establishment of networks, i.e. learning platforms for exchanging experiences, good practice and knowledge to better serve SMEs. In 2009, a new set of Europe INNOVA actions was launched, based on European Innovation Platforms in three high priority policy areas: transnational cluster cooperation, knowledge-intensive services, and eco-innovation. The actions are oriented towards the development and testing of new innovation support services for SMEs, notably start-ups, delivered in the field by public-private partnerships made up of European professionals in innovation. The support services were tested in view of their wider application, e.g. by the Enterprise Europe Network. The initiative also supports the Lead Market Initiative by injecting dynamism into entrepreneurial innovation via catalysis between supply and improved demand factors, which unleashes the innovation dynamics in lead market areas covered by the European Innovation Platforms.

PRO INNO Europe is an initiative which aims to become the focal point for innovation policy analysis, learning and development in Europe, with the view to learning from the best and contributing to the development of new and better innovation policies in Europe. The initiative brings together public actors responsible for innovation with a view to fostering transnational cooperation on support for innovation through various instruments. Launched in 2006, PRO INNO Europe has supported closer cooperation between innovation policy makers at different levels, thus contributing to the creation of a European Innovation Space. New innovation policy concepts were jointly developed and tested, helping improve their efficiency and speed up their implementation throughout Europe. In 2009, new actions were launched, focusing on specific priority areas, such as clusters, eco-innovation and services.

In Europe it is believed that the identification and further dissemination of “good practice” is no longer sufficient. To make real progress, participating countries and regions have to work closer together in search of “better practice” in support of innovation and subsequently apply these ideas. The actions closely reflect the recommendations of the Communication "Putting knowledge into practice: A broad-based innovation strategy for the EU" notably in relation to making the EU more innovation-friendly through wide partnerships involving consumers and citizens and promoting cooperation among stakeholders.

Adopted in June 2008, the "Small Business Act" (the follower of the Small Business Charter) for Europe (SBA) reflects the Commission’s political will to recognize the central role of SMEs in the EU economy and for the first time puts into place a comprehensive SME policy framework for the EU and its Member States. It aims to improve the overall approach to entrepreneurship, to irreversibly anchor the “Think Small first” principle in policy making from regulation to public service, and to promote SMEs’ growth by helping them tackle the remaining problems which hamper their development.

Formation of clusters is widely used in Europe and other countries of the world. A cluster is defined as a group of firms, related economic actors, and institutions that are located near each other and have reached a sufficient scale to develop specialised expertise, services, resources, suppliers and skills. They are a real economic phenomenon that can be economically measured, whereas clusters policies are an expression of political commitment (and cluster initiatives the organised efforts) to support existing clusters or the emergence of new clusters.

Cluster policies are designed and implemented at local, regional and national level, depending on their scope and ambition. It is the role of the EU to facilitate and add to such efforts, notably by promoting

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research and education excellence and entrepreneurship, fostering better linkages between industry (especially SMEs) and research, and encouraging mutual policy learning and transnational cluster cooperation.

Current European innovation policies are focused on projects to stimulate SMEs to participate in R&D. In the EU, a state programme is typically an open or semi-open platform for collaboration, typically among research, business and government. Public-private partnerships provide the framework not only for shared funding of the technology transfer process but also for shared use of R&D outcomes, information, new technologies, intellectual property, etc. They commonly used for pre-market development of new public research findings and ideas, supporting new innovative companies including creation of incentives for public bodies to establish start up companies, facilitation of commercial exploitation of new public R&D products, information services, etc. Public-private partnerships are considered one of the principal mechanisms to improve innovation efficiency and attract R&D investments. Project's co-funding by the private sector and the participation of enterprises in research programmes and projects are often a criterion for funding decisions.

However the current Innovation Performance gap between the US and the EU is mainly related to insufficient patenting, weakness of the higher education system for life-long learning and shortcomings in R&D in the private sector. Because of the variety of cultures and economies within the EU, the innovation performances are very different per region and per sector. Special programmes have been developed for the 10 new EU member states to support the recent achievements in improving their innovation performance. Furthermore special networks have been established within sectors (Gate2Growth Networks) and in the regions (Pilot action of Excellence on Innovative Start-ups, PAXIS). New innovation policies of the European Commission are defined to improve competitiveness, growth and productivity. New innovation programmes do not only focus on the 'high-tech' sectors but also include the more traditional industries. Where in the 80s the trend in business strategies was 'big is beautiful' and in the 90s 'small is beautiful' was leading, this decade will be characterized by 'intelligent is beautiful'. The EU stimulates an 'open innovation' model where knowledge and experiences are shared among all actors within network platforms. The 'Open Innovation' concept[67] stimulates SMEs to conduct or participate in R&D. The EU aims to promote the interaction of a broad range of policy areas, such as structural funds, state aid policies, education and training. Synergies will be created in national and regional efforts within one framework of common objectives. This will need the mobilization of all actors in policy making, enterprises, research, education, trade unions, civil society, etc. Other challenges for SMEs that are identified in the EU Innovation Action Plan are in the field of access to finance and access to qualified human resources, such as the limited number of scientists that are willing to continue their careers within SMEs.[68]

Nauwelaers and Wintjes[69,] based on the empirical findings achieved in a comparative research, involving 40 innovation policy instruments in 11 European regions, argue there is a need in a new innovation policy

[67] Chesbrough, H.W. (2003), Open innovation: the new imperative for creating and profiting from technology. Boston: Harvard Business School Press.

[68] R&D and Innovation in SMEs A joint Japan – EU seminar Tokyo, February 2005.

[69] Nauwelaers C. and Wintjes R. (2000) SME policy and the regional dimension of innovation: Towards a new paradigm for innovation policy? MERIT, Maastricht Economic Research Institute on Innovation and Technology, Research Memoranda, 023.

paradigm and a shift in rationale and in broad orientations for innovation policy, addressing SMEs in their regional context. The main role for innovation policy, which aims to increase the capacity of a region and the capabilities of its SMEs to innovate, is to foster interactive learning within the firms and within the regions. This calls for an interactive mode of policy intervention.

Many EU Member States have national SME support programmes that try to take into account the regional dimension[70]. In Austria innovative SME start-ups supported by a programme known as Innovation Programme Enterprise Dynamics. The programme was launched in 1996 and gives both direct support for innovation expenditures (up to 15 %) and loan guarantees (up to 80 %). The funding can amount up to € 750 000 for a firm per year. The regional dimension of the programme arises from the selection process, in which regional considerations are taken into account. In Hungary there is a programme that specifically targets start-up firms in backward micro regions. The programme 'Complex technology acquisition of start-up firms in backward micro-regions' fosters technical change in regions that suffer from economic hardship.

In the Belgian region of Flanders technology transfer between universities and enterprises is facilitated by the TETRA Fund. The aim of the Fund is to increase innovative capabilities of SMEs by making researchers at universities and other institutes of higher education (HEIs) more accessible to companies. Participating HEIs are also expected to benefit from the resulting interactions with businesses. The Fund finances technology-based applied science projects. Financing for the Fund is provided by the Flemish Government. The Fund is administered by the Institute for the Promotion of Innovation by Science and Technology in Flanders.

Often it is the case that information has to be available locally in order to be really useful. That is why advisory bodies supporting innovation in SMEs have to establish regional services. In the United Kingdom national and regional Business Link organisations offer online, face-to-face and phone information for SMEs. There are now more than 40 Business Link organisations in nine regions of the country. In England the Links are funded mainly by Regional Development Agencies. In addition to advice the Links offer subsidised loans. In the Czech Republic the government supports the Chamber of Commerce that provides 180 information points for entrepreneurs. At these information points entrepreneurs can obtain basic information that they need in starting and managing their businesses. In addition, there is regional business and innovation information available as well as information about available public business support measures.

In France Regional Centres for Innovation and Technology Transfer (CRITT) provide many kinds of technological services for SMEs. These Centres were established already in the early 1980s, and there are now more than 130 of these associations. Some of them are able to finance their activities from fees they get from client companies while others rely on government support. The CRITT Centres take an active role in promoting innovation, as they visit companies, disseminate information and provide services facilitating technology transfer. Some of the most successful CRITT Centres have been designated as Technological Resources Centres (CRT). In order to obtain that status, a CRITT Centre has to fulfil certain qualifications

[70] *Description of* r*egional examples are based on* Lemola T. (2010), Building an enterprise-centred national innovation system. Unpublished report for the project "Enhance Innovation Strategies, Policies and Regulation in Ukraine – EU Project EuropeAid/127694/C/SER/UA", Advansis Ltd.

that concern professional quality, provision of services to SMEs and up-to-date linkages with research bodies.

Evidence from different countries proves there can not be "one-size-fits-all" policy portfolio. Regional differences in innovation capabilities call for a tailored mix of policy instruments to support innovations in SMEs.

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Ukrainian experience

National perspective

Since the nation obtained independence in 1991, the Ukrainian SME sector had been gradually developing regardless of the slow pace of economic reform and questionable commitment among officials in the early

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years of transformation[71]. A large number of Ukrainian entrepreneurs are (or started as) small traders. Economic crisis in the first years of independent Ukraine and growing unemployment pushed the majority of (potential) small entrepreneurs to start businesses, which helped to avoid social unrest in the early 1990s. While in the first years of reforms small business played a role in fighting shortages of food and consumer goods – by exploiting the opportunities of import from China, Poland, Turkey and other countries – in more recent years entrepreneurs have started to respond to growing demand of consumers and small businesses by setting up small construction firms, consumer- and business-oriented services and manufacturing businesses.

Since the market reforms have been launched in Ukraine, a progress was made in the formation of market institutes and creation of basic conditions for entrepreneurship development and innovation. But the Ukrainian state policy in SME development and innovation does not meet the need of the country to build a knowledge-based economy. SMEs constitute an integral part of domestic entrepreneurship and are expected to speed up structural changes in the economy and increase efficient use of national resources **(Table 10.1)**. Yet the state support to innovation in SMEs does not address the challenges of the enterprises.

Table 10.1: Distribution of Ukrainian enterprises by size, 2009

Indicator	Large	Medium	Small	SMEs
Number of enterprises per 10,000 people	NA	5	75	80
Share of enterprises in total number, %	0.5	5.8	93.7	99.5
Share of employment in total employment, %	39.6	34.4	26.0	60.4
Share of products (services) sold in total sales, %	45.6	37.7	16.7	54.4

Source: Ukrstat

Date of last modifications: 28/04/2011

Despite some positive trends in the development of SMEs in Ukraine there are a number of problems and deficiencies. The main problem areas include (but are not limited to):

- Legislation regulating business activities;

[71] Smallbone D. and F. Welter (2008), Entrepreneurship and small business development in post-socialist economies, London: Routledge.

- Time-consuming and complexity of obtaining permits to start doing business;
- Financial constraints of small businesses and access to external finance (bank loans);
- Lack of resource and information support to small businesses by a network of business support providers;
- Low level of professional training (free or at a reduced price) for small businesses;
- Low level of innovation in SMEs.

At present the SME sector is characterised by sectoral disproportions (in 2009 trade enterprises comprised 61,5% in total volume of products (services) of small enterprises and 25% in small enterprises employment) and regional disproportions (the number of SE per 10,000 population in 2009 was 75 in Ukraine, 259 in Kiev city, 44 in Ternopilska oblast); a high level of shadow economic activities; a low performance of enterprises (the share of small enterprises with losses in 2009 amounted to 39,9%).

Regional variations may be caused by differences in economic structures, demand conditions and institutional arrangements; which in turn can have an effect on the attitude of the population towards entrepreneurship, hence, the ability of the small business sector to develop[72].

These features have an adverse influence on the innovation capacity of SMEs. Further development of the Ukrainian SMEs should be accompanied with an evolution in public policy which would meet the actual needs of growing a robust private sector. Public policy should address the key issues hampering SMEs to fulfil their roles in socio-economic development, i.e., enlargement of the assortment of domestic products and services, creation of an effective competitive environment, revival of the entrepreneurial initiative of the population, increase in flexibility of the employment system, strengthening regional economies and innovation.

In Ukraine today the innovation and R&D capacity of SMEs remains low, which calls for policy amendments in SME development in general and innovation in SMEs, in particular. The most recent data on innovation in enterprises are available for 2010. According to statistics in **Table 10.2**, there was no growth in the share of enterprises with innovations in the last several years, which might be caused by the impact of the world financial crisis of 2008. The total expenditures on innovations have decreased, in particular expenditures on R&D and the purchase of new machinery and equipment.

Typically the Ukrainian enterprises rely mainly on their own funds to pursue innovations, which in 2007 amounted to 74%. After the world financial crisis of 2008 the share of own funds spent on innovations reduced to 60% in 2010 (**Table 10.3**). The level of state budget support of innovations in enterprises remains very low and has reduced from 1.3% in 2007 to 1% in 2010. No positive change has occurred in innovation activities of industrial enterprises in the several recent years, although an insignificant increase in new technological processes was reported (**Table 10.4**). The share of innovation products in total industrial output reduced from 6.7% in 2007 to 3.8% in 2010.

[72] Smallbone D. and F. Welter (2008), Entrepreneurship and small business development in post-socialist economies, London: Routledge.

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Table 10.2: Innovation activity of enterprises in Ukraine

	Share of enter-prises with inno-vations, %	Total expenses, mln UAH	Including on account of					
			R&D	including		Acqui-sition of other external know-ledge	purchase of machi-nery, e-quipment and software	other expenses
				Intra mural R&D	Extra mural R&D			
2007	14.2	10850.9	986.5	793.6	192.9	328.4	7471.1	2064.9
2008	13.0	11994.2	1243.6	958.8	284.8	421.8	7664.8	2664.0
2009	12.8	7949.9	846.7	633.3	213.4	115.9	4974.7	2012.6
2010	13.8	8045.5	996.4	818.5	177.9	141.6	5051.7	1855.8

Source: Ukrstat

Date of last modifications: 28/04/2011

The update of the official statistics for 2010 with regard to innovation in enterprises is a strong argument in favour of the introduction of state and regional policy measures to support SME development helping companies to recover from the consequences of the world financial crisis of 2008 and to stimulate state policy initiatives for fostering innovation in SMEs.

Table 10.3: Financing sources of innovation activities of manufacturing enterprises

	Total sum of expenses	Including on account of			
		own funds	state budget	foreign customers	other sources
	million UAH				
2007	10850.9	7999.6	144.8	321.8	2384.7
2008	11994.2	7264.0	336.9	115.4	4277.9
2009	7949.9	5169.4	127.0	1512.9	1140.6
2010	8045.5	4775.2	87.0	2411.4	771.9

Source: Ukrstat

Date of last modifications: 28/04/2011

Table 10.4: Innovations in manufacturing enterprises

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	Share of enterprises, that introduced innovations,%	New technological processes put into service, process	of which economical and resource savings	Innovative types of products put into production, names	of which new types of equipment	Share of the innovation products sold in industrial output, %
2007	11.5	1419	634	2526	881	6.7
2008	10.8	1647	680	2446	758	5.9
2009	10.7	1893	753	2685	641	4.8
2010	11.5	2043	479	2408	663	3.8

Source: Ukrstat

Date of last modifications: 28/04/2011

High economic growth rates in the world today are provided through the introduction of new technologies and innovation, development and production of new products and services. In this process an important role is played by the R&D institutes – producers of new knowledge.

Despite the fact that a large share of R&D is financed by the state budget, the Ukrainian state-funded research institutions do not contribute to economic growth to push innovations forward, which may be caused by a relatively low demand for their scientific output on the part of enterprises. Hence, an important task at present is to create conditions under which Ukrainian enterprises would be interested to implement new scientific results and, in some cases, to perform in-firm research and development followed by innovations.

More specifically in Ukraine there are neither effective instruments nor mechanisms to install public-private-partnerships. In the Act of Ukraine „On Public-Private-Partnership (PPP)“ dated 1.7.2010, R&D and innovation are not foreseen in the list of areas of PPP enforcement. In Ukraine, enterprises participate in less than 1% of state science and technology programmes (in 2004 – 2006). In Ukraine there is no mechanism of co-financing the projects included into the state scientific and technical programmes at the expense of enterprises, private investors, business angels, or community funds. There are no state programs targeted at new business or other ways of commercialization R&D results. Innovation in the business sector is mainly financed from companies' own funds, which tends to reflect to the lack of available other sources of innovation funding. This is a structural challenge particularly to the small and medium-sized companies. As previously stated the participation of enterprises in research and innovation programmes and projects is often a prerequisite of funding allocation. In Ukraine, enterprises participate in less than 1% of State Science and Technology programmes.

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The main obstacles to innovations in industrial enterprises perceived by Ukrainian entrepreneurs include (in order of declining importance) the following:

- Deficit of own capital (79.5%);
- High level of innovation expenditures (57.1%);
- Insufficient financial support by the government (54.3%);
- High risk (40.7%);
- Drawbacks of legislation (38.7%);
- Long period of recoupment (38.2%);
- Lack of solvent clients (for innovation) (32.1%);
- Difficulties in co-operation with other enterprises and research institutions (19.7%).

These obstacles can be grouped into three key areas in which entrepreneurs need external assistance (support from the state): finance, better regulation, and cooperation with other innovation actors (mainly producers of new knowledge/technology, but also other sources of new knowledge and innovation expertise, e.g., other enterprises, consultancies, intermediaries). These policy priorities accord with those identified in the countries of the European Union.

The Ukrainian innovation policy fails to respond to the challenges of innovation in SMEs and innovation cooperation between R&D institutes and business, which calls for the design and implementation of new measures to address these issues.

Recent years have witnessed the introduction of new policy measures to foster innovation in the country, which should, inter alia, promote innovations in SMEs:

- "Strategy of innovative development of Ukraine on 2010 – 2020 in the conditions of globalization challenges";
- "Creation of innovation infrastructure in 2009 – 2013";
- "Tax Code"
- "The Programme on Investment and Innovation Activities Development in Ukraine";
- Initiative to create "The National Venture Company"

The broad national programmes to foster SME development and innovation have had a limited positive effect on the situation in the economy mainly because they were not supported financially and had no specific policy instruments to reach the goals. This can be proved by the examples of the "Strategy of innovative development of Ukraine on 2010 – 2020 in the conditions of globalization challenges" and the State special economic programme "Creation of innovation infrastructure in 2009 – 2013". These programmes did not receive funds from the state budget and their main tasks (at least in 2009 and 2010) were not completed. Part of the reason why the national innovation policy documents fail to reach their objectives is that they are not supported by specific policy instruments which would be efficiently managed by government institutes responsible for the tasks of innovation development and SMEs.

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The Tax Code supersedes and consolidates all separate tax laws and regulations that were in force in Ukraine[73]. In its current form, the Tax Code does not introduce changes in favour of SME development and innovation. According to international experts, "*For many years, international organisations (International Monetary Fund, World Bank, Organisation for Economic Co-operation and Development, European Union) and the private sector have been calling for tax reforms in Ukraine. From the macro perspective of the international finance institutions, reforms are needed to improve the tenability and transparency of public finances, strengthen public investment, and encourage economic growth. The main problem areas identified in the past are the inadequate pension system, low public investment, high social expenditure, ineffective public (tax) administration, high tax burden and confusing tax legislation that encourages fraud and fuels the shadow economy. In response, the private sector has been demanding a reduction in the tax burden, greater transparency in the interpretation and implementation of the rules, adoption of international (EU) standards, and anti-corruption and anti-fraud measures*"[74].

The business community is actively seeking improvements to the Tax Code. The amendments should make the Tax Code more "SMEs friendly" and foresee stimuli for innovations in SMEs.

The Programme on Investment and Innovation Activities Development in Ukraine, recently approved by the Resolution of the Cabinet of Ministers of Ukraine (N 389, February 2, 2011), is a comprehensive document describing the current situation in innovation system of Ukraine and setting the main objectives in innovation development. The Programme's objectives are "*to create favourable conditions for investment attraction in backbone industries and innovation infrastructure development, to improve state support effectiveness, to increase investment, economy crediting, state capital investments, and to ensure their concentration for production modernization, high technologies introduction*". Judging by the "backbone" industries mentioned in the programme, which are "fuel and power, agro-industrial, housing and utility, machine-building complexes, and transport infrastructure", this policy initiative is more focused on large enterprises, rather than SMEs. Similar to other government policy initiatives the programme does not foresee any (at least provisional) budget for the implementation of innovation projects. This may lead to a situation when the consequent laws on state annual budgets will refrain from providing the funding to enterprises within this programme. The National Action Plan for 2011 foresees a design of instruments to provide finance for innovations in enterprises via creation of the National venture company (see below).

The "Innovation in SMEs" issue is simultaneously an object of SME policy and innovation policy. Better results could be achieved in case of an efficient policy design and delivery in both areas. Moreover, the two policies should compliment one another and be coherent. In this respect *cooperation is needed* between the government agencies responsible for SME development and for innovation. In the Ukrainian context the key government bodies are the State Committee of Ukraine in the Issues of Regulatory Policies and Entrepreneurship (After the administrative reform of December 2010 SCURPE is a department in the Ministry of Economic Development and Trade) and the State Agency in the Issues of Science, Innovation and Informatization (SASII).

[73] KPMG (2010), Draft Tax Code of Ukraine – Principle Changes, KPMG News Flash, June 25, 2010.
[74] UEPLAC (2007), Comments on the Draft Tax Code of Ukraine Kyiv, 5 November 2007. http://ueplac.kiev.ua/downloads/outputs/comments_on_the_draft_tax_code.pdf.

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Aimed at promotion of innovation friendly environment in Ukraine the State Agency in the Issues of Science, Innovation and Informatization (SASII) has undertaken the following steps in the first half year of 2011[75]. A draft Law of Ukraine "On amendments to some legislative acts of Ukraine on stimulation of innovation activity" was prepared, which (if approved) would introduce new mechanisms of innovation support and, in particular, make available venture capital for innovation. A draft Law of Ukraine "On amendments to some laws of Ukraine on activity of science parks" was prepared (Verhovna Rada has submitted the draft law to the President of Ukraine on June 22, 2011). The new law on science parks defines eligibility for state support of entities working under the science park scheme and will promote the implementation of R&D results produced by research institutions and higher education institutions (universities), thus stimulating innovation.

Draft government documents were prepared by SASII to improve innovation infrastructure:

- "On establishment of the *State innovation company***".** The State innovation company is planned to provide support for creation, promotion, implementation and commercialization of R&D results in the real sector of economy, and attract investments for this purpose.
- On the establishment of the "*National venture company*. The National venture company will accumulate the capital of legal and physical entities for the support of the initial stages of innovation process related to implementation of innovations, support of inventors and researchers, start-up companies, and experimental production.

SASII has also started to develop the "Technology transfer centre" and "Technology transfer network" to promote new technologies and expand the information exchange. SASII officials believe the introduction of the above measures will contribute to innovation activity in Ukrainian enterprises.

The main SME support policy initiative – the National Programme of Promotion of Small Entrepreneurship Development[76], is a framework for the overall support and promotion of SMEs. Judging by the experience of previous years and the action plan for 2011 (which was only approved by the Cabinet of Ministers of Ukraine in April 2011)[77], the task to promote innovation in SMEs is not explicitly mentioned in the action plan of the programme. The only measure (number 7) in the action plan which relates to innovation reads as follows: "Promotion of development of the industry of direct investment and venture capital". The anticipated result of the measure is "Improvement of legislation with regard to peculiarities of creation and functioning of venture funds». The Ministry of Economic Development and Trade is responsible for the implementation of this measure. As it will be described below, new legal acts and development of venture funds have been a task of SASII and this demonstrates a duplication of functions of different government bodies.

The National Small Entrepreneurship Support Programme (National Programme hereafter) has been the main policy instrument to foster SME development in Ukraine. At the regional level authorities design and implement regional programmes based on the objectives set by the National Programme. The quality of

[75] SASII (2011), Information and analytical materials on the results of activity of State Agency in Issues of Science, Innovations and Informatization in the first half-year of 2011. http://www.dknii.gov.ua/index.php/2010-09-14-09-33-59/2010-09-14-09-36-42
[76] The Law of Ukraine (2000), "On State support of small entrepreneurship". http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=2063-14.
[77] KMU (2011), "On approval of the action plan of implementation in 2011 of the National programme of small business promotion in Ukraine" Order of the CMU N 273 of April 6, 2011.http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=389-2011-%EF

these documents improved over the years, but the key weaknesses, i.e., the implementation gap, financial and organisational constraints are still in place.

The Law of Ukraine "On the National Small Entrepreneurship Support Programme determines the main objectives of the programme:

- Improvement of normative and legal base in the sphere of entrepreneurial activities;
- Formation of a single state regulatory policy in the sphere of entrepreneurship;
- Improvement of financial, credit and investment support of small enterprise;
- Promotion of creation of infrastructure for small enterprise development;
- Implementation of regional policy to promote small enterprise development.

The expected results, as written down in the document, are described rather fuzzy: acceleration of small enterprise development, utilisation of its hidden capabilities, making small enterprise an effective instrument to solve economic and social problems, promotion of structure change of economy, sustainable tendency in increase of number of small enterprises, reduction of shadow turnover in small business, increase in input of small business to the economy of the Ukraine and strengthening economic base of regions, positive impact of solving unemployment problems, saturation of national market with goods and services. The Programme foresees biannual elaboration of regional programmes with measures to implement its tasks. The Cabinet of Ministers of Ukraine is responsible for the implementation of these measures by local authorities.

A growth in the commitment of regional authorities to foster small business and entrepreneurship development is noticeable in many oblasts. However it is producing little effect primarily because of a deficiency in funding: for example, the National Programme of Small Entrepreneurship Support in Ukraine between 2007 and 2008 received from the state budget 1% of the sum needed for its implementation. The national programme is a framework document in accordance with which every two years regional programmes are elaborated and approved by regional authorities. Regional authorities report to the SCURPE on the results of programmes' implementation following the main components: finance of regional programmes, financial and credit support to small enterprises, resource and information supply to small enterprises, formation of business support infrastructure and improvement in the system of education and training for small enterprises.

Back in 2000 SCURPE had prepared the Methodological Recommendations on Formation and Implementation of Regional Programmes for Small Entrepreneurship Development. This document defined regional programmes as one of the most important instruments of small entrepreneurship policy and as a system of objectives, tasks, target indicators and measures to achieve the objectives. The document contained a detailed description of the process of the regional programmes preparation, their structure and possible sources of finance. The main objective of the regional programmes was to direct actions and efforts of regional and local authorities, small business, associations of entrepreneurs and organisations of business support infrastructure towards accumulating financial and other resources for creation of a favourable business environment for small entrepreneurship, for support and protection of small enterprises. It was recommended that the regional programmes should use a wide range of financial sources, including the state budget funding from the Ukrainian Fund for Entrepreneurship Support,

regional funds for entrepreneurship support, other funds, budgets of the regional employment centres, privatization funds, foreign financial support, funds of associations of entrepreneurs, donations and others. With regard to innovation, it was recommended the regional programmes had a section on "Innovation projects and pilot programmes", but there was no emphasis on innovation activity of small enterprises or any suggestions on instruments to foster innovation. The other context, in which the term "innovation" was used in this document, was related to business infrastructure formation. This may be one of the explanations why regional programmes for small entrepreneurship support never did and still do not consider "innovation in SMEs" as one of their priorities.

Financial support of small enterprises was till recently a task and responsibility of the Ukrainian Fund for Entrepreneurship Support (UFES) established in 1991. The law of Ukraine "On State Support of Small Entrepreneurship" (19.10.00 N 2063-III) assigns the Fund with the task to finance implementation of the state policy of entrepreneurship support at the national level. Insufficient budget is the main constraint in the activities of UFES, which is working under supervision of the Head of the SCURPE and depends mainly on state budget money, which is reflected in the laws of Ukraine on State Budget, adopted on an annual basis. Not every year the fund receives money from the state budget, as was the case, for instance in 2007 and 2008. Sometimes the money assigned by the state budget is not spent because of a poor organization of the activities. For instance, in 2010 Cabinet of Ministers of Ukraine has announced the Call for micro crediting for small enterprises on 12 October (Resolution of CMU N 923). The UFES had less than three months left to organise the competition among the small enterprises for micro credits of 50 000 – 100 000 UAH for the period of 1 year, or 100 001 – 250 000 UAH for the period of 3 years. The total planned amount of budget funds equalled 15 million UAH.

Analysis of the National Small Entrepreneurship Support Programme, which is implemented by regional small entrepreneurship support policies leads to the conclusion that "innovations in SMEs" are not a top priority. With regard to innovation more attention is paid to the creation of business support infrastructure, including technology parks, incubators or business development centres, or developing clusters. No financial support instruments were foreseen for innovations in SMEs. SCURPE, which was in charge of the general entrepreneurship and SMEs policy, had a vast list of responsibilities and innovation was not high on the list.

In Kyiv city[78] the regional programme of small entrepreneurship support had foreseen allocation of 58.8 million UAH to be spent in 2009-2010, of which 9.4 million UAH were spent in 2009. As in other regions the partial compensation for bank credits' interests was the main item of expenditures, which amounted to 7.92 million UAH. The communal enterprise "Kyiv city business centre" has assisted in creation of 8 information and consulting centres. New participants joined the programme of the Kyiv resource centre, which maintained and enlarged its data base. In 2009 403 local officials have increased their qualification in the framework of the training module "State regulation of economy: innovation activity in Ukraine". The communal enterprise "Centre of high technologies and innovations" was a co-organizer of the all-Ukrainian competition "Innovation breakthrough-2009", and provided consultations to business owners with regard to intellectual property rights, innovation projects and investment attraction. The internet

[78] Monitoring stanu vykonannya regionalnyh program pidtrymki malogo pidpriemnitstva v regionah Ukrainy (za pidsumkami 2009 roku). Misto Kiev

resource "Capital city business portal" was further developed to enlarge commercial contacts of entrepreneurs.

In Donetsk oblast[79] in 2009 only 1/3 of planned funding from the oblast budget was spent (331400 UAH of 1000000 UAH). The regional budget was used for organization of the 5th regional conference "Small business and crisis: reasons, ways out, consequences" (150 participants). The Regional Fund for Entrepreneurship Support had organized 4 training seminars "Interaction of entrepreneurs and power"; created local funds in 6 cities of Donetsk oblast; consulted entrepreneurs on hotline (2000 phone calls/applications). The Centre of Consulting Assistance in Issues of Protection of Production Property and IPR held 270 consulting sessions for small entrepreneurs and published a collection "Intellectual Property". Centre for Development of Small and Medium Entrepreneurship had created "Information Systems of Subcontracting" portal to facilitate business partners search in Ukraine and abroad. Donetsk State University of Management had established "Donetsk city business incubator" with the main activities covering business training, sociological and marketing research, and assistance in business planning etc.

In 2009 in Poltava[80] 200 000 UAH were assigned from oblast budget to the regional programme of small entrepreneurship support, of which 91% (183 000 UAH) was spent on financial and credit support of small enterprises. A registry of oblast administration regulatory acts was created on the official web site. The Main Department of Economics of oblast administration has prepared "Methodological recommendations on creation of cluster models of production". Business incubator had organised seminars on agro tourism with participation of 216 people; developed 2 tourist routs: "By Kozak roads" and "Dykanschina – historic and cultural centre of Poltava oblast". Poltava Institute of Economics and Management "Svitoch" had established a business centre for young entrepreneurs. In August 2009 Poltava Trade and Commerce Chamber had organised a business forum "Ukraine-Belarus" to facilitate contacts of entrepreneurs in two countries. The Information and Analytical Centre "Unions of Entrepreneurs of Poltava" had initiated a newspaper "Resonance" to publish information on entrepreneurship development issues. Formation of the conception of regional innovation policy was one of the tasks of Poltava Oblast Programme of Economic Reforms for 2010-2014.

Enhancing innovation of any country primarily depends on the level of innovation development in the regions. Ukraine is a country of a diversity of regions in terms of their economic and natural resources, entrepreneurship and R&D and innovation development. Innovation in the regions crucially depends on three main groups of factors: economic, institutional and financial. Regional authorities – State Oblast Administrations are responsible for regional innovation policy. But in the Ukrainian context regional authorities have limited legal, administrative and financial resources to be effective in innovation policy. Introduction of new laws, creation of relevant government agencies is obligatory but not sufficient for implementation of state innovation policy. Design of innovation policy in Ukraine may not be perfect but the key weakness in this respect lies in the delivery of innovation policy, which is mainly done at the regional level. To a great extent the success in policy delivery depends on the capacity and competence of regional authorities. Regional authorities in the design of their innovation policies should proceed from the

[79] Monitoring stanu vykonannya regionalnyh program pidtrymki malogo pidpriemnitstva v regionah Ukrainy (za pidsumkami 2009 roku). Donetska oblast

[80] Monitoring stanu vykonannya regionalnyh program pidtrymki malogo pidpriemnitstva v regionah Ukrainy (za pidsumkami 2009 roku). Poltavska oblast

key objectives of the economic development in their regions taking into account the regional resources available.

Regional innovation policy should foresee an analysis of state-of-the-art in R&D and innovation in order to identify the level and degree of innovation potential, prospects and directions of innovation activity, its scale and impact on the competitiveness of the region, structural and institutional changes, factors to increase innovation; and objectives and priorities for R&D and innovation.

The objectives and content of the regional innovation policy should proceed from the following:

- Regional goals should not conflict with the national strategic goals;
- Regional goals must be formulated taking into account the specifics and needs of the region;
- Regional innovation programme should not proceed from the availability of resources and capabilities, on the contrary, the resources for the programme must be drawn from the stated objectives;
- Wide consultations with regional innovation experts and business community (in particular large solvent enterprises capable and willing to help innovation development);
- Policy measures to increase innovations in SMEs should be coordinated with and supported by the policy measures for SMEs support in general. Coherence and coordination of SME (entrepreneurship) policy and innovation policy should be one of the concerns of regional authorities;
- International best practices in regional innovation policies should be carefully studied and adapted to the conditions of a particular region.

Regional innovation policy realized in the programme should become an integral part of the short-term and long-term plans and forecasts of the regional social and economic development with the ultimate task to increase the competitiveness of the region and well-being of the population. In Ukraine there is an urgent need in radical reform of intergovernmental relations on the basis of fiscal decentralization, granting more autonomy to regional governments. Such reform should aim at increasing revenues of regional budgets through redistribution of financial resources. Decentralization will increase the responsibility of regional authorities allowing for a more efficient use of resources for innovations. An increase in the responsibility of regional authorities and *granting* them more autonomy is the task of the central government, which may take a long time to be completed.

Meanwhile, regional governments could be advised to look for and introduce alternative (low-cost) measures to support innovations in SMEs based on the peculiarities of individual regions and available resources. Under the conditions of limited financial resources the emphasis in regional innovation policy could be moved towards assistance in:

- Enhancing cooperation between R&D institutes, SMEs and existing innovation support providers (business centres, incubators etc.);
- Setting up incubators for innovation-based start-ups to provide free advice, consultation and information;
- Providing premises for start-ups (low price rent);
- Enhancing innovation cooperation between large enterprises and SMEs;
- Development of national crafts;
- Facilitating access to international innovation networks and setting up regional networks of enterprises;

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- Participation of SMEs in regional government procurement (at least at the level of 20%);
- Assisting in free or low-cost access to ICT resources and organization of training in E-business.

Regional authorities are advised to rely on the business community, NGOs and business support providers both in the process of elaboration of the regional innovation policy and its implementation. The following guidelines for innovation in SMEs support policy could be used to design a regional innovation in SMEs policy to meet the needs of a particular region:

- To simplify and make more transparent the participation rules and administrative procedures of the existing state programmes of innovation support, which is particularly needed by SMEs;
- To start implementation of any new measure of innovation in SMEs with a demonstration project in pilot regions;
- To enhance the use of ICT in public policy to increase visibility of innovation services;
- To involve private organizations and innovation experts more directly in the innovation service provision. (e.g., via innovation voucher schemes);
- To integrate different public services in innovation support into single entry points (similar to e.g. single window registration already existing in Ukraine).
- To launch initiatives that support cooperation between innovation actors (R&D, enterprises, intermediaries, financing institutes) at the regional level.
- Regional authorities in the process of public policy formulation and implementation should address the following issues:
  - What is the relevance of the policy instruments according to lessons from theory?
  - Do these instruments tackle real innovation needs from companies?
  - Do the means correspond to aims of the policy instruments?
  - What is the efficiency of the instruments (cost-benefit ratio)?
  - What are the results achieved by these instruments?
  - What are their impacts?
  - How are the instruments coordinated with the rest of the policy system?

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Conclusions

Intensification of the economic reform and establishment of the market economy can be most effectively attained by formation of competitive environment, by developing entrepreneurship and creating conditions for growth of small and medium-sized businesses. There have been limited improvements in the overall business environment in Ukraine: few policy initiatives have been launched over the last years which would ease doing business. The country is relatively weak in the key areas of supporting SME competitiveness, technological capacity and export promotion. Ukraine is still in a phase of completing the basic institutional, legal and regulatory requirements underpinning SME policy. Relative weakness of SME policy lies specifically in the areas most relevant for high-growth enterprises, such as the provision of sophisticated business services, and the launching of programmes enhancing the technological capacity of SMEs. The good intentions to a great extent remained unimplemented due to a number of reasons, including a low commitment of Verhovna Rada to improve legislation; scarce budget resources; an unwillingness and incompetence of local authorities to promote private entrepreneurship development. According to statistical information a wide network of entrepreneurship support organisations is operating in Ukraine: according to the data provided by some ministries and committees there are several thousands of them. However most of such organisations are only nominally on the list while the quality of their services in the sphere of small business remains low.

Ukraine faces many challenges in building the knowledge based economy, i.e., developing an economy that can return high living standards to people. The paradox has been observed that Ukraine is good at research, but not strong at converting that potential into real economic return. SMEs should play a pivotal role in raising investments in R&D and making the economy of Ukraine more competitive. However,

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compared to the developed market economies the share of innovative SMEs in innovations is relatively small. Measures are to be taken to strengthen public private partnership (PPP) mechanisms. Different forms of public private partnerships in technology and innovation must be promoted. Incentives must be devised to make companies and foreign investors interested in participating in joint R&D and innovation. Bridging programmes between research sector and industry should be created. Sector- or technology-specific competitive state co-financed collaborative programmes for SME participation should be developed. The collaboration for new innovative products, high-tech products, radical innovations and technology areas important for the national economy should be co-financed, with 100 % coverage of the research sector. A way forward is the development of sector-specific or technology specific competitive state co-financed programmes for SME participation with introduced incentives for increasing the percentage of financing for collaborating with technological and research institutes, the prosecution of innovative high-tech products and increasing of exports. Competitive state co-financed programmes for SMEs in priority sectors will help them overcome the size-related resource limitations in their attempts to grow and be competitive based not on price but on producing innovative produces and services. Also the involvement of companies in consortia carrying out state and regional research projects should be a pre-requisite for being awarded. The modest number of start-ups or spin-offs that in effect take off and develop into firms of reasonable sizes presents one of Ukraine’s major challenges. Although the potential is there, the question is how to use, improve and enlarge that potential in such a way that SMEs can make an even larger contribution to innovation. National and regional authorities should establish initiatives to support R&D and innovation for SMEs. The innovation policy instruments should complement and enhance the current national and regional SME and deregulation policies and to introduce tax incentives, access to finance, grant schemes and information points for companies striving to innovate.

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Chapter 11

Innovation Indicator tools (Igor Yegorov, Gudrun Rumpf)

Analysis of internationally acceptable innovation indicator tools

In recent decades the importance of science and new technology for economic and social development increased significantly. In developed countries, the GDP growth is mostly related to new knowledge creation and innovations introduction. That is why Science & Technology (S&T) and innovation potential assessment have to receive paid more attention from the side of policy-makers. This can be explained by increasing role of science and technology in modern society. The developed countries have allocated over half a trillion USD annually for R&D development in recent years. Much more substantial financial resources have been allocated for innovation activities. So, it is understandable, why both individual countries and international organizations pay attention to the development of relevant statistic tools to assess the levels of S&T and innovation activities. The key role has been played here by the OECD secretariat since the 1960s. In fact, OECD experts develop international standards in the sphere of science and innovation statistics and agree them with the countries and such international organizations as UNESCO Institute of Statistics, Eurostat, Ibero-American Institute for Science and Innovation Statistics and others.

The OECD experts are trying to develop approaches to creation of the innovation indicators system to cover all major types of innovative activities according to the innovation process. These approaches have to reflect targets of innovation development; impact of innovation activities on production effectiveness; positions at local and international markets of hi-tech production. In this respect, a number of so-called Manuals, which formed Frascati Family" of Guidelines for the Measurement of Scientific and Technological Activities", was developed. Some non-OECD countries have started to use these Manuals, in particular Russia, Brazil, South Africa, and many others. China and India bring their science and innovation statistics in line with the OECD Manuals' indicators system. The OECD Manuals cover almost all R&D and innovation activities stages, though not all these processes aspects are reflected equally in these documents. In 1992 the "Manual on Technological Innovations Data Collecting and Processing" was published. This manual is better known to experts as «Oslo Manual». The main attention in the document is focused on innovation activities research at industrial enterprises level. It gives the major concepts used in the sphere, defines approaches to formation of indicators system, which reflect innovation activities of enterprises, formulates methodological recommendations on processing and interpreting statistical information. The latest release of the "Oslo Manual" was drafted at the end of 2005.
Among other Manuals and regulating and instructing materials developed under the auspices of the OECD the most popular is the "Frascati Manual" (latest release in 2002), which contains the list of the major R&D indicators, describing main approaches to questionnaires development to research and assessment of innovation activities.

The "Canberra Manual" contains the description of measuring of human resources devoted to R&D and innovation, information collection processes. The "Technology Balance of Payments" (TBP) is used to assess the volumes of trade in new technologies (both in their material forms and the IPR). TBP registers commercial transactions, related to the international technology and know-how transfers. It contains information on financial transfers for the use of patents, know-how, trademarks, patterns, designs, technical services (including technical assistance) and for industrial research and development (R&D) carried out abroad, etc. The coverage may vary from country to country, and the TBP data should be considered as only partial measures of international technology flows.

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The new „Patent Statistics Manual", published by the OECD in 2009 provides guiding principles for the use of patent data in S&T measurement, and recommendations for the compilation and interpretation of patent indicators in this context.

However, in spite of numerous updates, the OECD instruction materials failed to completely overcome some problems, which exist at the national level in different countries. For instance, approaches to calculations of the full-time equivalent for researchers, involved in R&D, are not identical in different countries.

Innovations statistics, in some cases, is still not fully comparative. The problems start at the level of major concepts used in different countries. Likewise, many countries modify the definitions from the "Oslo Manual" during the national innovation surveys. Herewith, for example, the term "novelty", is as a rule not clearly defined («new for an industry», «new for a firm», «new for a country», etc.), which leads to some problems in comparing the received data at the international level. The indicators of patent activity (quantity of patent applications, number of patents received) is often used in innovation research but it is impossible to compare patents produced in different countries due to differences in national legislations and traditions.

Today in the framework of OECD a number of new manuals and learning materials are developed to be used in practice for innovation activity assessment, in particular, the manuals on information technologies, "intellectual investments", production technologies, industries with different levels of knowledge-base assessment and for technological audits.

In particular, the Production Technologies Assessment Manual has to be an important supplement to the "Oslo Manual", which was not fully adapted to survey of innovation activities in countries with different level of economic development, as well as to specific assessment of innovation activity levels in separate companies and industries due to intensive inter-industry technology transfer.

Globalization processes are crucial for successful innovation and S&T development. In modern statistics it is accepted to use the following for their reflection at macro level:

- Foreign companies` R&D costs share in the overall R&D costs of a given country;
- Expenses on R&D, made abroad for national companies and governments and their shares in total expenses;
- Quantity of technological alliances with other countries` companies;
- Number of patents registered abroad and national patents being of foreign origin.

Special attention of experts, involved in innovation activities statistics, has recently been drawn by the problem of adequate innovation activities records in the services sector. According to the experts, recently this sphere has incurred 25-40% R&D and innovation expenses in the USA and in other developed countries. This share is likely to increase in the nearest future. The most acceptable information on the services sector was obtained in innovation surveys. However, the surveys approaches have not yet been completely unified. Different countries use different methods which results in incomparability of received data. In addition, innovation activities in the services sector have a number of features, the most important of them are:

– focus on almost exclusive use of innovations created in other sectors;

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- domination of organizational, but not technological innovations.

It is understood researchers will focus their attention mainly on innovation activities assessment methods in the services sector in the nearest future.

On considering the overall OECD S&T and innovation indicators, it could be noted that the main indicators are represented in 18 groups:

1. Gross Domestic Expenditures on R&D (GERD).
2. Total R&D personnel in full-time equivalent
3. Percentage of Gross Domestic Expenditures on R&D by sources of financing.
4. Percentage of Gross Domestic Expenditures on R&D, performed by different sectors.
5. Total researchers in full-time equivalent
6. Business enterprise expenditures on R&D.
7. Business enterprise personnel in full-time equivalent.
8. Business enterprise expenditures on R&D (BERD) by sources of financing .
9. Business enterprise expenditures on R&D (BERD) by sectors of the economy.
10. Higher education expenditure on R&D (HERD).
11. Higher education Total R&D personnel in full-time equivalent.
12. Government intramural expenditures on R&D (GOVERD).
13. Government Total R&D personnel in full-time equivalent.
14. Government expenditures on R&D by sectors of the economy
15. R&D expenditures of foreign affiliates.
16. Patents.
17. Technologies balance of payments.
18. International trade in R&D-intensive industries.

Thus, the OECD accepted indicators system is composed of indicators characterizing R&D expenditures (input indicators) and indicators assessing the research results. Indicators of R&D expenditures form a subsystem of financial and labor costs indicators (input indicators). Effectiveness indicators comprise patent indicators, indicators of international trade in R&D –intensive industries, indicators of technology balance of payments, bibliometric indicators

In general, the processes taking place in the sphere of innovations and S&T could be characterized by a wide range of quantitative and qualitative indicators. Various aspects of these indicators are somehow connected and reflect not just the structure of innovation system, but also its interrelations with other national economy spheres. It is not always possible to collect relevant data on the basis of national statistics traditional methods. For this reason, the so-called innovation surveys are regularly conducted in the EU countries. As a rule, they are held once in two-three years. They constitute an important supplement to the regular (annual) innovation information collecting and processing procedures in the Community countries. The necessity of innovation surveys is due to the fact that annual data are collected according to quite a limited indicators list and are not always enough to innovation policy decision making. Besides, the innovation surveys cover issues common for different EU countries, as well as those specific for separate countries. This not only provides opportunities to compare the data, but also reflects the features of countries participating in surveys. In any case, the bulk of information on innovation activities is collected according to the OECD standards, Frascati Manual, and Oslo Manual definitions. At the same time, possibility exists to introduce indicators natural for certain countries due to their S&T and innovation systems features.

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Innovation surveys based on a unified methodology have been an important tool of innovation policy in the EU countries since late 1990s.
Innovation surveys results provide information characterizing enterprises` innovative activities which makes it possible to observe the progress in the innovation sphere and to analyze the degree of their influence on economy development. Summarizing the obtained results the EU develops measures of innovation activity stimulation in the European Community countries, especially in those having low level of innovation activity.
Innovation survey covers research of EU Member States` enterprises innovative activities, candidates for the EU accession, and Iceland and Norway. Previously, the surveys were held each four years, and presently – according to innovation surveys recommendations – once in two years.
Eurostat in cooperation with the EU Member States has developed a special questionnaire with a set of necessary definitions and methodological recommendations to conduct the Community Innovation Survey (CIS). According to new demands, new types of innovations – organizational and marketing ones – were introduced in addition to exclusively product and process innovations studied before.
According to the latest innovation survey, the questions are grouped as follows:

1. Innovation activities (questions on product and process innovations introduction).
2. Innovation activities expenditures (according to innovation activities directions)
3. Innovations effects (questions on innovation activities result obtained)
4. State support (questions on sources and measures of innovation activities state support)
5. Innovation cooperation (questions on cooperation with other enterprises and organization)
6. Innovations information sources
7. Measures of IPR protection
8. Organizational and marketing innovations introduction

Experience proves that there is a number of methodology problems arising during innovation surveys. Firstly, it is about different interpretation of some questions by different countries, especially as regarding definitions of innovation and its novelty. Secondly, it is about common problems of services sector innovations statistics. The major problem herewith is the difficulty of the same concepts and tools application as for production innovations study.

Development of a special European Innovation Scoreboard (EIS) has become an important component of the EU scientific and innovation policy implementation. The major objective of the Scoreboard is to develop a rational EU strategy of “United Europe” development harmonization on the basis of various countries data analysis. Such strategy provides, first of all, the further development of international cooperation within the EU, development of new cooperation forms and methods between scientists and research organizations.
The European Innovation Scoreboard’s indicators system makes it possible to compare countries. Herewith, the European experts pursuant to Commission’s order are not limited by calculations for the EU countries only, but involve into comparative analysis statistics data on the USA, Brazil, Japan, Israel, Norway, and in recent years – China, India, South Africa, and others. Integral indicators of innovation development, including so-called EU Innovation Index, are calculated within the European Innovation Scoreboard framework in order to make comparisons more substantial, the benchmarking procedure has started to be widely used. It allows to measure the “distance” between countries and regions, to define best practices and to develop recommendations on transition of disadvantages into advantages.

The necessity to conduct a comparative analysis of the current state and the perspectives of S&T and innovation potential development of Ukraine and other countries is determined by the need to determine

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Ukraine's place in the sphere of S&T. Such evaluation is an important precondition and element of integration, broadening and deepening Ukraine's participation in European structures.

System of indicators was a result of a long discussion between different experts from Community Member States and testing calculations of a number of "candidate-indicators" to be included into the final list. In 2001 it resulted in development and adoption of S&T and innovation system of indicators, which consisted from 17 major indicators, divided into four groups:

1) R&D and innovation personnel (human resources, involved in R&D and innovation activities);
2) R&D funding levels and patent activity;
3) Innovation activity level, in SMEs at first place;
4) Level of dissemination of modern technologies in economy.

In 2005 there were 5 blocks of indicators, and the number of indicators increased to 26. In the system of EIS-2005, nine indicators were absolutely new; others were present in the previous system releases in various forms.

In 2007 the EIS indicators were represented in five blocks reflecting various aspects of innovative development:

1. "Driving forces of innovations" – indicators reflecting state and structure of innovation potential.

2. "New knowledge creation" – indicators reflecting levels of R&D financing.

3. "Innovations and entrepreneurship" – indicators reflecting levels of innovation activity at enterprises (firms).

4. "Application" – indicators reflecting employment and commercial activity in innovative sectors.

5. "Intellectual property" – indicators reflecting patent activity.

At the end of 2008, the EU Commission approved the changes in the composition of EIS indicators and methods to calculate the resulting (integral) innovation index, which is also used to rank several dozen countries of the world. The changes were made for better understanding of innovation processes in the modern world. The analysis of comments and problems of previous EIS releases resulted in groups' number increase to 7 (with their grouping into 3 major blocks) in the new EIS release in 2008-2010. The aim of the reconsideration was to get dimensions including connected groups in order to make innovations assessment balanced. The blocks and groups were designed to consider the diversity of various innovation processes and models.

Analysis of innovation indicator tools used by the Ukrainian stakeholders

According to the Law of Ukraine "On State Statistics" the statistics authorities are to collect, store, process, analyze, protect statistic date and provide statistical information use, in particular, in scientific, S&T and innovation activities, be responsible for its reliability and objectivity. Herewith, the statistics authorities guarantee data confidentiality on separate enterprises and organizations that is why in the official statistics publications the information is grouped according to enterprises and organizations types.

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Scientific and innovation activities in Ukraine are monitored on the basis of indicators, included in the forms of state statistical observation of science and innovations.

All organizations having S&T research projects officially registered in the Ukrainian Institute of Scientific and Technological Information report regularly on their S&T activities. The number of such organizations in the last decade is stable with 1350-1550.

Data on innovation activities are traditionally collected only at *industrial* enterprises only. Such approach obviously led to certain underestimation of the overall level of innovation activity in Ukraine.

In the unified state register of the state statistic authorities there are about 100 thousand enterprises and organizations having in their statutes activities in the sphere of "Science and scientific servicing". But state statistic reporting on scientific and S&T works (form N1 - science) and on scientific and S&T activities indicators (form N3 - science) is only done by those above mentioned 1.35 – 1.55 thousand scientific institutions and enterprises which list is determined by the statistics authorities.

The State Committee of Statistics (SCS) of Ukraine, due to the use of information-search system, has an opportunity to analyze scientific and S&T activities, in particular, the indicators from the mentioned form N1-science and form N3-science.

Thus, scientific institutions and organizations reporting indicators by regions, ministries, science branches and sectors, ownership types and forms, and their dynamics are given in the special yearly statistic collection.

Scientific institutions and organizations register maintained by the State Committee of Statistics of Ukraine and changes to it are to be agreed with the Ministry of Education and Science, other central executive authorities, state academies of sciences, which the listed institutions and organizations are subordinate to.

Unfortunately, not always the official statistic publications content allows to analyze in details the S&T sphere status. Thus, statistic information in "Effectiveness" chapter is reduced to a single indicator "Number of developments", per year, sector, region, ministry, by developments` technological level as compared to the international one, and by creation of new types equipment and technologies. The "Number of developments" indicator is obviously incapable of characterizing the effectiveness of scientific institutions activities and cannot be used as information-analytical material for decision making by the executive authorities.

In the Law of Ukraine "On scientific and S&T Activities" there are definitions of the major concepts, in particular, those regarding results of scientific and S&T activities:

"scientific result – new knowledge, which is obtained in the process of fundamental or applied scientific research, and which is recorded on scientific information holders in the form of a report, a scientific paper, a scientific report, a scientific information on scientific and research paper, a monographic research, a scientific finding, etc ";

"scientific and applied result – a new constructive or technological solution, experimental sample, completed testing, development, implemented or possible to be applied in social practice. Scientific and

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applied result can be in form of a report, a draft project, design or technological documentation for scientific and technological products, actual sample, etc."

According to the stated Law, scientific (research, research-technical, technical) council of a scientific institution has to do the scientific and technical assessment of the R&D results, which (the assessments) in their turn, serve the basis for the state and departmental statistics reporting, for consideration and approval of current research plans, for defining the priority directions of scientific and technological activities of a scientific institution or organization, and for reporting to the Ministry, other central executive authority, the National and sectoral academies of sciences.

The latest release of the quarterly state statistics report (Form N1 - science) of a scientific institution on scientific and technical works provides a significant number of indicators: in UAH thousands - "the overall volume of the project", including for fundamental, applied research, developments, scientific and technical services, and other "gross expenditures" with their details on separate articles, "internal operating costs" including those according to works types, "sources of financing" with slightest details, and a separate chapter on "scientific personnel": employees quantity, including researches, technicians, support staff, others; education – complete higher education, basic higher education, initial higher education, other; number of employees having PhD; experts moving – researches, PhDs, technicians, support staff employed, released; researches distribution by age, etc.

But the above-mentioned Form contains no single indicator, which reflects the results of the project, such as the number of publications in refereed journals.

In the other statistics Form N3-science sections include indicators "quantity of developments" (in units), "scientific research and developments on priority directions of science and technology development" (in UAH thousands), "patenting and licensing" (in units) and "international cooperation" (in units and persons quantity). There are two more sections, providing textual information on topical orientation of scientific research and developments requiring wide presentation, and on separate developments titles which an organization considers to be appropriate for the implementation. It`s obvious, that use of information in the form of brief abstracts does not let to make specified summarizing and comparisons of separate scientific institutions` effectiveness.

In general, the current system of state statistics needs some improvements and modifications in order to be completely comparable with the international standards.

Register cards for PhDs contain important information on science personnel potential, in particular data on a PhD's occupation, his/her specialty, year of thesis defence, etc. These data meet the standards used in developed countries, in particular by the National Scientific Fund of the USA.

It can be stated that till recently the major problems for statistics in Ukraine were the following:

- Using "Soviet" system for science sectors classification (factory or enterprise, branch, academic[81], University)

[81] Academics in the Soviet Union and modern Ukraine (and , by the way, Russia) means those, which belong to one of the state academies of sciences, including National Academy of Sciences of Ukraine

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- Limited use of full-time employment equivalent leading to underestimation of relevant data on personnel, involved in R&D
- Using current prices to analyze the dynamics of R&D expenditures that in the circumstances of a relatively high inflation led to R&D funding tendencies distortion
- Using only official national currency exchange rates instead of its purchasing power parity, which did not provide adequate data on real efforts in scientific and technological spheres
- Certain problems were connected with distribution of researchers by age and the statistics of those scholars, who had long-term business visits abroad, associated with 'semi-permanent' work in foreign research centres.

It is worth mentioning that the above -mentioned problems have started to be gradually and successfully solved within recent 2-3 years, but the implementation of new indicators does not allow compiling corresponding time series, which open the way to use formal statistical methods of analysis. .

The disadvantages of the current scientific activities indicators system are presented in details in the third part of this report.

The data sources and indicators of innovation activities assessments

The possibility to use various data sources and conduct relevant comparisons exists in Ukraine. These sources are:

1. Statistics forms of the States Statistics Committee of Ukraine.

2. The results of regular competitiveness surveys carried out by the SSC of Ukraine.

3. Data of specialized innovation surveys carried out by separate researchers and organizations.

4. Results of the specialized innovation survey carried out according to the EU methodology (specialized SSC survey).

5. Information collected by various Departments (for instance, statistics, regularly collected by the Ministry of Education and Science of Ukraine[82]).

Here comes the sources` brief description starting with the last one.

The departmental statistics is collected in Ukraine by different Ministries and interested Departments (for example, by the National Academy of Science of Ukraine). To great extent the departmental innovation statistics, if based on data from the NASU, the Ministry of Industrial Policy and the Ministry of Education and Science of Ukraine – the major "interested organizations", coincide with the standards of the State Statistics Committee of Ukraine. Herewith, certain issues of innovation activity are detailed by the Ministries and Departments, while the others are not considered at all, according to the needs of this or that Department. Such approach is quite natural, but the departmental statistics prevent from making correct comparisons at the national level and to great extent duplicate the nationwide statistics (the information from the SSC of Ukraine).

[82] The Ministry was renamed into the Ministry of Education, Science, Youth and Sports as a result of Administrative reform, initiated by the President of Ukraine in December 2010.

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As we have already mentioned in the first part, the tool of the national innovation surveys has been widely used in the EU countries for more than a decade. The Ukrainian national survey was first carried out in 2007-2008 using the questionnaire developed by the EU experts. With no doubt, this was an important precondition of providing the comparability of received data. But together with this, the attempts to solve all the problems of a relevant nationwide pull formation failed. These problems were first addressed during the following survey stage in 2009. Some results of this nationwide innovation activities survey were placed at SSC of Ukraine web-site, but the detailed results of the survey were waiting for their publication when this report was drafted, that is why we will only have a possibility to comment on them in our further works.

It's worth mentioning that the innovation survey data is the most important source of information for the formation of the European Innovation Scoreboard (EIS) and calculation of Innovation Index, thus such surveys may be viewed as an extremely important element of comparative analysis of the innovation activity in Ukraine and the EU countries. Moreover, the possibilities of innovation survey will allow in the future collecting data on specific problems of innovation activity by means of extending the questionnaire with additional questions on innovations in the sphere of services and at small enterprises.

The data of specialized innovation surveys, carried out in the framework of specific research projects, provide the information about innovative activity of particular enterprises and economic sectors. Under such surveys the collection of questionnaire data is often accompanied by the detailed research of particular companies (review of so-called "cases") that allows getting an important and qualitative information directly from the companies. In addition, the similar projects allow making a thorough analysis of particular groups of companies, for instance, large, medium-, and small-sized enterprises. Another important point is that small enterprises report to the government under a simplified procedure and it is hardly possible to introduce additional indicators of innovative activity in the relevant forms of the state statistic reporting.

The market survey, which had been conducted by the State Committee of Statistics on the quarterly basis since 1997, just recently was extended by the questions on innovative activity. Such surveys allow getting the up-to-date information on the level of this activity within a country. Of course, it's rather difficult to get detailed data in the framework of this activity, but the important research result is a possibility to compare macro indicators of innovative activity on the national level with the data received on the basis of traditional surveys of the State Committee of Statistics. More detailed information on the methods and results of the market survey you may find in the proceeding. The advantage of market survey is that it allows to get data on the activity not only from industrial enterprises but also companies operating in the sphere of construction and services. Moreover, the market surveys give an opportunity to estimate the prospects of innovation activity, since there are questions related to the company plans in this sphere for the next year. Considering the conditional character of the obtained data, one can make certain conclusions about the level of innovative activity in the future implementing "inertial" scenario of the economic development. As far as such surveys are carried out by the State Committee of Statistics, we'll consider it after the main statistical forms.

And, finally, the values of innovative activity indicators may be obtained on the basis of existing statistical information from the form No1 – innovation "Survey of technological innovation of industrial enterprise" and some other forms, which don't have direct relation to innovations but contain some indicators related

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to some aspects of scientific, technological and innovative activity. The results of data collection and processing are published annually in the annual statistical collections of the State Committee of Statistics of Ukraine “Research and Innovation activity”.

Actually, all the data may be used for a particular evaluation of innovation development processes in the country, and others may be used directly avoiding the additional surveys of experts. The methodology of collecting and using the EIS indicators was built exactly in such a way: they are collected on the basis of unified procedures applied to the thoroughly made samples.

The state statistics data is the main source of information on innovative activities in Ukraine. It should be noted that all the forms of state statistical reporting may be divided into two groups: traditional (regular forms) and new (one-time and experimental forms used for specialized surveys).

Nowadays, the main source of information on the research of innovative activity on the regulatory basis is the form No 1 – innovation “Survey of innovative activity of industrial enterprise” (annual). It shall be submitted by the legal entities of all the organizational and legal forms as well as their branch offices that carry out a commercial activity the classification code of which under the classification of economic activity types (KVED) is “C” (mining industry), “D” (processing industry), “E” (production and distribution of electricity, gas and water), regardless their main activity.

The innovative activity of small-sized enterprises may be assessed with the help of the data from the form No 1 – entrepreneurship (small) “Report on main indicators of small enterprise activity” (half-yearly).

With the purpose of monitoring the patent-licensing activity, the State Committee of Statistics collects information under the form 4-nt “Report on the IPR acquisition and the IPR objects use” (yearly) and 7-nt (licenses) “Report on conclusion of the IPR disposal agreements” (yearly).

A report under the form of state statistical survey No 4-nt shall be filled in on the basis of the data from the forms of primary records approved by the Order of the State Committee of Statistics, namely:

– form No IB-1 Register of the applications for inventions, useful models, industrial samples, assembling (topographies) of integrated circuits filed in Ukraine;
– form No IB-2 Register of the applications for inventions, useful models, industrial samples, assembling (topographies) of integrated circuits filed to the competent authorities of foreign states;
– form No IB-3 Register of the used inventions, useful models, industrial samples, assembling (topographies) of integrated circuits;
– form No IB-4 Register of innovation proposals;
– form No IB-5 Register of the applications on innovation proposal;
– form No IB-6 Statement on the IPR object use.

The form consists of 3 parts:

1. Creative activity indicators: the number of the creators of IPR objects (IPRO); IPRO applications submitted to the competent authority on IPR protection; IPRO protection documents given by the competent authority on IPR protection; use of the IPRO; costs related with the protection of IPRO and their use.
2. Categorizing of the IPRO creators under age, sex and education.

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3. List of particular units and their indicators incorporated to the report.

The form of state statistical survey No 7-nt (licenses) "Report on the conclusion of agreements on IPR disposal" has 3 parts:

1. Acquisition of property rights and permission to use IPRO;
2. IPR disposal;
3. Production of goods on the basis of licenses, license agreements or with the use of IPRO, the property rights for which were got under the agreement on transfer of exclusive intellectual property rights.

As mentioned above, another source of information on innovative activity is market survey (MS) or competitiveness activity survey, conducted by the Competitiveness Department of the State Committee of Statistics. Compared with regular statistical surveys that cover only one or few interrelated aspects in any economic sector, the MS generalizes the information under many aspects selected for the determination of business activity cycle.

The priority in aspects selection is based on the indicators that determine:

1) Early stage of production (new orders, order books);
2) Prompt response to changes in economic activity (for instance, stocks);
3) Prospects (production, general economic situation).

The main advantages of market surveys:

1) Properly organized surveys make the key data available during 15-20 days while it takes significantly more time to get the official numbers. In other words the survey data show the distribution of economic trends faster than the data of official calculations.
2) The received information is subjective. These results measure the respondents' understanding of business situation. For instance, with the help of survey results it's easy to get the information on entrepreneurs' expectations that allow not only finding out their perception of economic situation but also forecasting their economic behaviour.
3) MS provide the information on the economic sectors which are not fully covered by quantitative (official) statistics. For instance, the information on factors that hinder the production development at enterprises, investments, on assessment of general economic situation in the sector where the enterprise operates or the assessment of production facilities.

One of the main advantages of the questionnaire used in the course of such survey is its relative simplicity, since it takes the respondents little time to fill in as far as the majority of questions have qualitative character and the questionnaire's structure encourages them to participate in the survey.

The State Committee of Statistics of Ukraine jointly with the S&T Complex of Statistical Studies (Research branch of the Committee) carries out such surveys with the purpose of studying the process of investment and innovation implementation exactly at the industrial enterprises where investments are attracted and new technologies are implemented more often.

The survey of enterprise business activity allow to study the areas of investments use at the industrial enterprises, determine the impact of factors that constrain their investment activity, analyze the actual state of innovative activity and find out the entrepreneurs' expectations about changes in the future.

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Thus, we can state that in Ukraine there are a lot of data on scientific, technological and innovative activity and the statistical reporting system is being improved. The problems of comparison with the international standards and recommendations on further improvement of statistical reporting are stated below.

The biggest problem is the necessity to divide the organizations involved into scientific-technological and innovative activity under sectors according to the Frascati Manual. However, regarding a big number of indicators, they coincide with the relevant international indicators.

Nevertheless, there are certain differences between the OECD indicators and the indicators that are used in Ukraine and mentioned in the second part of the report. Moreover, for Ukraine it is important to use additional indicators which may be helpful for analyzing the dynamics of scientific, technological and innovation potentials.

The issue related to the innovative activity is more complicated. The innovation survey done applying the method of the European innovation surveys allows making a conclusion that the majority of indicators, which are used in the EU countries, may be applied also in Ukraine. First of all, it concerns the indicators of the number of innovative enterprises, structure and quantity of innovations etc.

There are rather problematic data on the venture capital availability and the areas of its use as well as information on the activity of small enterprises. The latest is determined by the discrepancy in the small enterprise definition used by the EU and Ukrainian statistics. The criteria of small enterprise definition used in Ukraine are not somewhat different for the various sectors of economy compared to the unified criteria used in the EU countries.

There is a problem with the venture funds. Due to the drawbacks of legislation they virtually don’t finance the innovative activity irrespective they are widespread on the real estate market. The application of data on the venture funds activity in Ukraine can not be compared with the similar activity of the EU countries.

At the same time in Ukraine there is a possibility to calculate a big number of indicators that allow to analyze the peculiarities of innovative activity in the country.

Regarding the patent statistics, one part of data of Ukraine is collected according to the standards of the World Organization of Intellectual Property (Ukraine has joined the majority of international agreements in this area), the other part is collected by the international organizations (first of all, it refers to the data on the number of patents of the USA, EU, patents of trial group etc.).

There may be some problems with the retrospective data while compared as far as in the particular period of time 1990 – beginning of 2000 years in Ukraine there were so-called declarative patents, the value of which was low according to the experts.

It is considered that the implementation of the European innovation survey in Ukraine on the regular basis gives a possibility to make the large-scale and reasonable comparisons with the EU countries.

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Recommendations for the improvement of statistical reporting system in the sphere of innovative activity

The analysis made in the previous parts shows that not all the indicators that are used in Ukraine meet the international standards. Furthermore, in some cases the state authorities' lack of the relevant information (about techno parks and venture funds) required for reasonable decisions making.

The important peculiarity of the national statistics is the fact that the absolute majority of indicators which are collected by the statistical agencies may be referred to the so-called resource group, a minority – to those that characterize the impact of innovation, scientific and technological areas.

In Ukraine there are particular changes aimed at harmonizing the system of scientific, technological and innovation activity indicators with the OECD standards, however some of them are rather problematic.

The main suggestions on the improvement of scientific and technological activity statistics:

1. Classification of the research organizations of Ukraine:

It is necessary to make a correct re-categorization between the sectors under the international standards having replaced the existing classification by the categorization into state, commercial (business), narrow sectors and non-profit organizations sector. This procedure requires the specified data from all the organizations enrolled to the register of research institutions as far as in many cases a formal subordination to the state doesn't imply the state financing and execution of works for the benefit of government organizations.

2. Proposals on the amendments to the classification of scientific and technological activity (CSTA)
The application of CSTA in statistics for the classification of reporting data and analysis of the state of art of scientific and technological area has to meet the up-to-date requirements on the relevance of main scientific areas of the national science development. In the process of development of particular scientific areas in result of researches' creative activity new unstudied issues arise that leads to new scientific problems and areas, and in order to solve them it's necessary to have properly trained specialists.

It should be mentioned that the "List of research specialties" that was used for the formation of CSTA (015–97) was valid until 1999. Thus, it's necessary to review and make amendment to the CSTA (015-97).

The "List of specialties under which the dissertations are presented for PhD obtaining" approved by the Higher Certification Commission of Ukraine in 2005-2010 and registered in the Ministry of Justice of Ukraine shall be used as a basis while making the amendments at the level of types and sub-types.

3. Regarding the forms that reflect scientific and technological activities, the following changes are suggested:
<u>a) Form 1- science</u>

1) In the part "Scope of work executed since the beginning of the year" it would be appropriate to specify not only the part of executed but financed works.
2) In the part "Expenditures"... (item "Reference") it would be appropriate to specify not only the share of lease in the total space, but also the amount of money received from the lease

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3) In the part 1, item “Sources of funding” it would be appropriate to specify the country of funds origin (the most important countries and groups of countries: Russia, the USA, EU, China and other countries). It will allow to better track the international money flow related to the creation and transfer of scientific information.
4) In the same item “Sources of funding” it would be appropriate to specify the article “Extra budgetary funds” setting forth the list of such funds (or their main types) in the instruction to the form. Moreover, it would be reasonable to review the list of funds annually considering the current changes in the relevant Laws.
5) In the part 2 it is necessary to specify the data on quantity of employees in equivalent of full employment under the international standards as addition to the indicator “quantity of part-time employees”. Or, as an option, to introduce the indicator of the number of part-time employees in terms of full employment instead of the indicator “Man-hour”.
6) In the part “Categorizing of researches under age” it would be appropriate to introduce the indicators with the step 5 years (not ten as it is relevant for some age groups for the time being). Such categorizing is applied in many international organizations.

3-science

1) In the part 1 “Quantity of executed works” with more details may be eliminated.
If it is impossible the detailing indicators (1011-109) on the quantity of new materials, methods and theories etc shall be eliminated.

2) In the part 1 "Quantity of executed works" the indicator “quantity of published works” shall be in details, at least to back to the indicators that had been valid by 2000. It would be more reasonable to introduce such indicators as:

- Individual monographs published abroad
- Individual monographs published in Ukraine
- Manuals
- Articles in the magazines which are parts of international databases SCI, SSCI, Medline (or some other internationally recognized database on medical sciences), on the interim stage it is possible to use the information from SCOPUS database.
- Articles published abroad which are not a part of the previous group
- Articles in the national publications that are not a part of international SCI databases
- Preprints, brochures
- Separate chapters in the monographs
- Theses, teaching materials etc.

Such categorization will allow to better control over the real number of publications that is extremely overrated in recent years under the primary statistical data received from the research institutions.

If such categorization seems to be too detailed, it is necessary to determine the articles in the magazines incorporated to the databases SCI, SSCI, Medline (or some other internationally recognized database on medical sciences). To use more sophisticated approach is not necessary.

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3) The content of part 2 shall be reviewed along with the change of state priorities (add this provision to the instruction).

4) In the part 3 "Patent and license work" it is necessary to separate the quantity of patents registered in the USA and EU.

In the part 4 “International cooperation” it is necessary to divide the quantity of international grants into those received for the participation in scientific events (Travel grant) and those received for scientific work. Moreover, it would be relevant to set forth individual and team grants (in case of team grant it is necessary to determine how many employees managed to use it). It’s advisable to specify the country from which a grant was received.

5) Considering the number of visits, it is necessary to set forth the countries (group of countries) of departure: the EU countries, including Germany, France, Great Britain and others; North America (the USA, Canada); South America, Asia (including Israel, China, South Korea etc.).

6) Instead of parts 5 and 6 it is necessary to introduce the key words that meet the subject matter of research. It will allow making generalization and facilitating the data aggregation. As an option, theses parts may be fully eliminated, since the relevant information is partly duplicated in codes.

Moreover, the modern international practice separates scientific and innovation activity in different economy sectors that have different technical and technological levels.

If the industry spends for R&D over 4% of its production volume, it is called “high-technological”, if 1-4% - “medium technological”, less than 1% - “low technological”. The International Standard Industrial Classification (ISIC) and Standard International Trade Classification (SITC) are used for the classification. The latest help to specify the content of branch groups, but, of course, it doesn’t help to avoid many problems that arise in modern statistics, since it’s not always easy to find a mutual match between two classifications. The OECD experts suggested using the lists of relevant branches which are updated on the regular basis.

It is considered appropriate to confine with this list (which can be specified later) in Ukrainian statistics as well, and to separately determine the list of most progressive (critical, most perspective, etc.) technologies and their parameters by special surveys.

Recommendations on PhDs register (yearly post forms DS – “Records card of Doctor of Sciences” and CS “records card of Candidate of Sciences”)

Two-stage system of scientific degrees differs from that international. For comparisons with other countries it is necessary to currently put together the quantity indicators of Doctors of Sciences and Candidates of Sciences.

Regarding the specific changes:

1) It would be appropriate to enlarge the retrospective information block, focusing on foreign work experience of a Doctor or Candidate of Sciences (naming the country), and as well on his work as an Expert of international organizations (the UN, UNESCO, others).

2) It is also important to enlarge the volume of calculation indicators reflecting the higher qualification personnel dynamics.

3) The annual Statistical Yearbook should be supplemented with information on defence of Doctorate of Sciences and Candidate of Sciences dissertations.

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The three existing forms on innovative activities and patenting and licensing could be in general left as they are focusing on special surveys. 1-innovation «Technological innovations of an industrial enterprise survey» (post-yearly); 4-nt «Report on IPR acquisition and use of industrial property rights» (post-yearly); 7-nt (licenses) «Report on agreements on property IPR use» (post-yearly). These forms use helps track the dynamics of innovatively active enterprises quantity, volumes and directions of innovation activities expenditures, obtained results.

But it can be stated, that in the new edition of the form 1-innovation it would be appropriate (in parts 6 and 7) to name not all the reasons but 3-5 most important ones and to order them according to their importance. This would help determine the most important reasons for innovation activities drawbacks.

The forms on IPR have recently been reconsidered; they meet the international standards regarding the contents of relevant information.

Together with these forms of enterprises innovation activities monitoring it is appropriate to use separate indicators of form №1-enterprise «Report on major enterprise's indicators», in particular, those from the chapter «Innovation and information expenditures of enterprises». Innovation activities of small enterprises could to some extent be assessed with the help of №1-enterprise (small) «Report on major small enterprise's indicators» (yearly-post).

The forms reflecting patenting and licensing activities contain relevant information on the state of arts in Ukraine, but for specified international comparisons the data of international organizations are used, in particular those of the Patenting Department of the USA and the European Patent Office.

Recommendations on improvement of the form №1-technology (if preserved in the national statistics system) could be as follows:

1) In chapter „2. General characteristics", in my opinion, the feature "Novelty degree code" should be deleted. This could be justified as follows:

a) This code is set on the basis of exclusive subjective reasons and thus only reflects own views of an enterprise's representatives. The justification for this or that degree allocation is absent.

б) Technologies` real novelty can be defined due to information on patenting, certificates, etc.

2) Number of protection documents could be more detailed. Thus, it is necessary to provide information on patents obtained (separately) in Ukraine, the USA, and the EU. Moreover, in Ukraine the so called "declarative patents" should be separately pointed out. This will really help to have certain understanding of the technology international level.

3) It would be appropriate to use more detailed descriptions in the chapter "Use of advanced production technologies".

4) Biotechnologies and nanotechnologies are paid not enough attention in the technologies list. We see these technologies appropriate to be included into the overall list.

5) The chapters reflecting the so called „high technologies potential" as it is, containing methodologically not justified propositions on relevant calculations, are to be deleted.

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Conclusions to Chapter 11

- Regular innovation surveys by to the European innovation survey methodology should become the main information source on innovation activities in Ukraine.

1. These indicators in particular can become the basis for calculations in the framework of the European Innovation Scoreboard. Besides, these indicators will make it possible to analyze regional scientific, technical and innovation activities in Ukraine. To compare the regions and Ukraine in general with the help of each region's innovation index. This will help to define the weak and strong points of separate regions of Ukraine, reflect the existing tendencies and develop and justify the development directions of scientific and technological policy of Ukraine.

2. While making changes in the local statistics, there is no sense in complete abolishment of the "traditional" sources of statistical data (forms) because they provide important information covering specific features of Ukraine. On the basis of these data it is possible to create time series and to follow changes in innovation system of Ukraine for a long time. The current report provides relevant changes to the existing forms and methods of information collection, which would help to use it more efficiently. Besides, the "traditional" forms data will be useful for specifying and checking the CIS questionnaire's data.

3. An important precondition of transition to the international standards in the sphere of science and innovation statistics is the utilization of the main OECD Manuals, including „Frascati Manual", „Oslo Manual" and some others, which contain main definitions and principles of innovations, scientific and technological potential assessment. If simplified, the procedure looks as follows: the Manuals, translated into Ukrainian, have to be sent to the OECD Secretariat. If the Secretariat will be assured that Ukrainian state statistics authorities apply the same tools, it checks the correctness of translation and it suggests the date of transition to the international standards (year, month). Besides, the OECD starts using data on Ukraine in its comparative research. UNESCO and other international organizations use the OECD standards almost without changes. .

4. The role of science and knowledge increases in the information society. It would be appropriate, conducting specialized surveys, to use the EU experience of specific issues of science impact on society development. For example, in Russia they have established the system of monitoring the public opinion about science taking the EU recommendations into consideration. The survey contains questions on scientific research level and new technologies implementation assessment; on innovations importance, on working conditions of scientists in the country, on the state role in scientific activities regulation, on research priority directions. The problems of trust to science, scientific activities prestige and scientists` social status, population's interest in scientific subject matters, scientific and technical information availability, attitude towards learning are also studied within the frameworks of the survey.

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Chapter 12

Regional innovation programs (Olha Krasovska, Nikos Maroulis, Arkadiy Khrebtov, Gudrun Rumpf)

Introduction

The aim of this chapter is to highlight the experience of EU27 member states with regard to regional innovative development programs and measures and to pinpoint problems and difficulties that are common throughout the EU with regard to Research, Technology Development and Innovation (RTDI) regional policy formulation and implementation. This is also an attempt to analyze the current situation with regional innovation programs in Ukraine.

European experience

Regional Research and Innovation Policies in EU

Innovation has become a central issue both in regional and in industrial policies throughout the EU during the past 20 years. During this period, innovation policies have moved away from a linear model and a 'best practice' perception towards a more dynamic one based on the characteristics of the Regional and National Innovation Systems [1]. The Regional Innovation System approach presents the benefits of taking into account the strengths and weaknesses of the various actors (firms, research centres, etc), clusters, networks and their interactions / links within and beyond the region (national or international), following a systemic approach.

Moreover, until the 1990s innovation policy focused on Research & Development (R&D) infrastructure provision, financial innovation support for individual companies, and technology transfer. These policies very often neglected the absorption capacity of firms and their internal capabilities such as management and organizational capabilities, particularly of SMEs. Gradually the focus shifted on high-tech, knowledge-intensive industries, building up of research excellence, attraction of global companies, stimulation of spin-offs and knowledge spillovers. In addition to these partial policy interventions more systemic policy views were developed in order to deal with "systemic" failures of Regional Systems hindering the flow of knowledge and technologies and the institutional, organizational and network layers of the Regional Innovation (RIS).

In this chapter we will focus mainly on regions facing challenges in their attempt to converge to the EU average and on the policies these regions adopted in order to achieve this ambitious goal. This option relates to the comparatively greater need to invest in innovation in less developed regions and in parallel due to their relatively smaller capacity to absorb public funds aiming at innovation. The problems of these regions in this respect are often linked to a fundamental absence of basic innovative capacity in local firms, but also to a relative lack of regional autonomy in decision-making and a lack of trust and tradition of cooperation between the different actors in the innovation system.

Type 1 Regions - Peripheral Regions

This type of regions are often characterized by the predominance of traditional industries and low technology services sectors, with low levels or R&D and product and process innovation and an income

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level below the national average. Moreover SMEs dominate the local economy, while clusters and networks are either weak or completely absent, resulting in limited interactions between the actors of the Regional Innovation System. Innovation activities of local actors are limited to incremental innovations, particularly with regard to the production processes. Universities and research organizations based on these regions are either scarce or put emphasis on low to medium level of qualifications in correlation to the traditional sectors weight in the local economy. Finally, technology transfer organizations, if they exist, are ineffective.

Indicatively regions belonging in this category include Corsica (France), Balearic Islands & Andalusía (Spain), West Wales (UK), Western Macedonia (Greece) and Calabria and Apulia (Italy).

The major challenge for this type of regions is 'catching up' in relation to technological, managerial and organization developments occurring in more advanced central regions or abroad. This in turn implies:

– Linking regional actors (firms, institutions, etc) with clusters, value chains and knowledge organizations in other regions in order to facilitate technology transfer.
– Upgrading of the absorption capacities of firms and particularly of SMEs and attracting innovative companies both domestic and foreign in order to enrich the production base.
– Enhancing the technical and managerial skills of the human capital located in the region.
– Strengthening of the local knowledge production base by establishing branches of established research organization within the region which are relevant to the local economy.

Type 2 Regions – Old industrial and declining regions

In this category usually fall old industrial regions under restructuring, with medium level incomes compared to the national average with and medium level of human capital resources and medium-to-high knowledge creation capacities, which are however becoming fast obsolete.

These regional economies are also dominated by large firms locked in narrow technological trajectories. These companies also put emphasis on incremental and process innovations. Education and training in these regions is often oriented towards traditional sectors and technologies, while modern qualifications and training (technical and managerial) are missing. These regions are also usually populated by a sufficient number of specialized technology transfer organizations that are however purely coordinated and don't have sufficient linkages with local firms.

Indicatively regions belonging in this category include Emilia Romagna (Italy), Podlaskie and Mazowieckie (Poland), Upper Austria (Austria), Lombardy (Italy), Scotland (UK) and Saxony (Germany). The basic challenge of this region is the renewal of the regional economy. This in turn implies:

– Shifting the regional economy to new economic fields and technological trajectories and a diversifying the local production base.
– The building up of new skills for the human capital of the region.
– Attracting foreign direct investment and building networks and clusters around these new value chains.
– Increasing networking of regional actors with national and international advanced knowledge bases.
– Setting up new or diversifying existing regional research organizations into new dynamic research areas.

Type 3 Regions – Central Regions with fragmented networks

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The third type of regions usually refer to regions with relative high income economies that act as a pool for highly qualified human capital resources and where the most important Universities and research organizations are situated.

These regions are populated by many industrial and services sectors firms, however clusters and networks linkages are weak or problematic. Despite the presence of a large number of companies with R&D activities, knowledge creation and spillovers, product innovations and spin –offs creation are disproportionate to the regions potential. Furthermore despite the presence of many and high quality Higher Education Institutes and research organizations and a large pool of scientists, links with the industry are often weak. These weak linkages are also reflected in the low levels of innovation networking. Indicatively regions belonging in this category include Lazio (Italy) and Attiki (Greece).

This type of regions face difficulties in situating themselves into competitive niches of the global economy due to inefficiencies of the Regional Innovation System, despite the fact that basic components are present in the regional economies. This in turn requires policies aiming at:

– Supporting emerging clusters by enhancing interactions between the various actors (research centres, firms and Higher Education Institutes).
– Attracting foreign direct investment and developing specialization advantages in high value added areas.
– Supporting the establishment of start-ups and spin-offs in new advanced technological fields by ensuring that funding mechanisms (Venture Capital, bank loans) provide the necessary funding, by providing the necessary pool of highly trained personnel and by enhancing the collaboration of these companies with research centres and higher education institutes.

The three separate sets of policy approaches highlight the necessity for a tailor made innovation policy approach addressing the specific challenges, problems and opportunities found in each type of region. However, some key policies issues are common for all types of regions such as:

— There is a need to shift from the firm based measures towards a system based approach. Similarly, supply oriented policies centred on infrastructure buildings should be complemented with soft policies such as human and social capital development or cooperation between companies and universities.
— Innovation measures should not be limited to the stimulation of R&D and technological innovations but also take into account other aspects such as, organizational, financial and commercial aspects of the innovation process.
— In order to increase the capacity of regions and firms to innovate it is necessary to increase the absorption capacity of all actors in the region.
— During the designing of RTDI measures it is considered good practice to consult regional stakeholders and building consensus rather than following top down policy strategies.
— Coordination between the various levels of policy making (regional, national and EU) in order to avoid duplication of efforts and inefficient use of scarce resources.

Financing sources for regional innovation policy

Regional RTDI policies in EU27 countries are financed from public regional, national and EU sources, or frequently from a combination of the above. In addition to public funding, private funding is usually mobilised at the level of the individual projects where companies are requested to contribute to the cost of the project. A general rule which is often used is that the closer to the market the results of the project are,

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the higher the contribution of the participating (and therefore benefited) companies is. Thus programs supporting the construction, improvement or promotion of public infrastructures (e.g. public universities or research centres, public intermediary organizations etc.) are financed 100% by public sources. Similarly research programs supporting academic research or research in public research organisations are funded 100% by public sources. However, in programs with the participation of the private sector e.g. programs aiming at: promoting research collaborations between public research organisations and companies; technology transfer; promotion of innovation etc. the private companies should contribute to the budget of the projects they participate. In these types of projects the public partners receive 100% of their cost, while the private companies should either finance a share of the project's budget or at least a share of their own costs (shares could vary significantly across programs). The remaining of companies' costs is subsidised by the government (federal or regional).

The framework for defining the amount (share of the budget) of public subsidies that allowed to private companies is the regulation for European Union regulation on State Aid (2006/C 323/01) which is further explained and codified in the Vademecum of the Community Law on State Aid. State aid rules cover only measures involving a transfer of state resources (including national, regional or local authorities, public banks and foundations, etc.) to private companies. Within this framework, national legislation could provide additional restrictions or requirements for public subsidies.

It must be stressed however that the above RTDI measures and funding intensities apply to EU countries which most of them have developed national innovation systems, efficient public research sector (Higher education institutes, Public research centres and technology transfer mechanisms) and the presence of competitive firms and financing institutions (banks and VC's). Thus, the adaptation of the above aid schemes and the aid intensities should always take into account the level of development of the research and innovation system and of the actors and the impact of the state aid in their mobilisation.

Within the EU the major funding mechanism for financing innovation and R&D (with the exception of national sources) are the Structural Funds, the seventh Framework Programme for Research and Technology (FP7) that focuses mainly on R&D, and the Competitiveness and Innovation Program (CIP).

The Structural Funds thus remain the main Community instrument used to foster regions innovative capacity, which is currently complemented by the Regions of Knowledge initiative implemented under FP7 as part of the European Research Area (ERA) policy. Between these initiatives there are potential risks of overlaps and duplications that require close coordination between the different Community programs. Since 2000, the emphasis on RTDI type measures in the SF has been increased in line with the Lisbon goals. During the 2000-06 programming period, approximately 10,198 MEUR were allocated to RTDI initiatives, or 5.5% of total funds in the EU25. In absolute terms the SF do appear to be an important contributor to national R&D efforts notably in Objective 1 regions and this may contribute over time to a convergence of GERD in Europe (regions with average per capita GDP below 75% of the European Union average). Finally it is estimated that into the current programming period (2007-2013) €86 billion of Cohesion Policy funds (which are part of Structural Funds) are allocated to innovation in the EU-27, of which considerable amounts will support cluster initiatives and their infrastructures.

Methodological issues for developing regional innovation policies

As we told above there is no best model for the governance of the regional innovation system and that different policy mixes are suitable to different regions depending on their particular internal characteristics and also on the capabilities, governance structures and processes of the regional authorities. Moreover, regional authorities will be able to implement effective RTDI policies if on the one hand have the autonomy to define a wider set of policies directly linked to innovation (such as educational policies) and on the other hand if there is a good coordination with other regions and more importantly with the central government policies and priorities. Before policy starts focusing on the development of excellence in selected scientific areas, the creation of competent local actors and organisations should be pursued. Similarly, before policy focuses on the system as a whole, the development of key institutions and industries should be a priority. Therefore, the experience and the good practices identified in EU countries should be used with caution as they are suitable for more advanced research and innovation systems. As a corollary, different policy options are suitable for high performing regions with dynamic clusters and for weak systems with weak institutions, low levels of clustering and "lock in" in traditional sectors where path dependency is predominant.

However, in order to create a regional advantage, national and regional authorities cannot rely only in the segmentation proposed above into different type of regions but also should take into account the fact that different sectors exhibit specific learning interactions [2], the increasing importance of internationally distributed knowledge networks and the importance of the regional competence base embedded mainly in highly skilled people. Thus policy makers should take into account the fact that the innovation process of firms and sectors varies substantially and requires specific knowledge bases, i.e different mixes of tacit and codified knowledge, qualifications and skills. In some sectors innovation takes place mainly through the recombination of existing knowledge while in other sectors innovations require heavy investments in cognitive and rational processes through R&D. This in turn has implications as to the policy mix and measures that should be introduced in an economy in order to foster innovation.

Consequently, the fundamental task of regional authorities is to create the conditions, the formal framework as well as the informal norms of trust and reciprocity, in short, the social capital that is required so that firms, intermediate organisations and public agencies be capable of self-organising around a process of interactive learning.

Finally, the governance of the regional innovation system, e.g. the formulation, design and implementation of policy mixes should be seen as an integral component of this system and as an evolutionary process. Regional governance evolves over time, and this evolution is marked by a transition from less to more complexity, from less to more conscious actions on behalf of policy makers.

The governance system should play both a proactive and reactive role to the changing environment of the regional innovation system, whether this change is the result of endogenous actions of the various components of the system, or the result of exogenous factors such as EU accession or globalization. Thus the coherence of this system in terms of efficiency, effectiveness and impact of the designed measures is important. Recent studies [3] have highlighted the role of the following three factors as fundamental for achieving the aforementioned objectives.

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- The existence of structural institutions, such as regional research councils, is crucial to the process of governance through ensuring coherence and coordination of responsibilities.

- Clear formulations of strategic policy objectives, well resourced, implemented and monitored, are major driving forces for good governance.

- Such a view of the governance system also implies that stakeholders should participate into the designing of policy measures.

This dynamic perception of the governance system implies that the policy mix is a dynamic process where instruments whose objectives have been achieved or are no longer valid should be abolished or replaced with modified versions that are more appropriate to the contemporary needs.

Operational management issues for regional innovation programs

The analysis will be deployed at 3 levels.

Level 1 - Programming authorities: This level refers to the body, authority responsible for the design of the regional program, i.e. regional, national or a combination of both.

The issue of the designing/programming authority for regional innovation programs is related on the one hand on the degree of regional autonomy (constitutional decentralization of power) and on the other hand on the emergence over time of regional partnerships and institutions that are able to develop and steer an effective RTDI strategy. In countries, with a weaker regional innovation system usually follow the approach of centrally planned strategies and measures. In countries with advanced regions regional RTDI strategies are formulated at the regional level, with the involvement during the designing process of various regional stakeholders. In the latter, regional policies are developed within the broader context of the national RTDI policies. The degree of coordination between the national and regional levels is rather country specific depending on several factors which has been already discussed above.

Level 2 - Managing authorities: This level refers to the body/bodies responsible for managing the implementation of RTDI measures. These bodies can either be specific national or regional agencies, government departments or secretariats.

Managing RTDI measures requires substantial knowledge and experience in complex ‘multi-actor, multi-measure’ programs, since many measures bring together a wide range of actors from Higher Education Institutes to firms, financial institutions and consultants. Moreover, programs can involve a range of types of measures from infrastructure investment to support for collaborative industrial research.

In almost all EU countries the financial management and control of programs is usually carried out by a management authority responsible for an entire program, while ‘the implementation agency’ for specific RTDI measures may be a more specialized body. In most EU countries operational implementation of regional RTDI measures tends to be dominated by government departments (either national or regional level).

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Less common is the case where programs are run by a combination of a ministry (or regional government department) and a specific agency (sometimes in the form of non-profit companies as in Greece for the Information Society program or as in Scotland in the form of Program Management Executives).

These specialised structures, often based on wide-ranging partnerships (as in, Denmark, Germany or Scotland) of all key actors in a region, offer the advantage of creating a one-stop shop for funding applications.

Level 3 – Coordination of regional with national policies: Coordination of regional and national policies allows policy makers to avoid duplication of efforts and exploit complementarities.

The analysis can be based on two extremes. On the one extreme are regions that implement a completely independent strategy resulting often at the overlap of competencies and objectives without achieving the critical mass needed to be effective. On the other extreme are countries that use regional innovation policies in a complementary way to national policies, or have a completely different objective.

The Netherland for example, during the 2000-2006 programming period, adopted a differentiated regional approach by orienting regional RTDI policy towards the regions strengths, while ignoring the weaknesses of regional innovation systems. In contrast, Finland followed the opposite approach, by employing SF interventions as a mean to complement the existing national policy measures and provide a financial support for those regions that have limited capabilities to make use of national funding.

In Spanish regions and particularly in the region of Catalonia, regional RTDI policies are used in order to fill in the gaps of national and international programs. This has lead to limited focus on project funding by regional authorities for individual actors. Instead, the region has traditionally focused its attention towards building research infrastructure and attracting outstanding international staff to work in Catalonia. So, rather than research programs, ‘vertical strategies’ are promoted, focusing on building up basic capacity in the region, which is often translated into completely new, state-of-the-art research institutes and technology centres.

However, the lack of coordination and complexity between the national and the regional level can be observed in a number of countries from all types of constitutional situations including, Austria, Germany, Spain, Bulgaria, Greece, Ireland, Portugal, Sweden, Poland, and the Czech Republic. Difficulties arise typically between various (e.g. Ministries of Education and Research and the Ministries of Economy) and regional authorities. Lack of co-ordination might also result from the large number of national and regional consultative bodies, agencies and organizations involved in the policy formulation and implementation process. Finally, the fragmentation of the R&D system and the continuous creation of new national agencies make the RTDI system even more complex to manage.

Indicators for monitoring, and assessing regional innovation and research policies

Context Indicators

Context indicators apply to an entire territory, population or category of population. In contrast, a context indicator does not apply to the implementation of a program and to its effects. It always applies to the

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entire eligible territory, without distinguishing between those that have been reached by the program and those that have not. In other words context indicators are related with the performance of the Regional Innovation System (RIS) and all the policies affecting the RIS, either National or Regional.

Moreover, context indicators should not be region specific but rather international in scope, so that policy makers will be able to compare the efficiency of policy measures (i.e. RTDI policies and measures) in relation to other regions. Such an approach has been followed within the EU with the European Regional Innovation Scoreboard that provides a comparative assessment of innovation performance across the NUTS 2 regions of the European Union and Norway.

The rational behind the development and monitoring of such a system of indicators is that "As the regional level is important for economic development and for the design and implementation of innovation policies, it is important to have indicators to compare and benchmark innovation performance at regional level. Such evidence is vital to inform on policy priorities and to monitor trends" [4].

The 2009 Regional Innovation Scoreboard is replicating the methodology used at the national level in the European Innovation Scoreboard (EIS) and uses 16 out of the 29 indicators used in the EIS for 201 Regions across the EU27 and Norway. The reason for the employment of a reduced number of indicators at the Regional Innovation Scoreboard is that the data available at regional level remain considerably less than at national level.

The 16 indicators system used in the scoreboard are divided in three groups / pillars, the enablers, firm activities and Outputs. Enablers capture the main drivers of innovation that are external to the firm, such as the Public R&D expenditures as percentage of GDP. On the other hand, firm activities capture innovation efforts that firms undertake such as the business R&D expenditures as percentage of GDP. Finally, the third pillar of indicators, outputs, captures the outputs of firm innovation activities such as the sales of new-to-market products as a percentage (%) of the total turnover of firms.

Program Indicators

Program indicators try to monitor and evaluate (at the extend this is possible) the direct and indirect effects of the implementation of a program. Within the framework of monitoring and evaluation, program indicators are applied in order to show if a particular intervention is a success or failure.

A program has always numeral consequences positive vs negative, direct or indirect, immediate or long–term. Thus program indicators in most cases are rarely able to measure all these consequences. A program mobilizes resources (which could be financial, human or institutional) with the view of achieving some specific objectives. In order however policy makers to be able to monitor and evaluate a specific program or measure it is necessary to scale down the objectives in a 7 levels scale as suggested in the following table.

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Table 12.1: Definition of indicators by level or objective

Type of indicator	Definition
Resource / Input	Means made available by funding authorities and used by the beneficiaries for their activities
Output	Product or result of the beneficiary's activity
Result (immediate outcome)	Immediate effect for direct recipients.
Impact (sustainable outcome)	Sustainable effect for direct recipients
Global impact	Global effect for the entire population concerned (direct or indirect) – e.g. employment or competitiveness of a Region.
Efficiency	It relates to outputs, results and impacts
Effectiveness	It relates to outputs, results and outcomes

In more detail, resource indicators provide information on financial, human, material, organizational or regulatory means used by beneficiaries for implementing a particular program or measure. Resources are the joint responsibility of the funding authority that allocates them and of the beneficiaries that use them. Examples of resource indicators include the total budget of the measure, absorption rates, number of people working for the implementation of the measure, number of organizations / beneficiaries involved, etc.

Output indicators represent the products of the beneficiaries' activities, i.e. everything that is obtained in exchange for the public funding. Outputs are the responsibility of the beneficiaries who have to report on them through the corresponding monitoring scheme set up for each program. Examples of outputs can be number of people trained, percentage (%) of an infrastructure constructed etc.

Result indicators represent the immediate advantages of the program for the beneficiaries, i.e. reduced costs, use of a new productive capacity established by the financed firm, number of qualified personnel that have been recruited etc. Moreover, impact indicators represent the consequences of the programs beyond their direct and immediate interaction with the beneficiaries, i.e. number of sustainable new jobs created in the long –run, increase in sales/profits due to the production of new innovative products, increase in exports etc.

Furthermore, two important dimensions of any evaluation process are the efficiency and effectiveness of a program, measured by a corresponding set of indicators. Thus effectiveness indicators measure what is obtained compared to what was expected. In contrast, efficiency indicators measure what is obtained compared to the resources that were mobilized. An example can be the cost of a kilometre of motorway built (i.e. 5, 10 or 1000 euro per kilometre).

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Another common policy area addressed by many similar measures across all EU countries is related to the training of the human capital. Most of these programs aim at the modernisation and adaptation of the national or regional education systems in order to provide better training and increase the employability of people. Training programs can take many forms: basic training at the outset of a career, the renewal or acquisition of skills throughout the working life, academic or professional training etc.

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Ukrainian experience

Legislative background of regional innovation policy in Ukraine

According to the National Regional Development Strategy till 2015 [1] there are the following main purposes of the state regional policy of Ukraine:

– to create conditions that allow the regions to realize their potential,
– to make maximum contribution to the national economy development,
– to gain competitive advantages in international markets.

To achieve these goals it is necessary to solve at the regional level following problems:

– low investment attractiveness of regions and low level of innovation activity in them;
– undeveloped industrial and social infrastructure in the regions;
– growth of regional disparities in socio-economic development;
– weak interregional relationships;
– inefficient use of human potential.

Innovation component is included in strategic policy objective of regional development of Ukraine till 2015 into the task "Improving regional competitiveness and strengthen their resource potential" according to the priority direction - restructuring the economic base of definite regions and creating conditions for diversification on the new technological basis. It is assumed that this direction will help to increase productivity of the regional economy and to support new activities that will increase growth and employment. This will involve the regions which necessitate restructuring traditional industries with the critically high depreciation of fixed assets and with the risk of man-made disasters at national

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level. Promotion of the creation and implementation of innovations, including diffusion of advanced technologies; particularly to reduce risks of disasters is one of the ways in which government support will be referred to this restructuring.

As mentioned earlier it is obvious that implementation of R&D results and innovations is a main factor of economic development. The activity towards increasing of S&T potential is intensified in regions that have experience with a knowledge-intensive and high-tech products development.

In order to implement the task state support should be directed to:

– establishment an effective system of cooperation between institutions, enterprises and organizations in R&D, education, manufacturing, in business, finance and credit sectors for fostering innovation;
– promotion of the establishment of investment funds for implementation of innovation projects involving resources of state and local budgets and private capital; creation of a competitive system of innovative projects selection according to the priorities of regional development; development of independent expertise of investment projects and to enable SMEs to participate in performance of the state defence order;
– concentrate financial and intellectual resources for implementation the measures identified by the state as innovation development priorities;
– creation of the favourable conditions for directing investments into high-tech manufacturing sector and innovation staffing;
– formation of extra-budgetary sources of innovation activity, legal regulation of joint investment, including venture capital market regulation in the field of innovation;
– stimulation of the creation by enterprises and institutions of their own environmental management systems according to international and national standards.

The state will promote innovation and provide R&D using the latest scientific and technological achievements by following ways:

– to organise competitions of domestic innovation and venture fairs in order to attract investment into primarily the most promising innovation projects;
– increasing the state demand for training personnel for innovation entrepreneurship, in particular innovation managers and professionals on venture investment.

Appropriate scientific justification (feasibility) of regional innovation, industrial and social policy in the longer term perspective is also one of the priorities for scientific support of regional development till 2015. On September 22, 2011 the Verkhovna Rada adopted the first draft of the Law "On State program of economic and social development of Ukraine for 2012 and main directions of development for 2013 and 2014". The program defines priorities for each area of reforms, one of which is to strengthen the role of regions in promoting economic growth and increase their responsibility for solving social problems. Hopefully, this will positively influence the regional innovation policy.

Today in Ukraine there are 3 main tools of regional innovation policy

– Regional Program of Innovation Development (regional innovation programs).
– Agreement on regional development.
– Agreement between the State Agency of Ukraine for Investments and Development and local authorities.

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Let’s consider Regional programs of innovation development (regional innovation programs) more detail. Innovation programs are one of the tools of local authorities influence on the innovation processes development in definite regions of Ukraine in which creation of innovation model of economic development is the strategic goal of regional development [2].

The following should be considered to be the main tasks of a regional program:

– improvement of mechanisms to promote scientific research and experimental developments results commercialization;
– increase of the number of organizations developing innovations;
– support to innovation activities infrastructure creation;
– development of small and medium knowledge-based manufacturing businesses;
– increase of competitive innovation products output;
– formation of a region’s innovation potential and innovation infrastructure permanent monitoring system;
– financial and credit support to priority developments;
– target orientation of specialists training at higher schools with focus on perspective directions of industry and social sphere development based on “Human Resources (HR) support”.

Development of regional innovation programs must be in compliance with the Law of Ukraine "On state forecasting and elaboration of economic and social development programs of Ukraine" and according to the Methodological recommendations on the development of the regional targeted programs, its monitoring and reporting on its implementation, approved by the Ministry of Economy and European Integration of Ukraine [3].

Given the specific character of innovative programs` objectives and tasks, the requirements to these programs are governed by the provisions of the Law of Ukraine "On Innovation Activities" [4]. The projects included in these programs are to be innovative, i.e. stipulate for development, production and sales of innovative product(s), which in turn must comply with the requirements of Articles 14 and 15 of the mentioned Act.

Regional Program of Innovation Development (hereinafter - the Program) should be directed to the most important problems of regional development through the creation of new technologies, production facilities, materials and other high technology and competitive products on the base of implementation of medium-term priorities for innovations at the regional level.

Elaboration and development of medium-term priorities for innovations at the regional level is carried out under the Law of Ukraine "On the priority directions of innovation activity in Ukraine" [5] taking into consideration the Guidelines for the development of medium-term priorities for innovation on sectoral and regional levels, approved by joint order of Ministry of Education and Science, Ministry of Economy, Ministry of Industrial Policy, Ministry of Finance and National Academy of Sciences of Ukraine from 09.07.03 N 442/279/180/298/449.

Implementation of medium-term innovation priorities at the regional level are in accordance with Article 6 of the Law of Ukraine "On the priority directions of innovation activity in Ukraine” through innovation projects is the aim of the regional innovation program.

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In Donetsk Region:

In 2000, Donetsk Regional Council and Donetsk Regional State Administration identified the strategic objective of their activity: formation of the regional economic development innovative model (Decree № 342 of the Chairman of the Regional State Administration "On the Organization of the Development of Scientific and Technological Development Program for Donetsk Region till 2020" dated 01.06.2000), which was to become the basis for new approaches and management techniques, economic management mechanisms enhancement. Scientific and Technical Council on development of the Program on Scientific and Technological Development of Donetsk Region till 2020 (headed by the Chairman of the Regional State Administration, Yanukovych V.F.) was created by the mentioned Decree of the Chairman of the Regional State Administration. The members of the Council were representatives of the region's scientific organizations, enterprises and institutions interested in the Program's adoption and implementation.

Also, in order to meet this challenge, Donetsk Regional State Administration signed the Cooperation Agreement on Preparation of the Program on Scientific and Technological Development of Donetsk Region till 2020 (dated 23.05.2001) with the National Academy of Sciences of Ukraine.

The efforts made during 2000-2002 resulted in the Program on Scientific and Technological Development of Donetsk Region till 2020 developed by Donetsk Regional State Administration jointly with the National Academy of Sciences of Ukraine involving a wide range of the region's scientific institutions` and leading industrial enterprises` specialists.

The developed draft Program-2020 was considered at the joint session of Donetsk Regional State Administration and the Presidium of the National Academy of Sciences of Ukraine and was recommended for implementation by the Decision "On Approval of the Draft Program on Scientific and Technological Development of Donetsk Region till 2020" dated 06.03.2002.

Donetsk Regional Council approved the Program-2020 as that on Donetsk Region innovation development by the Decision № 3/25-656 "On the Program on Scientific and Technological Development of Donetsk Region till 2020" dated 22.03.2002.

Presidential Decree № 291/2002 "On Measures to Stimulate Scientific and Technological Development of Donetsk Region's Economy" (dated 25.03.2002) fixed the status of the Program-2020 as Ukraine's first regional innovation development program.

Elements (sections) of the program regulated by General recommendations for development of regional innovation development programs [6].

Comprehensive analysis of regional innovation programs

Before beginning this study we have behavioural analysis of economic, scientific, technological and innovation capacities of 27 regions of Ukraine and on this basis we have put forward the following assumptions:

– Regions with higher levels of economic development are more advanced in terms of innovation programming
– In regions where there are no special program of innovation development, innovation component included in the socio-economic development

The following categories of regional innovation support activities exist in Ukrainian regions:

– Priority directions of innovation activity
– Program of innovation and/or S&T development (activity)
– Special programs designed to support certain aspects of innovation

According to the existence or not of such activities, Ukrainian regions can be categorised as follows:

1. Regions with “Priority directions of innovation activity” (Crimea region).
2. Regions with “Priority directions of innovation activity” and regional innovation and/or S&T programs (Chernihiv, Cherkassy, Donetsk, Poltava, Kirovohrad, Vinnytsia (draft) regions).
3. Regions with only regional innovation and/or S&T programs (Dnipropetrovsk, Zaporizhzhya, Ivano-Frankivsk, Rivne, Ternopil, Kharkiv, Chernivtsi (draft) regions).
4. Regions with special programs designed to support certain aspects of innovation activity, including:

– Regional target program "Creation of the innovation infrastructure in the Odessa oblast in 2008-2012”.
– “Conception of regional innovation system development (draft)”(Zhytomyr oblast).
– “Kyiv city program of industrial development based on innovations in 2007 – 2011”.
– “Program on establishment of cross-border transport and logistics centres as structural parts of innovation clusters in the Zakarpattya oblast for 2009-2011”

All Ukrainian regions can also be divided into two other large groups:

– Regions with special programs to support innovation and/or scientific and technical activities
– Regions where support of innovation and/or scientific and technical activities is integrated into the programs of social and economic development

It should be noted, that the first group is heterogeneous. There are the only draft innovation programs in a number of regions (e.g. in Vinnytsia, Chernivtsy regions), while in others innovation programs have been already approved by the local authorities. The analysis of public availability of regional innovation programs showed that the web-sites of regional councils and administrations contained texts of program in 7 regions (Dnipropetrovsk, Donetsk, Zaporizhzhya, Ivano-Frankivsk, Rivne, Cherkassy, Chernigov). The programs declared in Poltava, Kirovohrad, Kharkiv and Ternopil regions were not found in the public domain, also it applies to projects of regional programs of Vinnitsa and Chernovtsy regions. The texts of the priorities for innovation in the Crimea, Vinnytsia, Zakarpattya, Kirovograd, Poltava and Chernihiv regions are also absent. There were available only for Cherkasy region. All special programs designed to support certain aspects of innovation (Odessa, Zhytomyr and Kyiv) were found in the public domain. There was no information on innovation regional programs in other regions. This preliminary analysis of the

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availability of innovation regional programs denied our previous assumption about that the most economically developed regions are also the most progressive in matters of the creation of regional tools to support innovation (regional innovation programs). It turned out that such of industrial developed regions as Luhansk, Lviv and Mykolaiv have no special programs to support innovation or S&T activity or such programs are not available in the public domain. Instead, such regions as Ivano-Frankivsk, Rivne, Cherkassy, Ternopil, Chernigov have the regional innovation programs.

Analysis of existing innovation and / or S&T development programs we will conduct by the following program components:

1. The degree of validity of the objectives and reasons for program implementation
2. The completeness of the data on current economic, scientific and innovation potential of the region
3. The validity of resource maintenance of the program. It should be noted that the program should not only contain total financing, but also its distribution by years and funding sources.
4. The presence of concrete measures to be undertaken at the regional level to implement the program. Particular attention here we pay to the existence of measures aimed at

– cooperation of research institutions and industrial enterprises aimed to development of innovation and technological alliances, science intensive (technology) products, conducting market research in S&T and innovations;
– cooperation of research institutions and universities;
– strengthening of innovation infrastructure;
– attracting financing from private companies and investors for the Program implementation

These measures are extremely important for effective implementation of innovation policy at regional level.

5. The mechanism of the program implementation, namely the selection process and support of regional innovation projects and innovation projects of technological parks aimed at the medium-term priorities for innovation in the region
6. Completeness of expected results and existence of specific indicators for program performance evaluation.

Regions with regional innovation and / or S&T program

Let's analyze existing regional program for innovation and / or S&T technological development by listed elements. We analysed following programs:

1. Dnipropetrovsk region. Regional Innovation Development Program till 2020, approved by the Head of Regional State Administration of 04/03/2008, the number R-82/0/3-08 and Dnipropetrovsk regional council decision of May 23, 2008 № 386 - 1915 / V
2. The Program of S&T development of the Donetsk region until 2020, approved the decision of Donetsk Regional Council of 03.22.2002 № 3/25-656 year
3. Targeted economic program of innovation development Zaporizhzhya till 2012, approved the decision of Zaporizhzhya Regional Council of 07.08.2008, the number 12

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4. Program for S&T and innovation activity till 2015, endorsed the decision of Ivano-Frankivsk Regional Council of 05.06.2009 № 803-30/2009 year
5. About S&T and innovation development of Rivne region for 2008-2010, approved by the council decision number 610 of 01/16/2008
6. Cherkasy region. Regional program of S&T and innovation development for 2008-2011, approved by decision of the Cherkasy Regional Council of 06.06.2008, the № 18-3 / V
7. Program of innovation and investment development of Chernihiv region for 2007-2010 "Chernihiv Investment - 2010" approved by the 1910 session of the Regional Council 05/24/2007 5 convocation, and the order of the regional state administration from 03.05.2007 № 17
8. The program of S&T and innovation development of the Ternopil region for 2005-2010, approved by the decision of Ternopil regional council on 25 January 2005 №375
9. The program of innovation and S&T development of Poltava region till 2008, approved by the decision of Poltava regional council on 18 October 2004

Also we included in our analysis drafts of the programs of Vinnitsa and Chernivtsi regions.

It is need to note that Dnipropetrovsk and Zaporizhia regional programs are almost identical. Preliminary analysis of the innovation potential of the region, which is not done in Dnepropetrovsk's program, is the advantage of Zaporizhzhya program. One explanation for this is probably the fact that Zaporizhia and Dnipropetrovsk region at the moment of program development have common Regional Innovation Development Center (Dnipro), which was the application developer. To the same extent it is related to the drafts of programs of Vinnytsia and Chernivtsi regions, which together are under the scope of South-Western Regional Innovation Development Center.

The degree of validity of the objectives and reasons for program implementation

Aims of creation, the legal framework of their creation, namely the specified regulations under which the program is developed are indicated in all programs. In the program of Dnepropetrovsk region purpose is indicated, but the reasons and grounds for development of the program are absent and in Ternopil program there is no purpose of its creation

The completeness of the data on current economic, scientific and innovation potential of the region

By the presence of descriptive and analytical part existing programs can be divided into 3 groups, namely programs in which

– descriptive part is missing
– the analysis of both economic and scientific-technical and innovation capabilities is presence
– the analysis of either the economic or S&T (innovation) potential is presence

It should be considered as positive fact that the descriptive and analytical part is hosted in different degrees in all programs except Dnipropetrovsk, where no such characteristic. Donetsk, Ivano-Frankivsk, Chernivtsi, Chernihiv regional innovation programs have full analysis of both economic, scientific-technological and innovation potential of the region.

It should be mentioned that in Program of the Donetsk region the analysis of economic, scientific and technical potential of the region is very detailed by all industry sectors. Main problems of each industry and the ways of their solutions are identified in the Donetsk program. Innovation potential of the region

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represented (the second volume of the Program) as a set of innovation S&T projects (over 460), which provide innovation development in all sectors in the Donetsk region.

The programs of Zaporizhzhya, Ternopil, Rivne, Cherkassy regions contain characteristics of scientific and technological and (or) innovation potential. Some of them also include the SWOT analysis, e.g. the SWOT analysis of regional innovation and S&T field in the Program of Rivne region and SWOT analysis of the economic potential of the Chernihiv region. In our point of view SWOT analysis is a necessary element of descriptive and analytical parts of programs, which allows assessing strengths and weaknesses of the region.

Duration of the programs

Duration of the existing programs are different, the most long term programs are programs of Donetsk and Dnepropetrovsk regions, which will continue till 2020, program of Ivano-Frankivsk and Chernivtsi (draft) regions is less long term (till 2015). Other programs (Rivne, Cherkassy, Chernigiv, Ternopil) are designed for implementation till 2010 -2011 p, i.e. it means that actually in these regions a work on developing and implementing new programs should take place right now. Draft of Vinnytsya program is the only one in which there is no deadlines, the program implementation is planned to be done in 3 stages without specific breakdown by years.

The presence of concrete measures to be undertaken at the regional level to implement the program

"Measures of program implementation" is treated differently in all regions. Somehow all the programs contain specific measures, but the degree of specification and details of these measures are very different. Programs of Dnipropetrovsk, Donetsk, Zaporizhzhya, Ivano-Frankivsk, Ternopil, Rivne and Cherkasy regions contain specific measures to implement the program with deadlines and funding.

The Program of Ivano-Frankivsk region contains directions for development and implementation of new technologies till 2015 according to the priorities, which are also one of the components of modern innovation development. Instead, the program of Chernihiv and draft programs of Vinnitsa and Chernovtsy regions contain no concrete measures, but only tasks (Chernihiv), or goals (Vinnytsia, Chernivtsi), without breakdown by deadlines, the volumes and sources of funding. Despite of this fact, we assume that most of regional innovation programs contain measures of their implementation, although the level of specifications in some regions is inadequate.

The situation with the reflection in programs measures directed to the specific areas of innovation is worse. Thus, measures aimed to the "cooperation of research institutions and industry" is envisaged in the program of Donetsk region, Ternopil region and drafts of Vinnitsa and Chernovtsy regions (based on the creation of regional clusters). But in the Ternopil program there is no mechanism of such cooperation, this is just a declaration of cooperation of research institutions and industry among program measures.

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"Cooperation of research institutions and universities" is considered by the most of the regions as training, and only in the Ivano-Frankivsk region a database of R&D results of universities and research institutes updating is among other measures provided for this direction.

Somewhat better is the situation with measures aimed to the "strengthening the innovation infrastructure," which spelled out in details in all regions (except Chernihiv). Programs contain list of innovation infrastructure components, which should be established or improved in the existing network. In Ternopol program it is presented well, there is just what innovation infrastructure should be. In Vinnitsa and Chernovtsy regions draft programs the issue of the innovation infrastructure is the separate section of the programs.

The evaluation of measures aimed to attracting funds of private enterprises and investors to the program implementation is not very optimistic. Thus, the program of Ivano-Frankivsk region provides just researches to attract investors, but not direct involvement of investors to the program implementation. In the programs of Dnipropetrovsk, Zaporizhzhya regions it is planned to develop a mechanism of innovation projects financing by different categories of the projects. Attracting investors to implementation of program measures in specific areas is provided in the program of Donetsk, Rivne and Chernihiv regions. In the Ternopol program investors are planned to be involved to the realisation of innovation projects in the region. There are amount of financing from investors to these project in the program.

In Donetsk Region:

Effective implementation of the Program demanded an appropriate organizational-economic mechanism formation.

During 2002-2003 Donetsk Regional State Administration addressed a number of issues concerning the creation of institutional structures necessary for the Program-2020 further implementation of regional level:

- Territorial Development Directorate of the Regional State Administration was reorganized into the General Territorial Development Directorate, which included the created Center for Regional Development (consisting of two units: the Department for Science and Industry Interaction and Innovations Stimulation and the Department for Innovation and Investment Projects Selection), by the Decree № 185of the Chairman of the Regional State Administration dated April 4, 2003.

- The state innovation policy implementation in Donetsk Region and Program-2020 management functions were entrusted to the Centre for Regional Development;

- A Working Group on organization of science and industry interaction was established (in order to improve the Program implementation coordination) by the Decree of the Chairman of the Regional State Administration. It is composed of executives and specialists of the Regional State Administration, regional offices of central executive authorities, universities and research institutions of Donetsk Region, leading scientists of the NAS of Ukraine;

- The Regional Council on Science and Technology was created as a permanent advisory body managing scientific and technological development of Donetsk Region by the Order №605 of the Chairman of the Regional State Administration dated October 2, 2003.

The validity of resource maintenance of the program

It should be noted that there are significantly different approaches to financial maintenance of program implementation used under the process of program development in the regions. So, if Zaporizhzhya and Ivano-Frankivsk regions hope to get money from the state budget and off-budget funds (funding from other sources is not specified in the programs of these regions at all), the Chernihiv and Dnipropetrovsk hope to get findings from other sources (accordingly 88.2 and 91.9 % of total funding they plan to get from other sources), which, unfortunately, is not detailed in the programs. So it is unknown exactly who will finance the programs measures implementation. Donetsk region, in his turn, relies on active involvement of enterprises and investors in the implementation of innovation projects (about 19% of the total investment is suggested to get from this source). Donetsk also plans to use actively local budget, but not for the program implementation directly but the general financing of the S&T and innovation activity in the region. Chernivtsi region focuses more on external support and participation in international projects (about 40% of total financing is suggested to get by grants from international organizations). Ternopil region plan to use following financial sources: funds of enterprises and organisations, state and local budget, regional centre of entrepreneurship support, international donor, funds of Ternopil Chamber of Commerce, funds from investors, funds from Ministry of Science and Education. There is now distribution by sources and years, except number of innovation projects which is planned to be financed by investors and Ministry of Science and Education.

The common conclusion could be that distribution of sources of financing by years and measures is presented well in Dnepropetrovsk, Donetsk and Zaporizzhya program.

The program indicators

The program indicators are indicated in 5 programs. The indicators of groups “Resource / Input” and “output” (such as the number of innovation developments in data bank of innovation proposals, the number of seminars on innovation development, the quantity of new regional funds for crediting of innovation projects) are indicated in the program of Dnipropetrovsk and Zaporizzhya region, also some indicators are given in the program of Chernihiv region. But sometimes they have a declarative character. Programs of the Donetsk, Zaporizhzhya and Ternopil regions contain indicators of the performance group (Impact (sustainable outcome) such as a number of new innovation enterprises, new jobs in it etc. The programs of Ivano-Frankivsk, Rivne and Cherkassy regions do not contain the values of quantitative indicators. Draft programs of Vinnitsa and Chernovtsy regions do not contain any quantitative indicators. It should be noted that in the most of the regions “Measures of program implementation” are developed and adopted by Regional State administration every year. This document contains indicators of program implementation.

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The mechanism of the program implementation

Mechanism of the program implementation we understand as the innovation projects aimed to achieve program tasks. The projects of certain companies are listed only in the program of Cherkasy and Ternopil regions. The projects listed in the program of Chernihiv region are investment projects. All other programs suggest only creation (development) of a database of innovation projects and the mechanism of selecting projects for funding, but projects are not specified. The program of Donetsk region provides the main directions of development and modernization of specific enterprises, which are the basis of the regional industrial potential.

So, as we can see the structure and completeness of the regional innovation programs are extremely different among regions, and any of the existing programs can not be considered as example for other regions.

Regions where support of innovation and / or scientific and technical activities is integrated into programs of social and economic development

For example, in the draft Strategy of the Kiev region till 2015 provided chapter "Development of scientific innovation. Establishment of research and production centres: technology parks, business incubators, clusters" is included into the strategic plan #3 “Structural policy, investment environment and innovative transformation”.

In the Strategy of economic and social development of the Lugansk region until 2015, approved by the decision of LRSA 25.09.2008 № 24/120, operational objective 1.3.3. – “Support of the development of innovative products and projects” is included in the Strategic Direction 1: Creation of conditions for total employment and rising incomes of people.

This confirms our assumption that in regions where no regional innovation programs, innovative component are included in the programs of socio-economic development.

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Conclusions

Currently the number of regional innovation programs in Ukraine is low. None of them could serve as a model for others because all of them have a number of shortcomings. The main deficiencies of regional innovation programs lie in financing, broadly set objectives, lack of monitoring and evaluation components. In part of regions where regional innovation programs were developed, they end in 2010 or 2011, so it is necessary to work actively on improving old programs and designing new ones. The model ("Ideal") program looks like a combination of individual components of the different regional programs, namely:

– Detailed description of economic potential of the region (Donetsk program)
– Detailed description of S&T and innovation potential of the region (Ivano-Frankivsk, Poltava, Ternopil)
– SWOT analysis of the state and prospects of economic, innovation and S&T development of the region (Rivne, Chernihiv)
– Financial support (Dnepropetrovsk program could be the example of distribution of financial sources by years and sources, but there is no optimal example of mechanism how to attract financial resources to the program implementation)
– Indicators of program performance (Dnepropetrovsk, Donetsk, Zaporizzhya could be examples but the list of program indicators should be extend)
– List of the measures and performance of its implementation (Dnepropetrovsk, Donetsk, Zaporizzhya)
– List of innovation projects (Cherkasy, Poltava)

According to the results of our project studies we estimate that effective coordination of central and regional research and innovation policies is one of the ways of enhancing these policies. Innovation policy focus should be shifted to the regional level, making the regions starting points (basis) for innovation policy development. At the same time we should remember about the necessity to maintain balanced development of all regions. Effective innovation policy could be one of the tools of such balanced regional development.

Our research also proved that regional innovation programs are major functional tools of regional innovation policy.

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Chapter 13

Decentralization factors (Olha Krasovska, Nikos Maroulis, Arkadij Khrebtov)

Introduction

In almost all EU countries governance of research and innovation policy is based on the interaction of regional and national policy actors (multilevel governance). At the regional level we can often identify competencies for the lower and medium levels of education, the creation of incubators and innovation centres, technology transfer agencies and, more recently, cluster policies. At the national level in many cases we find competencies for universities, specialised research organizations, and funding for Research & Development (R&D) and innovation. Ukraine in spite of the some first steps of decentralization remains high centralized country, where the most policy decisions related to innovations are taken at the national level.

European experience

Decentralisation implies institutional changes in at least two directions. On the one hand the devolution of powers from a national to a regional and/or local level and on the other hand the delegation of certain tasks to intermediate organisations of usually public nature.

Structural Fund (SF) and Community support programs have contributed in many cases decisively to a decentralisation of Research, Technology Development and Innovation (RTDI) interventions. The SF programs have boosted the regional role in previously strongly centralised countries (France, Ireland) and have reinforced the already strong decentralisation trend elsewhere (e.g. the United Kingdom). The same gradual change over the last few years occurred in the 10 Eastern European new Member States with regard to the diffusion of powers and responsibilities to regional authorities and governments. The main driver for diffusion of responsibilities from central to regional authorities and also for the involvement of regional authorities in policy formulation and implementation in these regions has been the Structural Funds and EU policy objectives (cohesion policies and community acquis).

The distribution of former competencies and responsibilities between these layers can be explained by the varying degrees of political autonomy for regions within Europe in terms of designing, funding, administration and implementation of policies, according to different constitutional systems. A grouping of countries by their degree of decentralization could be the following:

1. Federal countries and countries with ‘autonomous’ regions (Austria, Belgium, Germany, Spain, UK)
2. Centralised countries, with regional capabilities (Bulgaria, Czech Republic, Finland, France, Greece, Hungary, Ireland, Italy, the Netherlands, Poland, Portugal, Romania, Slovakia, Sweden)
3. ‘Single-region’ countries (Cyprus, Denmark, Estonia, Latvia, Lithuania, Luxembourg, Malta, Slovenia)

Federal countries

In federal countries, the role of the federal ministries and organisations is combined with the role of the regions/German “Länder” ones. On the one extreme in this group falls Belgium, that is the only country

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where RTDI policies are fully decentralised with responsibilities shared by Regions, while the federal government retains responsibility only for setting research priorities that require a homogeneous execution at country level and for international agreements.

At the other extreme we can find the UK where the Department of Trade and Industry (DTI) plays a major role regarding RTDI policy formulation while the implementation has been devolved to the Regional Development Agencies.

Finally in Germany, the federal government collaborates with the Länder with regard to RTDI policies formulation and funding while coordination between the various regions / Länder is ensured by the Bund-Länder Commission for R&D.

In Spain regional decentralization started during the 1980's. The Spanish constitution identifies 17 regions in Spain: 15 so-called Autonomous Communities and two Autonomous Cities. Spain's political structure is a quasi-federal decentralised system and this is also reflected in its RTDI policies. This autonomy in Regional authorities, allowed Regions (a characteristic example is that of Catalonia) gradually to follow a differentiated RTDI policy mix compared to the Central government policies, which sometimes lead to "power" struggles with the central government. Consequently, during the 1980's, Regional Innovation Systems and institutional set up in Spanish regions have evolved under the influence of EU, Spanish government and regional governments RTDI initiatives. In the late 80s and 90s the regions started to develop regional R&D plans that, with some exceptions, were similar to the national programs. This involved the duplication of a large number of agencies, institutions and instruments. Moreover, despite the fact that not all regions have the same responsibilities, most regions developed similar R&D plans [1]. The regional innovation policies focused initially in the public research and academic sector and only recently have shifted their focus towards the private sector. Some regions established a broad formal structure including their own Science Laws and formal broad regional RTDI plans and structures to ensure the participation of all the different organizations during their design of RTDI policies. The regional plans do not include – with some exceptions – measures for cooperation with other Spanish regions. In fact the data on academic co-publications show that Spanish researchers cooperate more often at an international level than at an interregional level.

However this institutional set up has led to little coordination with national and European policies or those of other regions. However, the new programs associated with the Cohesion Funds (2007–2013) are developed in a coordinated way by the regional and state government together. Other initiatives such the discussion about the new national roadmap for Science & Technology (S&T) infrastructures also point towards a tendency for greater collaboration between national and regional authorities.

In conclusion, there is no clear division of responsibility between national and regional administrative levels, which tends to generate duplicated efforts. At present all the regional governments have developed regional policies, though their scope and reach are very diverse, which implies that the present Spanish RTDI policy structure is confusing and that coordination between national and regional polices remains a complex and difficult matter [1].

Centralised countries

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Centralised countries constitute the largest group within the EU27. However, the level of centralization varies considerably from countries such as Portugal and Greece where the regional authorities have very few powers and capabilities, compared to countries such as Finland. In this group of countries efforts for decentralization were mainly driven by the Structural Funds as their assistance is provided on the basis of regional plans. In Bulgaria and Romania regional policy design and implementation relies at the national level. In Greece, regional authorities are involved in the design and the implementation of measures, however due to the lack of capabilities and efficiency policy formulation remains the responsibility of national authorities.

In France, regions are very active in the field of innovation and are gradually becoming more involved in co-funding infrastructures for higher education and research. In Italy, competences in RTDI policies are shared between the national and the regional governments, with a clear division of responsibilities. On the one hand the national government focuses mostly on co-ordinating RTDI policy and pre-competitive development, while regions concentrate on supporting local production systems through the provision of innovative services and technology transfer mechanisms.

Centralised countries in transition

The EU experience of the decentralization of RTDI policy making with the 10 Eastern European countries (plus Bulgaria and Romania) heightens the fact that the transition process from a centrally planned regional policy towards a more decentralized model is a very slow process, with setbacks and that it is still twenty years later a process far from completed. In many cases, during the initial years of the transition centralization increased, while funding for regions was drastically reduced. Regions were unprepared to take up the task of restructuring of the local economies based on their past experiences and lack of policy-making capabilities.

Before the transition, the networks that dominated regional economies were mainly based on inter-regional linkages and were organized around sectors or around large companies. This in turn reduced regional policy to sectoral policy where state owned enterprises (SOEs) were strongly embedded in local economies but their forward and backward production linkages were rarely located in the region [2].

In Poland, the institutional framework for innovation and knowledge is fragmented with often overlapping responsibilities between the various Ministries and Regional authorities. Also, the co-ordination relating to innovation matters is vertical, while the horizontal co-ordination between Ministries that deal with innovation is weak. The development of regional innovation strategies in Poland has only started recently motivated by EU-policies that provided financial support to draft such strategies in selected pilot-regions [3]. Following these initiatives the Polish government in 2003 provided grants to regions in order to undertake similar exercise. By the end of 2004 almost all regions (voivodships) had already formulated their innovation strategies, strategies that are expressed in the Regional Operational Programs funded by the Structural Funds. However after the 2005 parliamentary elections the new Ministry of Regional Development (MoRD) was created with the view to increase the absorption capacity of the Structural Fund interventions, which at that time was estimated at an alarming low level of 4.35 percent.

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At the regional level, the key organisation overseeing the design and implementation innovation measures is the Marshal's Office, and its main tasks among others include: preparation of regional economic development strategies, multi-annual regional programs and implementation of the Regional Innovation Strategies (RIS). However, the Marshals' Offices lack the capacity to design and implement innovation-oriented policies.

Despite the fact that there are no evaluations on RIS in Poland some first conclusions [4] regarding their implementation can be drawn:

– There is limited collaboration between central and regional authorities for the formulation and implementation of regional innovation strategies and thus the national strategy and priorities (e.g. key industries, clusters, technologies) are not in concordance with regional strategy. Each RIS project was prepared independently using not only different experts but also relying on different methodologies. When elaborating the RIS, there was no co-ordination mechanism between the regional and national level.
– Several measures at the regional level have quite a weak analytical and instrumental basis. More efforts are necessary in order to establish a close link between analysis, strategy, priorities, measures and projects and finally monitoring and evaluation.
– The large number of support measures led to the de-fragmentation of the support system with too many small measures.
– Several regional innovation strategies are not yet fully integrated in the overall economic development strategy for the region, reducing the potential for complementarities.

Thus, the arguments related to optimum institutional set ups are far from over. One the one hand proponents of decentralisation state that regional governments are more able to cater for local needs, establish links with revenues needed to finance programmes and increasing the accountability and efficiency of these programmes. In contrast, there are arguments supporting centralization in terms of macroeconomic stabilization particularly in times of crisis and for the achievement of economies of scales and increased spill –over effects across regions.

Finally the central issue of the healthy degree of decentralization cannot be answered in a definite way, but it is rather an issue of a variable geometry, depending on the specific characteristics and development stage of countries and regions, as presented in the table below. The norm is that the regions that are competent in terms of the enablers the more likely it is for this specific region to have more autonomy and efficiency in formulating and implementing its own RTDI strategy.

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Table 13.1: Balance of Central vs Regional innovation policies

Variable	Key issues - enablers
Competencies	Skills, efficiency, effectiveness in designing, implementing, monitoring and evaluating policies at the regional level.
Legislation	Degree of legislative autonomy of the region in terms of R&D, innovation, educational and economic development policies
Local conditions	Existence of clusters, networks, research centres, higher education institutes, foreign firms, i.e. institutional conditions
Finance	Do regions posses their own funds or are they entirely relying at the national authorities for funding? Presence of VC's, FDI potential, specialized banks and other financial institutions and their level of specialization and competencies.
People	Existence of skilled personnel in S&T, managerial skills, etc
Political directions and structures	General level of decentralization of regional policies

Source: Maroulis, N., & Koschatzky, K. (2007). Specific Analysis on the Regional Dimensions of Investment in Research

To conclude, the decentralisation process implies an increasing need for strong political leadership and at the same time to clearly delineate local, regional & national roles to avoid duplication, and build coherence.

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Ukrainian experience

Ukraine belongs to the group of centralized countries, with regional capabilities. According to the article 133 of Constitution of Ukraine administrative and territorial structure of Ukraine consists of 25 regions (24 oblasts and one autonomous republic, the Crimea) and two cities with special administrative regimes (Kiev and Sevastopol). There are 490 districts (rayon) at the lower level. Regions have their 'mini-parliaments' (olastnie rady), elected by the local population but the governors are nominated from Kiev by the President after consultations with Parliament and the Prime-Minister. Governors and their administrations represent executive power. The President also nominates the heads of district administrations. The state fiscal system provides the central executive bodies with the bulk of tax revenues that makes local authorities heavily dependent from Kiev. The Crimean Autonomous Republic has more financial and political freedom but this region needs subsidies from the central budget to make ends meet. As a result, research policy is mainly directed from the central ministries, although local authorities also have some tools to exert influence, especially on local universities and research organisations from enterprise and branch sectors.

The decentralization issues have been raised for a long time in Ukraine. By signing the European Charter on Local Self-Government in 1997, Ukraine officially recognized decentralization and citizen participation in the administration as integral elements of European legal understanding of democratic governance. However, these intentions must be maintained by appropriate policies, institutional reforms and implementation of the appropriate measures. Some changes have been already taking place, but the development of a comprehensive (or complex)"transformation strategy" from the unitary and still very centralized country remains underdeveloped. It was found that at the national level it is very difficult to reach agreement on a common vision of decentralization also because of different interpretations and understanding what decentralization means. On the other hand, at the local level communities are not always get benefit from the decentralization process, and efficient and effective municipal services is rather exception than the rule [1].

Research on decentralization issues in Ukraine

In Ukraine decentralization issues were occasionally raised in government and academic circles, but they did not have such a broad circulation as in the rest European countries. Despite the fact that solving the problem of decentralization is an important element of effective economic development and innovation systems (along with such issues as structural reforms, employment, eradication of poverty), domestic researchers pay little attention to this issue. For example, it can be noted a series of works devoted to the issues of decentralization, but the innovation aspects are not displayed in them (see, for example) [2-6]. A number of the dissertations on the issues of decentralization (see, for example [7-10]) were defended in recent years, but all of them were defended for the degree of Candidate of Law, Political Science or Ph.D. in public administration. Apparently, these works are devoted to general problems of the process of

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decentralization of power, but there were any specialized works on the issues of decentralization of innovation policy.

Attempts of the administration and territorial reforms in Ukraine

It should be noted that politicians and researchers had began to discuss the need of administrative reform of Ukraine immediately after the declaration of independence of Ukraine. But the topic became more important since Ukraine joined the Council of Europe (November 1995). The need for public administration reform was embodied in the establishment of the State Commission on administrative reform. Its provisions and membership was approved by the Decree of President of Ukraine № 1087/99 on 2 October 1997. According to the decree the Commission was headed by the former President of Ukraine L.M. Kravchuk. In 1998, the State Commission developed a draft concept of administrative reform in Ukraine, to the development of which leading politicians, parliamentarians, academics and heads of government were involved. Meanwhile, Deputy Prime Minister Roman Bezsmertnyi had proposed his own concept of administrative reform [11].

The draft of administrative reform developed by R.Bezsmertny suggested the change of primary and middle level of administrative-territorial division of Ukraine. This territorial system reform should be carried out on the base of “bottom up" principle, i.e. the transformation should be taken place at community and regional (district) level, because of the largest number of services to citizens provided at these levels. The reform action plan included reducing the number of administrative units. During the preparation of administrative reform in Ukraine solid legal framework was developed and adopted a significant number of regulations, most of them are decrees of the President of Ukraine.

The parliamentary hearings on "Decentralization of power in Ukraine. The empowerment of local governments” was held on 12 October 2005. The participants of parliamentary hearings noted that the activity of local governments lacked efficiency, largely due to the low volume of budget financing, imperfect mechanism for transfer of financial resources from the state to local level, inadequate tax base and artificially limited territorial base. They also emphasized that the organization of government in developed Western countries is based on decentralization, combined with strong local government bodies. This, in turn, shows advantages of decentralized model over centralized one in terms of sustainable socio-economic development. In the opinion of the parliamentary hearings participants the consensus between state government, local governments and public in the issues of decentralization can help to solve the problems in public administration and in sphere of effective local self-governance development.

At the parliamentary hearings some recommendations were proposed to the state authorities. They were approved by the Verkhovna Rada of Ukraine on 15 December 2005 N 3227-IV. Some of them addressed to research institutions and universities:

- to carry out the R&D on the issues related to the development of social and legal aspects of state building, improvement of the political system, further development of civil society;
- to give priority to the training of public servants and research staff-experts in public administration and local government;

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- to consider appropriateness of establishment new specialized academic councils on PhD thesis defenses in the field of public administration, including the field of local governance, in Kyiv, Lviv, Dnipropetrovsk, Donetsk, Odessa, Kharkiv, Khmelnytsky [12].

As we can see the recommendations of parliamentary hearings did not contain specific proposals on decentralization of innovation policy.

The current state of decentralization and administrative-territorial reform of Ukraine

Nowadays the problem of decentralization and territorial-administrative reform of Ukraine again is in the spotlight of pro-governmental politicians. In particular the President of Ukraine Viktor Yanukovych declared in his election program "Ukraine is for the people", necessity to transform local governance into a reliable and solid basis of democracy. He also stressed the importance of empowering local councils and the maximum removal of bureaucratic officials from issues of communities' development. One of the proclaimed theses that Viktor Yanukovych promised to implement in case of his election to President of Ukraine, was the decentralization of power and reform of fiscal relations in favour of local government.

In turn, the government program of economic and social development of Ukraine for 2010, which was developed accordingly to the President's program "Ukraine is for the people", noted that the current governance structure of the technological and innovation activities did not ensure implementation of S&T and innovation policy. There were no coordination interaction between science and industry. The efficient mechanism for implementation of domestic scientific and technological achievements was not established as well as there were no instruments for targeting R&D to the needs of the real economy.

As it is noted in the program, the state of regional and local development is characterized by weak material, financial, human and other recourses provision, which is necessary to accomplish the tasks and powers of local government; by crisis in housing and communal services, and in energy systems, fuel and water supply, social infrastructure; by unresolved urgent issues of reform of the administrative-territorial structure of Ukraine.

The tasks which aim to creation of new opportunities for developing country and its regions are following:

— the implementation of new tools to stimulate regional development
— the establishment of social and political base for reform of administrative and territorial division and local governance.

In turn, the implementation of new tools to stimulate regional development are:

— creating the conditions for stabilization of the socio-economic situation in the regions.
— concentration and increasing efficiency using state and regional resources.
— introduction partnership between Government and the regions.
— increasing the efficiency of cooperation between central and local executive bodies and local authorities aimed to solving the problems of development of territories.

The establishment of social and political base for reform of administrative and territorial division and local governance aimed to following targets:

— Creating conditions for sustainable development of communities, approaching capacity and quality of their work to European standards.
— Arrange administrative units.

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— To increase efficiency of budgetary funds, to improve the quality of social services.
— Improving land management.
— Improving management of territories by the central executive bodies [13].

So we can conclude that today Ukrainian government recognizes the need of decentralization. It is a positive point, because decentralization should be based on policy measures and appropriate economic mechanisms, in particularly it is transfer of more responsibilities to regional and territorial communities.

Decentralization of S&T and innovation policy in Ukraine

Let us go directly to consideration of basic principles of decentralization of S&T and innovation policy in Ukraine.

Current state of decentralization

So, according to existing legislation [14], regional authorities:

- are responsible for formulation of the regional R&D and innovation programmes;
- they could provide financing for R&D and innovation program within the limits of regional budgets;
- they could create regional financial organisations, which could provide loans for R&D and innovation projects;
- control and evaluate R&D and innovation activities, which are undertaken using money from regional budgets.

But in real life, there are some serious limitations that prevent local authority to influence the regional innovation policy in proper way.

Major limitations:

1. **Possibility to engage industrial enterprises to programs development process only subject to their consent;**

Currently, nearly all business entities are privately owned, and their being managed by the state and regional authorities is only possible using indirect mechanisms, such as tax incentives for priority economic activities development, that will ensure the competitiveness of the region. It should be noted here that only the Verkhovna Rada of Ukraine possesses lawmaking rights.

2. **Certainty absence of resources provision for innovation programs implementation at the stage of their development;**

The most predictable funding source for regional innovation programs is the regional budget, which usage has, in its turn, legislative restrictions, as **the Budget Law prohibits substantially financing of the first and second phases of innovation life cycle from local budgets.**

Most of innovation projects are usually offered by scientific institutions and organizations which, according to the Budget Code of Ukraine, are financed from the State Budget, and their being funded from budgets of other levels is possible only in the presence of target programs. Upon that**, innovative products are, in most cases, in their applied research stage, so after the project end it is impossible to assess productivity in terms of innovative products sales;** the next necessary stage – production design followed by its organization.

Ensuring innovations implementation in the real sector of the region's economy is possible through a development strategy agreed with the owner, and by attracting the necessary investment resources, both own companies' funds and borrowings. Thus, to some extent, the second constraint is a consequence of the first one.

In addition,

3. There are no legally set possibilities for venture financing in Ukraine.
4. There are no efficient economic mechanisms (secured in legislation) to transfer innovative technologies developed at governmental funds expense to the private sector.
5. There are no tax incentives for investments, including banking capital, attraction for innovation projects implementation.
6. High level of innovations investment risk reduces the attractiveness of this sphere for the business.

Declarations on support of innovation development and the real support of innovations differ substantially in different regions. At the same time, it is evident that almost all regions are trying to develop elements of local S&T and innovation infrastructures (e.g. research institutes, techno-parks, universities and hi-tech companies). These steps had had positive impact on the general level of innovation activities in the country, which resulted in the growth of innovation production in some regions of the country. In fact, local authorities in Ukraine have no real mechanisms for the program implementation, but have just the formal right to develop its. It should be also emphasized that the most regional technology programs in European regions are based on certain innovation projects, while not all Ukrainian regional innovation programs have a list of innovation projects.

For years regional authorities had no financial resources and legislative base for any dedicated innovation support activities. Local authorities have reduced their role predominantly to the monitoring functions of the state of innovation activities in the region. Although some regions had tried to introduce special measures of innovation support within regional development programs, their influence on innovation development remains limited. So, regional administrations in the Kyiv (city) and Donetsk regions have special departments responsible for the support of S&T and innovation activities. In the Autonomous Republic of Crimea (ARC) since 1996 till 2002 a Committee on Science and Regional Development functioned under the Council of Ministers of the ARC, which activities were funded from the regional budget. It was eliminated mainly for political strife [15]. Coordinating councils on regional development of S&T and innovation activities (e.g. in Donetsk, Mykolaiiv, Kharkiv, Zhitomir, Rivne regions) were established at the regional state administrations. To our opinion in case of the absence of such councils or other specialized bodies to manage the programs, coordination program functions are referred to the economic departments in the regional state administrations.

On the initiative of the central authorities of Ukraine the efforts to decentralize the regional innovation development governance have been made since the early 1990ies. Created in 1992, the State Innovation Fund of Ukraine had its regional departments over the regions (oblasts) of Ukraine. Unfortunately, the activity of the Fund was not successful. The government tried to use money from the Fund to fill the gaps in the State budget. The bulk of the Fund's money was stolen through faked 'innovation projects'. The state can not receive back more than three quarters of loans, which were distributed through the Fund. However, most of these departments still exist while the State Innovation Fund, after several transformations, has become the State Innovation Funding and Loan Institution (SIFLI). It's worth mentioning, that the Law of Ukraine "On Innovation Activities" opens the way for creation for different

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innovation funds, which could support innovation activities, but only SIFLI has been created. In our view, in order to enhance the system of innovation financing on the regional level, it is appropriate to use the existing relevant legislative provisions.

Another form of decentralization of innovation development is the implementation of mechanism of program development of innovations at the regional level. Detailed evaluation of regional innovation programs in Ukraine is presented in the Chapter - Regional programs.

On the other hand, regions could influence the R&D through indirect measures, such as provision of land, upgrading infrastructure, of lobbying interests of local research organisations in Kiev. They could exert influence on central government and ask it to increase financing of some R&D organisations, situated in their territories, by including research components in the programmes of development. Another option is to create techno parks or research centres in the region.

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Conclusions

So, we can conclude that the process of decentralization should be viewed in two dimensions:

1. Creation of authorities for management, implementation and/or support for innovation activities at the regional level (Network of regional centres of science, innovation and informatisation of SASII, Research Centres of National Academy of Scineces (NAS) and Ministry of Education, Science, Youth and Sports (MESYS) of Ukraine, the regional branches of the State innovation financing and credit institution). It will resulted to devolution of powers from a national to a regional and / or local level;
2. Creation of mechanisms to support innovations at the regional level (regional innovation programs)

However, as our research shows, there are only attempts to decentralize (creation of regional bodies on innovation development, introduction of number of the regions innovation development programs) in Ukraine. The decentralization process is still fragmented and devoid of complexity.

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Chapter 14
Peculiarities of innovation development in steel and coal regions (Nikos Maroulis)

Introduction

From the beginning of the modernization of the industrial development of Europe coal and steel have always moved hand in hand, becoming the key force for the development of the European economy.

At the beginning of the eighteenth century the fabrication of iron and the mining of coal were carried on over much of Western and Central Europe as, indeed, they had been for centuries. By the early nineteenth century the coal and steel industry had developed significantly. European countries had discovered how to use coal for a variety of purposes from making iron to using coal-generated steam to power machinery. The development of new technologies and specifically railways made the transportation of coal and steel cheaper and set the foundation for their further exploitation and application83.

The nineteenth century is characterized by the dissemination of technologies and techniques in processing coal and steel resulting in growing regional concentration. The new conditions for concentrating capital and labour led to development of new skills and foundation of enterprises in different European countries, which slowly made way for crossing the national boundaries84.

The twentieth century saw Europe living two world wars. The Second World War resulted in destruction all over the European continent. All participants in the war were economically on the verge of collapse. It was only after 3 years from the end of the war that the Economy of the European countries began to revive. From 1950 the European economy started to develop rapidly. Key factors for the economic recovery of Europe can be asserted to advancements in science and technology, the expansion of the world trade and the vital change of the European national policies. The scientific and technological innovations in chemical and electrical engineering during and after the war made possible new varieties of goods85.

Possibly the coal and steel industries will not be at the primary focus of national economic policies, and the interests intertwined with the industries are no longer as important as they once were. This gives companies in the coal and steel sector much more freedom to take the decisions that are in the company' s best interest, and enables them to respond adequately to a future that will pose many new challenges to the European coal and steel industry.

The experience of Germany – subsidizing the driving economical force

Germany is the largest producer of hard coal in the European Union. It has the remarkable reserves of hard coal (23.000 million t) and lignite (40.800 million t), making them he country's most important indigenous fuels[86].

Since 1997 coal mining in Germany has been concentrated in western Germany: the Ruhr region – accounting for 80% of the total production, the Saarland region - nearly 20%, and in the region surrounding Ibbenburen—about 3%. All coal mines are located in the region of North-Rhine Westphalia (NRW) with the remaining in the Saar region.

[83] http://www.makingthemodernworld.org.uk/learning_modules/history/02.TU.02/?section=7
[84] Coal and Steel in Western Europe; the Influence of Resources and Techniques on Production by William N. Parker, Norman J. G. Pounds
[85] http://www.thecorner.org/hist/europe/econ-coop.htm
[86] http://www.euracoal.be/pages/layout1sp.php?idpage=72

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The key restructuring processes of the German coal industry began in the 1970s through a policy aimed at increase of the efficiency and competitiveness of the sector. The key measures of the policy were expressed in:

- merging coal mines
- financial and protective focus on most productive coal mines
- protection of the environment
- allocation of discharged workers in the coal industry, by providing trainings or retirement programs.

The merging of coal mines and the allocation of coal reserves from exhausted coal mines allowed for a concentration of the industry which resulted in an increase of the production efficiency, creating favourable conditions for the development and introduction of technological innovation. The new technologies allowed for a rapid increase of the production capacities per mine worker.

The world oil crises in 1973 and 1979 caused an increase of unemployment and decrease of economic development. These global economic changes forced the German government to further subsidize the coal industry. By 1984 the operating coal mines in Germany were 23 and the employed in the coal sector numbered 122 000. Although coal production decreased by 22%, the sales increased by 50% due the government subsidies. In mid-1980s, another decline in the coal sector was initiating due to the fact that the subsidized German coal was too expensive for internal and external consumption[87].

The scope of the state subsidies to the German coal sector became a worrying factor to the European community, which in turn formulated a new policy for the industry. The conclusions of the EC were that German had to reduce its coal production output. However, at the same time EC acknowledged that the energy market was heavily dependent on the coal industry and could not survive without being subsidized by the state. The unification of East and West Germany in 1990 initiated the formulation of Concept 2005, which represented an agreement between the coal mining industry, the miner's trade union, the electricity industry, the state governments of coal-producing states, and the federal government. The document stipulated that the subsidized sales of coal should be reduced from 66 million MT in 1991 to 50 million MT by 2005. At the same time the operating coal mines was reduced to 12 1991.

The German policy of reducing coal production was accompanied by measures investing in development of technologies. RAG with state aid invested in developing environmental technologies, coal-based chemistry and logistics. RAG initiated environmental activities in re-cultivation and greening of closed coal mine sites. Government subsidies where used for activities outside the coal industry such as logistics – more than 100 locomotives were owned by RAG together with a 600 km railway system used for shipment of coal. Also the coal industry owned harbours and shares or entire shipping companies. This shift of the industry lead to the establishment of a new holding company –the RAG Beteiligungs GmbH- which was acting as an umbrella of all non-coal related activities -. The holding included the energy division STEAG AG, the chemicals producer Rütgerwerke AG, the environmental division Ruhrkohle Umwelt GmbH, the logistics complex RAG Umschlags- und Speditions GmbH and the real estate arm RAG Immobilien AG[88].

[87] http://www.fundinguniverse.com/company-histories/RAG-AG-Company-History.html
[88] http://www.fundinguniverse.com/company-histories/RAG-AG-Company-History.html

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Ruhrkohle AG was reorganized in 1995 with the establishment of the subsidiary RAG Vertrieb and Handel AG to optimize the procedures for allocation and trade of coal, and activities related to logistics. Ruhrkole AG was renamed to RAG AG.

Overall, the domestic development of the coal industry in the 1990s was characterised by strong dependence on state subsidies, consolidating of coal mine sites and programmes providing trainings and re-qualification to discharged employees. In addition the German coal industry made efforts towards international expansion. In 1999, RAG bought 95% of the Australian coal mine - Burton Coal Joint Venture, and the American firm Cyprus Amax Coal Company with head office in Denver, USA, transforming RAG into the second largest coal producer in the world[89].

The restructuring of the German coal industry still continues. Today there are seven operational and according to 2007 data the number of employees amounts 30,000. The current policy has been shifted from sales subsidies to social restructuring.

The experience of Poland

Poland is an example of a coal-based energy economy. The coal industry provides for more than 55% of country's primary energy supply, and 95% of its electricity is generated from these fuels. During the period when its's economy was centrally planned (1945–1989) Poland had little opportunities to import oil and natural gas. But because coal mining was considered one of the country's most important sectors, it was subsidized and coal prices were regulated to keep them affordable[90].

At that time Poland was not only one of Europe's traditional hard coal producers, but one of the world's leading suppliers. In 1972, Poland became Europe's biggest coal producer, with 150.7 million t, and until 1979 it was the second largest coal exporter in the world, after the US, selling 41.4 million in that year. Although its role as an exporting country was already declining in the 1980s, the output was maintained at a significant level (1988: 193 million t) compared with other European countries. The political events in the Central and Eastern European countries and the transition to a market economy system contributed to the shrinking of coal mining industry in Poland in the early 1990s. By 2002 production had fallen to 102.1 million t. The decline of Polish coal's competitiveness, compared with other fuels obtainable on the world market, was accompanied by a rapid fall in demand as a result of economic restructuring. Nevertheless, coal continues to play a major role, contributing 52% to the country's primary energy needs[91].

During 1990s, the traditional coal sector began to experience the challenges of economic transition. The coal industry was characterised by over-employment, low productivity and poor economic conditions. Therefore restructuring, including: privatisation, closing of inefficient mines, reduction of employment at mines, was inevitable. It was expected that commercial mining companies, now independent from state control, would solely adapt to the new economic conditions. But continuation of the government's policy to control the domestic price of coal limited the industry's potential for income growth and nearly all mines

[89] http://www.fundinguniverse.com/company-histories/RAG-AG-Company-History.html

[90] Lessons learned from the restructuring of Poland's coal-mining industry; Prof. Wojciech Suwala For the Global Subsidies Initiative (GSI) of the International Institute for Sustainable Development (IISD).

[91] EURACOAL – coal industry across Europe 2008.

experienced an increase in liabilities. The government supported some mining operations, but despite the state aid few mines were able to balance their accounts.

In 1993 the government adapted the policy of mine-closure programs and, introduced social programs to support employment reduction. Similar programs followed in 1994, 1996 and 1997. This attempt for restructuring the coal sector was met with an enormous debt of the sector of nearly $4.5 billion in 1994. The programs however, where not as efficient as expected since the government funding was insufficient and the social programs were not accepted well.

In 1998 the government, supported by the Solidarity trade union election movement developed the following key measures for further restructuring the coal industry:

- Social support for reducing employment without reducing the income of the dismissed workforce. The measure included two programs: redeployment of younger coal workers in other sectors of the economy; and social benefits for dismissed workers while searching for new jobs.
- Closing down or merging of the economically non viable mines in an effort to cut costs and increase economic efficiency.

Due to the high depth of the coal sector the government undertook all liabilities in the form of unpaid income taxes, employment taxes, environmental fines and pension depts. Operating mines were able to delay their debt payments until 2002, the year which was expected that mines would start to be profitable. In 2003 the government restructured the depth by deleting all debts incurred before September 2003 amounting to $4.9 billion U.S. Other debts from 2004 onward were to be paid before 2010. Since 2004, amendments to the restructuring programs have put off repayment of these debts, with a 2007 amendment putting off repayment until 2015.

In 2009 mine shares were sold to private investors supporting the goal of privatisation of the coal industry.

Re-structuring the traditional steel industries

The experience of UK

In 1967 the ‘Iron and Steel Act’ brought about 90% of British Steelmaking into public ownership. The country's non-integrated steelmaking and re-rolling companies, including half of the specialised steel production facilities were left in the private sector with a number of small companies. The same year BSC (British Steel Corporation) was formed from the UK's 14 main steel producing companies which employed 268,500 people.

Overall, 10% of crude steel production and about 30% of finished steel production remained in the private sector, leaving BSC with the generally less profitable bulk steel and lower-quality finished steel business. As the private firms were effectively subsidized through BSC's pricing of crude steel sold to them, they could direct resources on technical advances which allowed higher productivity.

In 1971 BSC started its "heritage program" aiming at developing the strengths and overcoming the weaknesses of the assets inherited from the private companies, in particular the low productivity of blast furnaces, which was due to inefficient cooling and the use of such low-grade material as coking coal with high sulphur content. By 1973 BSC had invested £764 million in this program and in such new projects as Anchor III, the construction of a new plant at the Appleby-Frodingham complex in Scunthorpe, Lincolnshire, on the site of abandoned ironstone workings. At the nearby port of Immingham, a terminal was built to accommodate 100,000-ton vessels bringing foreign ore for the furnaces.

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A 10-year development strategy initiated in 1973 with the goal to concentrate resources on five inherited sites, and on a new complex in Teesside. Some £3 billion-half from BSC, half from the taxpayers-were to be spent on raising capacity and on shutting down older plants, with the loss of at least 50,000 jobs. An innovative approach in 1975 was the establishment of a subsidiary BSC (Industry) Ltd. which invested in new non-steel ventures in areas where its closure program had biggest effect. This program was the largest capital investment in Britain so far.

The steel crisis started in 1975 forced BSC and the government to accelerate the closure program. By 1980, BSC's losses rose to £545 million, the government increased its borrowing limit once again, while the board announced that 60,000 jobs would be cut within 12 months. In 1980 and 1981 the government restructured the depth by cutting a total of £5 billion of debts. Most of the private companies also received state aid amounting to £50 million in 1982. They also benefitted from the "Phoenix" series of joint ventures with BSC, starting in 1981, since they were financed mainly out of public funds.

In 1988 BSC was privatised and transformed into British Steel plc. By 1994, the company had again become profitable after years of losses. In 1995, British Steel started the expansion of its activities in South America, central Europe and Asia expecting that the demand of steel in these emerging markets will raised. In 1997, British Steel built its first steelmaking facility outside the United Kingdom, in Tuscaloosa, Alabama.[92]

On October 6, 1999 the British Steel was merged with the Dutch steel producer Koninklijke Hoogovens to form Corus Groupcame. Corus itself was taken over in March 2007 by the Indian steel operator Tata Steel.

Over the last several decades the steel sector has invested heavily in technology, research and development and transformed the British steel industry as one of the most cost-effective in the world. According to the UK Steel Association, UK steel industry employees are now four times more productive than 20 years ago. Over the last 10 years the sector has invested over £2 billion on innovation; and over £50 million is spent every year on educating the workforce.

Across the globe, research and development has focused on new processes for the production and forming of metals, which required new metallurgical plant that has been developed and produced by companies in the UK.

The UK metallurgical plant construction sector is made up of companies who design and supply capital plant, systems, services and equipment for the world's iron and steel and non-ferrous metals industries. The steel sector today offers world-class design and engineering capabilities and expertise covering a wide range of technologies from exploiting primary raw materials to melting, casting, hot rolling, cold rolling and forming. Process lines for cleaning, coating and cutting the product are also designed to meet maximum output speeds with consistent quality performance.

The National Metals Technology Centre (NAMTEC), a collaboration between Industry, academia and the UK Government, is supporting the competitiveness of the British steel industry. It provides a combination of innovation services and technical expertise in design, production, fabrication and application of metals. NAMTEC has provided nearly 2 000 companies with technical assistance and consultancy resulting in

[92] http://www.fundinguniverse.com/company-histories/British-Steel-plc-Company-History.html

increase of sales and job creation. The centre is now widening its activities to provide a high-level technical training programme, targeted to meet the needs of the metals and manufacturing industry. It is also extending its scope to include the provision of research and development[93].

European initiatives and measures for supporting the development of coal and steel industry across Europe

Europe's coal industry has been declining since the 1950s, as prices for imported coal decreased and local extraction costs increased. Today coal accounts for 18 percent of energy consumption in the EU.[94] With the expiry of the European Coal and Steel Community (ECSC) in 2002, the EU adopted the Coal Regulation in order "to allow for the continued restructuring of the coal industry". The regulation stipulates that state aid is allowed on the condition that it follows a "downward trend", formulating three types of aid: investment aid, current production aid and closure aid.

In 2005, the European Commission authorised a state aids and EU funds for Poland, Germany and Hungary to continue the restructuring plans of the coal industries until 2010.

The European Union has no intention of excluding the coal industry from the European energy market. Instead it is concentrated in supporting in the form of investments into environment –friendly technologies for coal processing, known as “clean coal technologies” (CCT). The main focus is cleaner coal utilization through efficiency and CO_2 capture technologies. Recently the EU initiated the European Economic Recovery Program (EERP), with a total budget of the EERP for 2009-2010 of 3.98 billion EUR. The allocation of the funds for financing projects is: gas and electricity infrastructure (2.365 billion EUR); offshore wind energy (565 million EUR) and carbon capture and storage (1.050 billion EUR). At the end of 2009 the European Commission initiated the start of six CO_2 capture and storage (CCS) projects with a funding of 1 billion EUR under the. The six projects are located in:

- Belchatow (Poland)
- Compostilla (Spain)
- Hatfield (UK)
- Jänschwalde (Germany)
- Porto Tolle (Italy)
- Rotterdam (The Netherlands)

The focus of the EU on the further development and use of CCT is aimed at increasing the use of coal, and its present share in the energy consumption of the EU, with the foresight of growth in the demand of electricity in the EU.

With the end of the ECSC its funds were transferred to the European Community to create a common fund for research in the coal and steel area. This is being used to support the 'Research Programme of the Research Fund for Coal and Steel (RFCS), managed by EC DG Research. The RFCS supports research projects in coal and steel sectors. These projects cover:

[93] http://www.uktradeinvest.gov.uk

[94] *Clean Coal Technologies -The Security of Coal Supply; EC – Joint Research Centre Institute for Energy*

- production processes;
- application, utilization and conversion of resources;
- safety at work;
- environmental protection and reducing CO2 emissions from coal use and steel production.

The fund finances Research projects (60% funding), Pilot &Demonstration projects (50% funding) and certain Accompanying measures. The RFCS funding allocation is in favour to the steel industry with around 40 million EUR per year and 15 million EUR for the coal industry. The coal research objectives of RFCS are: Management of external dependence on energy supply; improving the competitive position of Community Coal; health and safety in mines; efficient protection of the environment & improvement of the use of coal as clean energy source.

The research priorities of the EU's seventh Framework Programme for Research (FP7) include areas of direct interest to the steel industry. Current and future efforts are towards the development of stronger and at the same time lighter and more ductile steel. Furthermore, new features are pursued by combining steel with aluminium, or by developing protective or functional coatings such as anti-graffiti, antibacterial, and anti-fingerprinting surfaces. Efforts are also made towards improving the steel making processes.

The steel industry is making progress towards cooperation amongst various companies in the area of research. European steel companies work jointly on EU co-funded on common research projects and at the same time applies the research results in accordance to their own development policies. In some cases steel companies are also led to share their applications under the demand of clients such as the automobile industry to be able to purchase the same car components from different companies. This provides an unusual and attractive opportunity for researchers to cooperate with colleagues in other companies and universities. The steel industry supported by EU measures such the FP7 and the RFCS have established a tradition in cooperating with academia for longer-term and basic research projects.

Industrial restructuring in declining areas – Shifting away from coal and steel industry
The experience of Germany

As it is presented in section 2.1.1 the main coal mining activity in Germany has been concentrated in North Rhine-Westphalia (NRW).

Through the period of 1950 to the 1970s new coal industries in different parts of the world decreased the competitiveness of coal mining in the Ruhr valley. The improvement of the productivity through technology transfer and process innovation was not able to compensate the disadvantages. In addition, the exploitation of new sources for the production of energy (water, oil, gas and nuclear power) reduced the dependence of the German industry on the exploitation of coal.

In parallel with the policy to increase competitiveness in the coal industry and to fight unemployment and poverty resulting from the declining of the industry, the "Ruhr Development Programme" was introduced in 1960s, aiming at building an extended human capital and knowledge infrastructure. Although there was not a single university in the Ruhr Area before 1965, now the region has one of the densest university landscapes in Europe, including six universities, six polytechnics, eleven technology centres, four centres of the Max Planck Institute, and two Fraunhofer centres.

In 1970s the regional policy started shifting focus away from the coal industry and towards the development of new industrial sectors and services.

From 1979 onwards were launched Technology Programs with the goal to stimulate research and development projects, support of technology based start-ups and SMEs. The "Ruhr Action Program" (1980-1984) with a budget of 3.5 million EUR focused on supporting SMEs especially in the service sector, improving education and training and as well as further stimulating research.

In 1987 the German government launched the "Future Initiative for the Coal and Steel Region" (ZIM). The focus of the initiative was on mobilizing and promoting the existing economic potential. The policy was a bottom-up approach focusing on supporting economic development from the regional base and supporting private initiatives and public private partnerships. In 1989 the programme was followed-up by the "Future Initiatives in the Regions" (ZIN).

The 1990's were characterised by policy support in education and training, establishment of new companies and support of entrepreneurship. This policy shift aimed at meeting the needs of enterprises for qualified personnel. The policy was supported by establishing technology centres and business incubators in the region. One of the most significant achievements of the policy shift was the realization of the program "Emscher Park International Building Exhibition" (IBA project). The program implemented the construction of 17 technology centres and the renovation of 3000 historical buildings, including closed exhausted coal mines. At present the Emscher Park is implementing greening procedures of the Ruhr valley. Together with the renovation of coal mining sites and the greening of the Ruhr valley the promotion of alternative tourism was initiated. The city of Dinslaken is negotiating with coal company MGG to convert a former mine site into a forest plantation. As much as 10,000 hectares of willows and poplars will be grown for biomass feedstock to provide heating. Not only will the polluted landscape be transformed into a forest, but the measure will generate new jobs. The processing of biomass requires qualified people, from the process of planting, maintaining and harvesting the biomass for biomass production, thus generating employment for an entire sector and at the same time being environment friendly.[95]

In the 1990s, German and local government invested in the Ruhr area 2 billion EUR for supporting 120 locations with new architectural, urban development, social and ecological initiatives. At the same time the Ministry of Economy of NRW supported SMEs for innovative R&D projects, by providing 50% funding.

Today the NRW follows a "picking the winner" strategy focusing on the strengths of the region and on further building cooperation between science and businesses.

The Experience of Poland

The coal industry in many regions of Poland is an important factor of the country's economy. Among the Polish regions Upper Silesia is the most important area for coal production despite the decline. Among the region's areas, Katowice is the most visible example of efforts aiming at changing the regions specialisation on coal towards other industries and activities.

In 1996 the Katowice Special Economic Zone was establishment managed by *Katowicka Specjalna Strefa Ekonomiczna S.A.* with its head office in the city of Katowice. The goal of the program was to attract investments and know-how and create conditions for rise of employment. A special economic zone includes uninhabited areas where special investments conditions apply together with the development of

[95] http://www.worldwatch.org/node/5834

necessary infrastructures for hosting new businesses and foreign investments. Today 14 such zones exist in Poland. The incentives applying in the Katowice SEZ include:

- tax reliefs – 40% of investment cots for large enterprises and 50-60% for SMEs.
- a relief of corporate income tax of 40-70% for new businesses.[96]
- easy access to nationwide road and rail networks.

The traditional industrial incentives applying in the Katowice Special Economic Zone was effectively accompanied with the development of a high qualified labour force. The area has more than 1,000 technical and professional schools, and 40 university departments and colleges, thus providing a big pool of highly educated and trained human capital.

As a result of the combination of the above factors the Katowice Special Economic Zone has become the leading SEZ in Poland in terms of number of companies, invested capital and created employment. More than 200 companies have been attracted to invest and develop their businesses in the zone and new employment amounted to 40,000 people. The attracted investors and businesses developed networks with the local suppliers thus generating multiplier effects. More than 80% of the investments in the SEZ are from foreign companies, as the largest share belongs to motor companies such as GM Opel, Fiat-GM, Powertrain, Isuzu Motors.

The experience of UK

The Derwentside district in North-East England, UK is a characteristic example of restructuring of a declining industrial region. The economy of the region has been heavily dependent on the iron and steel industry to the extent that the Consette Iron Company has been responsible for building the infrastructure and housing its employees. The global economical challenges due to the oil crisis in 1973 and the steel crisis starting in 1975, lead the government to close the nationalized steel and coal industries. The Consette Iron Company nationalized earlier under British Steel Corporation was closed in 1980. These developments initiated policies and measures for transforming the economic profile of the region.

The main focus of the policy was the diversification of the economy by promoting entrepreneurship and development of SMEs. Implementing the transformation of the economy called for cooperation between the national and local government, corporations (British Steel and British Coal), local nationalised industries and the private sector. The cooperation produced the establishment of the Derwentside Industrial Development Agency (DIDA). DIDA was established as a public private partnership supporting the economical regeneration of the region by government subsidized measures attracting and supporting entrepreneurship.

For the period from 1980-1988 DIDA had invested more than 50 million pounds, which in its turn attracted more than 70 million pounds investments from the private sector, distributed amongst 200 new businesses.[97] Some of the supported start-ups today are the regions biggest employers such as Derwent Valley Foods and CAV Aerospace.

Together with DIDA the region established the Derwentside Industrial Group, later renamed to Derwentside Business Network. It supported the activities of DIDA from the angle of providing consultancy to existing and start-up companies. The organization also provides crucial support in

[96] Upper Silesia.Easy ground to invest; An investment incentives overview October 2009; Delloite
[97] hudson

networking the different stakeholders by organizing regular meetings for exchanging business development opportunities and providing new information on modern developments in the different spheres of business, thus fostering a cluster like network of competence. In 1999 the regional policy led to the establishment of the Darwentside Engineering Forum with the goal of raising engineering competence and training.

Britain has also introduced a different approach to reforming its declining steel industrial areas as experienced in North East England. The policy of shifting the economical development of the region saw the establishment of the Northern Development Company in 1980. The main goal of the organisation was to attract multinational investments in the region, thus compensating for the job losses in the steel and other declining heavy industries. The measures succeeded in attracting key investments from Japanese companies like Nissan and Fujitsu.[98] Attracting inward investment has been a long-term policy for North East England providing for employment of the labour force previously occupied in the coal and steel industry in the region. During the 1990s the regional policy turned to supporting local entrepreneurship. In 1999 the Northern Development Company transformed to the Regional Development Agency. The policy of the RDA is aimed at developing an entrepreneurship society with a variety of new and developing businesses. Through different types of measures the region supports new start-ups and further development of existing businesses.

[98] Hudson

Conclusions to Chapter 14

Coal and steel have been the driving force for the industrialisation processes in Europe from the 19th century. For centuries these heavy industries have played the key role in establishing Europe as a world economic leader. The 20th century characterised by globalisation, caused significant damage to the European industries. The cheaper labour and transport costs from third countries lead the European coal and steel industries to loose their dominant position in the European economy and initiated restructuring processes across Europe.

The process of restructuring industries is differentiated from one country to another. The main features however, are introduced in almost all countries. In addition, the role of the government was crucial even in the cases where a free-market approach was adopted. Closing and reducing unprofitable industrial sites, merging and consolidating, were all traditional policy measures for meeting the economic imbalances. Consolidation of the industry was accompanied by a set of measures designed for fighting the increasing unemployment and social exclusion including: re-training of workers in order to find work in other industries; social benefits or incentives for early retirement etc. The most successful countries invested heavily (combination of public and private investments) on increasing the productivity of the industries either by technology transfer or by developing process innovations in-house. In the steel industry the effort was also towards differentiation of production by improving quality of steel or developing steel with specific characteristics.

In more recent times the restructuring policies aim at supporting alternatives to declining industries. Three main broad approaches were applied in combinations:

- Development of local entrepreneurship and promotion of SMEs by developing development agencies or other support structures, measures supporting entrepreneurship and creating dense training and knowledge infrastructures. The most successful examples (e.g. Ruhr Area in the North-Rhine Westphalia, Germany) not only mobilised local entrepreneurs but attracted investments from outside the region.
- Attraction of foreign direct investments by creating the necessary infrastructures such as special economic zones or specialised organisation and setting incentives and (Katowice, Poland; North-East England)
- Development of a service economy and mainly tourism by transforming the abandoned coal mining and steel sites to attractive leisure and cultural areas.

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Chapter 15

Inno-Policy TrendChart (Igor Yegorov, Gudrun Rumpf)

Preface

Innovation is a priority of all EU Member States and of the European Commission. Throughout Europe, hundreds of policy measures and support schemes aimed at innovation have been implemented or are under preparation. The diversity of these measures and schemes reflects the diversity of the framework conditions, cultural preferences and political priorities in the Member States.

The first TrendChart (TC) Report for Ukraine was prepared in 2008 within a framework of the EU funded project INCO-CT-2006-031585 Benchmarking Russia and Ukraine with respect to the Innovation TrendChart. Since then, the country has not been involved officially in preparing similar reports.

The proposed report contains all major elements of the TrendChart. It may be noted that some technical features were not available to the authors (such as the database allowing entering the comparative analysis of the 'innovation policy fiches' or the online insertion of new policy measures according to EU standards).

Ukraine is going through the complex process of administrative reform since December 2010. This reform changes the system of innovation governance substantially. The changed functions in governance are indicated in this report. However, some functions are still not defined. Therefore the detailed description of functions of all state agencies and ministries engaged in innovation policy cannot be indicated.

It is also worth to mention that Ukrainian data are not included to the process of calculations of average figures of TC, as well as for comparisons with minimal and maximum meanings. In addition, Ukraine has not switched to the new economic classifications of types of activities. These changes are scheduled for 2012.

The project recommends Ukraine to join the EU TrendChart system. In this case, Ukraine will have an opportunity to involve EU experts in the process of evaluation of the national innovation potential and give the national statisticians more reasons to align needed characteristics with the EU ones.

1. Main trends and challenges in the National Innovation System

1.1 Recent Trends in Macroeconomic and Market Developments

In 1990s Ukraine has passed through a difficult period without any single year of growth, the GDP dropped by 40% of the level in 1989. In 2000-2007 the Ukrainian economy grew at an average annual rate of 7.0% but the country still needed several more years to reach the GDP level of Soviet times. However, the economic crisis of 2008-2009 has a serious negative impact. The national economy shrunk by 15% in 2009. The recovery has started at the end of 2009, and it continued in 2010. The GDP grew by 4.2% in 2010, and it is expected to grow by 4.5-5% in 2011.

Investment grew by a healthy 12.0% per year in real terms in 2001-2007 and labour productivity grew by more than 50% in 1997-2007. The World Bank's absolute poverty line fell from a peak of 31.7% in 2001 to 5.7% in 2007. During the last two years the general level of investment declined by more than 40%, and it has started to grow in mid-2010 only.

The stock of FDI per capita reached only 622 USD in 2009, just over 23%[99] of the corresponding figure for neighbouring Poland.

[99] UNCTAD. – World Investment Report_2009. www.unctad.org/fdistatistics

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The main reason for the growth is an expansion of export and growing demand for the main Ukrainian export products (metals, basic chemicals, some agricultural products) and services (transportation of Russian oil and gas) to the world market. However, the growth was not strong enough to return to the pre-crisis level. The trade deficit had a tendency to grow in 2010 and the first half of 2011, hereby creating problems for the state budget[100].

The situation with external markets determines key parameters of the national economy. As a result, the proportion of foreign trade to nominal GDP was about 90% (if the official exchange rate, purchasing power parity (PPP) is not being used) in 2005-2006, although this indicator had the tendency to decline in recent years.

The share of high-tech and medium-tech sectors (mainly, machine-building industry) relative to total exports was around 15% and stable during 2001-2007 (14.5% in 2007) before its decline in 2008-2009. The relatively high share of this export is going to Russia and some other post-Soviet states (heavy machinery for mining and metallurgy industries, military equipment and so on).

The slowdown in the global economy in 2008-2009 had a serious impact on the Ukrainian economy. A lot of Ukrainian enterprises had to stop their production. The crisis created great problems in the financial sphere, especially for heavily indebted private companies, although the overall government deficit is still well below the critical mark. The new government signed an agreement with the World Bank and the IMF on new loans in 2010, which are designed to help the Ukrainian economy to pass through difficult times. The Ukrainian Parliament had to pass several laws, including a new pension law in July 2011 to meet IMF requirements.

Another source of problems is that growth was based on existing capacities. As specialists from the Institute for Economic Forecasting of the National Academy of Sciences of Ukraine stress, the metallurgy sector, which brings the lion's share of export revenues (42.2% in 2007) has limited capacity for further expansion. More than 50% of its capital assets including research equipment are around 20 years old and need substitution and the introduction of new technologies to work effectively and safely. The government's intention is to force metallurgy plants to pay market prices for their production inputs and to pay its debts to the energy sector. Ukraine is one of the most energy-intensive economies in the world: The energy intensity of Ukrainian GDP is close to triple the OECD average and higher even than in neighbouring Russia and Belarus.

In late 2008- 2009, the metallurgy sector suffered more than others. The decline reached more than one third of total production in 2009, if compared with the same period of 2008. Prices dropped even more than that. This has made production inefficient for many companies. In the post-crisis period competition in metallurgy sector has grown substantially, as Russia, Kazakhstan and Belarus have formed a Custom Union, that made access to the their market more difficult for Ukrainian goods.

Corruption remains a serious problem for the country. The introduction of a new Tax code in January 1, 2011 along with other changes in the legal sphere might contribute to solve the problem.

It is estimated that between 2.1 - 2.7 million Ukrainians are working abroad (permanently or temporarily). Sometimes, Ukrainian officials mention much higher figures - up to seven million - but these figures have not been confirmed through sociological surveys and other independent sources[101].

In the near future, the government will have to implement unpopular economic measures, associated with dramatic price rises, especially for utilities. It seems unlikely that the 'economic miracle of the mid 2000s', with double-digit figures of growth, will be repeated.

[100] Ukraine. Country Report May 2011.- Economist Intelligence Unit. – June 2011
[101] 2000 (Newspaper), January 22, 2011

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According to the World Economic Forum (WEF) Global Competitiveness Index, Ukraine was ranked 73rd place in 2008 among 131 countries (between Brazil and Romania)[102]. The country's position had dropped five places compared to 2005[103]. In the latest edition of WEF publication on Global Competitive Index[104], position of Ukraine has worsened, and country possesses 89th place now. This could be explained partially by inclusion of new countries, but lack of reforms also contributed to downgrading of the country in this ranking. It is a similar situation with the Business Competitiveness Index (BCI). There are two main reasons for this decline. First, the economic growth in 2005-2007 was lower than in the previous years, while some other countries have demonstrated much better development. The second reason is that 'soft' components of these indicators, associated with the level of freedom and political stability and the quality of institutions were in decline. It is also worth to note that indicators associated with new technologies reflect an even worse situation.

Exhibit 1 shows substantial decline in economic development of Ukraine in the period of crisis, as data for 2007-2008 were much better. This means that the gap between Ukraine nd the EU has widened due to the last crisis.

Exhibit 1: Comparable indicators of economic performance

Indicator	National performance		EU 27 average	
	2005	2009	2005	2009
GDP per capita in PPP (EU27=100)	19.8	17.1	100*	100*
Real GDP growth rate (% change previous year)	2.7	-15.2.	2.0	- 1.6
Labour productivity per person employed (EU27=100)	20.8**	18.3**	100*	100*
Total employment growth (annual % change)	1.9	- 4.3	1.0	- 4.6
Inflation rate (average annual)	13.5	12.5	2.2	3.4
Unit labour costs (growth rate)	4.5**	- 5.5**	-0.6	0.1
Public balance (net borrowing/lending) as a % of GDP	0	-11.1	-2.4	-4.7
General government debt as a % of GDP	17.7	43.2	62.7	82.3
Unemployment rate (as % of active population)	7.2	8.1	7.1	8.8
Foreign direct investment (FDI) intensity	10.0	2.3	1.7	…
Business investment as a percentage of GDP	21.4	13.2	…	15,1

Source: Eurostat - Structural Indicators and Long-term Indicators http://epp.eurostat.cec.eu.int and the State Committee of Statistics of Ukraine

Comments:

`**- estimates

**** - based on data from World Investment Report_2010 database - . www.unctad.org/fdistatistics

1.1.1 The credit crisis and its effect on innovation activity

The volume of financing of innovative activity during 1998 – 2008 has grown in fixed prices 10.2 times but if re-calculated into fixed prices of 1995 the increase would be just 2 times. The historical maximum of spending has been

[102] Key features of the Report on Competitiveness of Ukraine -2008. To the economic growth and prosperity. – WEF, Geneva, 2008.- 73 p. (in Ukrainian)
[103] http://www.weforum.org/pdf/Global_Competitiveness_Report/gcr_2008/gcr2008_rankings.pdf
[104] WEF Report on Global Competitiveness Index 2010-2011. – Geneva, 2011

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reached in 2007 (4857 million dollars in purchasing power parity (PPP) of national currency). It is important to note that the actual reduction of spending volume after eight years of a stable increase has already started in 2008 (despite of annual formal growth by 10.8% in 2008 in current prices). Therefore, the crisis development in 2009 has only emphasized the negative trends of the previous year. As a result, the level of innovation financing shrunk in current prices by 26.5% in 2009 in comparison with 2007, it has also shrunk by 48.8% in fixed prices, recalculated into PPP (in USD) by 47.4%. With regard to the correlation of the volumes of innovative spending in industry and GDP, the historical maximum of 1.5 % was established also in 2007 and the minimum of 0.87% in 2009, having approximated the level of financing of scientific and technical activity, which hasn't been observed during 2002 – 2008. Hence, the level of support of innovative activities in Ukraine has turned out to be more sensitive towards economic hardships of the recent years than towards scientific and technical difficulties.

With regard to the sources of financing of innovations the following trends shall be highlighted:

1. During the last decade, the main source of financing of innovation activities has been and remains the companies' own funds. When analyzing absolute spending of enterprises in fixed prices, it is worth to mention their sustainable growth in 2002-2007. After the start of the crisis, the expenditures have shrunk by 29.3% and 56.5% in 2008 and 2009 respectively against the 2007 level.

2. At the end of 2000s, the banking loans have become an important source of financing. If in early 2000s their share have reached 6.26% of the total volume of innovation financing, in 2008 it exceeded a third of the total volume of financing. The fact that from 2006 to 2008 the share of bank loans in the structure of financing has stepped up from 8.48% to 33.72% demonstrates the intensity of the credit boom. It is important to note that the hardships, related to the global financial crisis and banking sector reforms in 2009, have led to a very sharp reduction of the indicator's value - by 79.5% in fixed prices. The intensity of the lending of innovative activity is directly connected with the rates of general economic development as the biggest structural shares of the banking loans were observed during 2003-2004 and 2007-2008.

3. In 2009, the long-term tendency towards minimization of the role of foreign investors was broken. If in 2008 their share in financing of innovation reached a historical minimum of 0.96%, while in 2009 a historical maximum of 19.03% was recorded (the increase in fixed prices was 11.8 times). This has made this source as the second most important one for the second time in Ukrainian history (the first time it happened in 1998 when the share was at the level of 12.32%). However, the national investors did not follow this trend and their share has reached the relatively high level of 3.66% only in 2003. The rest of the time the share varied in the range of 0.2% – 1.5%. In 2009 the share dropped down to the level of 0.39% of the total spending.

4. Similar tendencies were observed in a budgetary financing of innovative activities. The share of the state was the second most important among all other sources (10%) at the beginning of the last decade. Afterwards, the share of budgetary spending has exceeded the level of 3% only once - in 2003. Similarly to the share of national investors, this share dropped down to insignificant 1.69% in 2009.

Government actions, aimed at fighting crisis in the innovation sphere

In 2008-2009 the Ukrainian government focused not on the support of innovation enterprises but on help to several key banks to avoid a financial catastrophe in the national economy.

The government had plans (they were reflected in the State Budget for 2008, Budget program code 6241050) to provide special low-interest loans for innovation activities, related to introduction of the new energy saving technologies. The total financing of these loans from the state budget could reach up to 167 mln. Hr. Ukr. The bulk of these loans were distributed among performers of innovation projects but not all plans were fulfilled in 2008 due

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to economic crisis, which started in the second half of the year[105]. Almost all other programmes on support of innovation were frozen in 2009. Only few of them received limited financing in 2009-2010.

1.2 Recent trends in the national innovation performance

Exhibits 2 and 3 present results of the experimental calculations of the European Innovation scoreboard indicators for Ukraine for the period from 2003 to 2009. Comparisons with the corresponding data for EU27 on the base of the latest recommendations were made by EU experts for the European Innovation Scoreboard (EIS) in 2008-2010.

The results are based on the data for 23 indicators that were experimentally calculated for Ukraine. Their utilization opened the way for calculation of the Summary innovation index (SII) for Ukraine, as the number of indicators is higher than 70% - the minimum level, which, according to EU experts, is necessary for correct comparisons.

It is important to note that the values of the indicators were not designed for 'direct calculations'. For example, the value of the indicator 2.1.3 'The expenses on innovation, which are not related to research and development (% of total turnover)' were evaluated based on the subtracting of spending on research and development from the expenses on innovation activities of companies. These data are included in the 'traditional' forms of the State Committee of Statistics of Ukraine statistics, but this information applies only to industrial companies and does not include companies that are engaged in other activities.

The values of some indicators are provided only for one or two years. This information is based on the data from the pilot innovation survey, conducted by the State Statistics Committee of Ukraine in 2007-2009[106].

In general, some parameters need clarification and verification. In particular, the information on employment in high and medium technology sectors is based on generalized data on sub-sectors, whose classification is not fully consistent with the latest EU classifications.

As for comparisons with the EU, we can say a certain stabilization of the values of many indicators for Ukraine in recent pre-crisis years but the process took place against a background of increasing values of the corresponding data in other countries, including some neighbouring countries of Ukraine, such as Poland, Turkey and some others. The result can be stated that the SII value for Ukraine is about 0.19, which is slightly lower than in Russia (0.23) and roughly coincides with the values of corresponding indicators for Bulgaria, Turkey and Serbia. This means that Ukraine lags behind the leader – Switzerland, whose SII is four times higher than in Ukraine. It is possible to expect that Ukraine's place in the overall ranking of EU innovation scoreboard could be changed, if the values of the remaining indicators could be calculated. There are possibilities for such calculations, in principle, bearing in mind that the State Committee of Statistics (SCS) has further plans to conduct an Innovation survey in 2011. This survey could include some important questions about the status of innovation activities, including, for instance, a question about access to broadband Internet from the side of companies. To date, specialized firms are collected and published data on broadband internet access, without differentiating data by type of users. SCS does not collect such information. Therefore, it is necessary to refer to expert evaluation.

However, in general, the situation with evaluation of individual indicators has improved substantially in the last couple of years, and now it is possible to obtain reliable data (or robust estimates) for more than 70% of all individual indicators. This creates certain favorable conditions for further progress in conducting further research, including provision of comparative analysis of the situation in the sphere of innovation activities in Ukraine and the

[105] Investitsii y Innovatsiyniy Rozvitok – 2008, N.2 (Special issue), p.11 (Investment and Innovation Development – in Ukrainian)

[106] It is important to note that official statistics for 2010 will be published in October 2011 only. That is why it is not possible to include data for 2010 in the Trendchart tables.

EU countries. It is possible to conclude that Ukraine maintains a strong position in terms of education and the shares of new products introduced by firms and in the local markets. At the same time, the position of the country in the sphere of international patenting remains extremely weak, despite some positive changes in recent years. Ukraine also lags behind the majority of the EU countries in the bulk of other indicators, including innovation activities and R&D in the business sector, venture capital provision and so on.

General indicators

In 2009, the level of overall R&D financing in fixed prices dropped down by 14.1%, despite of the slow increase of the level of R&D intensity of GDP up to 0.86%. Interestingly the trend of 2008, when the negative record of the R&D intensity level was accompanied by the increase of expenses on R&D by 1.3% in constant prices, was opposite to the tendencies of 1998 (the previous crisis year). The maximal annual growth rate of R&D expenses was observed in 2003, when it reached 23.7% in a year, and the greatest reduction - in the year of transition, 1992 (43.3%).

In the framework of the public sector (as an executor of R&D), mostly its non-profit component is developing. This resulted in a situation, when the 'science sector is working for science', not for other sectors of the economy. The cutback in total financing has various impacts on intersectoral interactions. In the majority of cases this connection is non existent, because the sectors slowly become more autonomous, unlike the public financing of R&D in the higher education institutions, which recently tend to increase.

A highly negative trend of R&D financing has developed in industry: In 2001 its share in the total financing amounted to 57.94% and in 2009 it fell down to 41.38%. Meanwhile the volume of industrial R&D in fixed prices fell from 1547, 83 million dollars in PPP (historical maximum) in 2003 to 1019,49 million dollars in PPP in 2009, i.e. by 34.1%. Furthermore, the value of relative reduction in 2008-2009 accounted for 14.7% that corresponds with the reduction of GDP of Ukraine and exceeds the cutback of total spending on R&D.

The main innovation drivers

According to statistical data, the general level of innovation activities in Ukrainian companies remains relatively low. The share of innovative enterprises across all sectors (including services, agriculture, construction etc) in the national economy is 18% according to CIS, while in the industrial sector it is even lower – 12,8% only (according to form 1 – innovation stemming from the State Committee of Statistics relating to industry only)..

Large industrial enterprises (with the number of employees exceeding 1000 persons) remain the most favorable environment for the realization of innovations in Ukraine. However, if in 1999 their shares were at the level of 69.7% of the volume of innovative expenditures and 85.2% of the volume of domestic R&D, in 2009, the shares of this sector declined slightly to 54.2% of the volume of innovation expenditures and to 78.8% of the volume of domestic R&D.

There is still lack of interest on the part of SMEs in making scientific and technical contributions to innovations, they mostly rely on application of ready technologies instead of producing innovation by themselves. Along with this, the large industrial enterprises still have a lion's share (76.1%) of the R&D outsourcing orders.

There are no clear leaders among the hi-tech sectors in innovation activities. All these industries are suffering from the lack of orders and financial resources. In this situation traditional sectors, like metallurgy and energy, are among the leading investors on innovation.

On the other hand, it is possible to conclude that innovative enterprises are present in almost all sectors of the economy. They form the most dynamic and successful group of companies. According to the State Committee of Statistics, over 50% of all innovative enterprises export at least part of their production.

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Innovation investments have become 'more diversified' over time. The share of investment in new equipment has dropped since 2000 but the share of organizational innovation relative to total investment has almost doubled. At the same time, enterprises spend relatively less on their intramural R&D and more on the purchase of new technologies from external sources[107].

The dynamics of main indicators

R&D does not play an active role in the transition to the innovation-based economy of Ukraine. The level of R&D expenses remains low, especially in the business sector.

If hypothetically the science-intensity of GDP were kept on 2004 level, and existent tendencies were preserved, the volume of R&D expenditures (provided the proper control of the inflation level) could have reached the 1992 level in 2007 and it could achieve the level of 1991 till 2015 – this is exactly the price of the mistakes made in the provision of financing of R&D of recent years. Unfortunately, for the time being it is possible to conclude that the country has experienced deviation from the trajectory of the formally sufficiently intensive economic growth (during 2003-2007). Thus, an explicit correlation between the levels of support of the R&D and the macroeconomic trends is observed mostly during the negative course of events. The years of independence show that, when the economic dynamics have a positive trend, the strength of the correlation substantially weakens (with very few exceptions). The declarations of the switching to the innovation path of development remain a political gesture.

As a result of all the above-mentioned events in 2006-2009, public financing, especially budget allocations have reached the level of Soviet times, while the business sector is lagging behind. This demonstrates indirectly the inefficiency of the system of the state regulation of economy with regard to attraction of capital from the business sector for financing of R&D. Moreover, the tendencies towards reduction of intensity of intra-sectoral flows in business sector and its stabilization in public sector were formed. The first one is compensated by growth of self-financing (from the own and other resources). It also shows the difficulties in realization of the national scientific and technical policy, especially in stimulating of internal R&D in non-governmental business sector.

Let us briefly review some other main trends in R&D financing:

The role of the total business sector tends to decrease regarding both financing and implementation of R&D. Meanwhile the stable reduction of expenditures on R&D in the business sector during 2003-2009 causes concern (in fixed prices it has shrunk by a record-breaking 54.4% among large sectors).

The higher education sector and the private non-profit sector do not play a significant role in the R&D financing both retrospectively and in the current period. (In 2000s their share varied within the range respectively by 0.06%-0.11% (higher education sector) and by 0.07%-0.44% (private non-profit sector) from the total volume of R&D expenditures with the negative trend with decreasing shares of these sectors). The higher education sector as an executing agent of R&D is still extremely dependent from the state financing (the range of the state funds share was 68.7% - 74.7% in 2000s). In general, the role of the higher education sector tends to grow; however, during the whole period under consideration it has not exceeded the level of 7% from the total volume of expenditures. The private non-profit sector showed a significant growth from 0% up to 0.71%, however, the reasons of such changes have to be specified.

In 2008 the outflow of foreign capital intended for R&D financing was stopped in Ukraine (in 2006-2007 both the relative and absolute reduction of volume of foreign R&D financing occurred, despite a stable economic growth). In 2009 foreign financing even increased by 22.4% in fixed prices.

[107] Naukova ta Innovatsiina dialnist v Ukraini. – Kiev: State Committee of Statistics of Ukraine, 2010, 351 p. (Scientific and Innovation Activity in Ukrraine – in Ukrainian)

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Exhibit 2. European innovation scoreboard: country pages, 2009

Relative positions of Ukraine in respect to the average meanings of the TrendChart indicators for the EU countries, 2009, % (EU average is 100%)

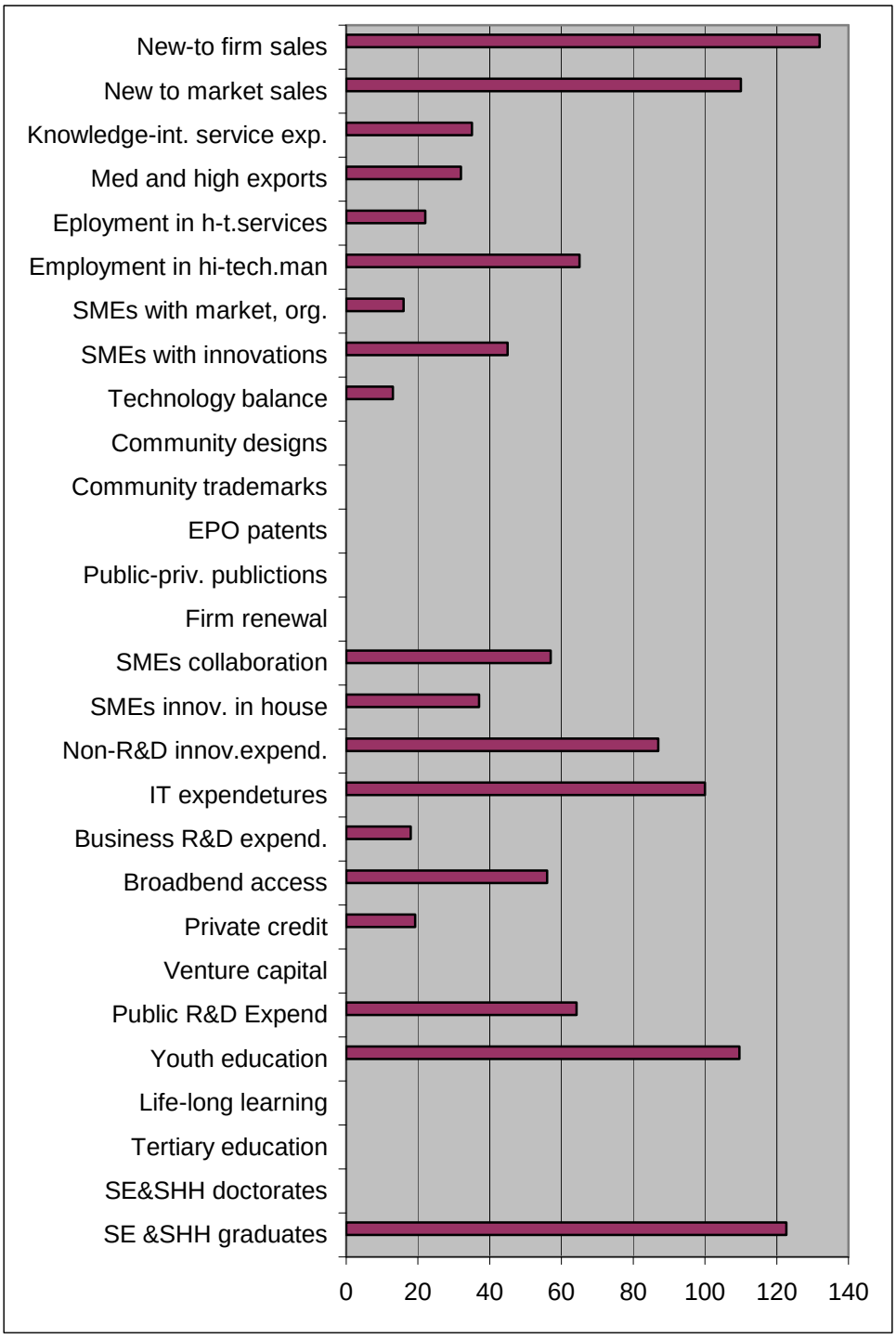
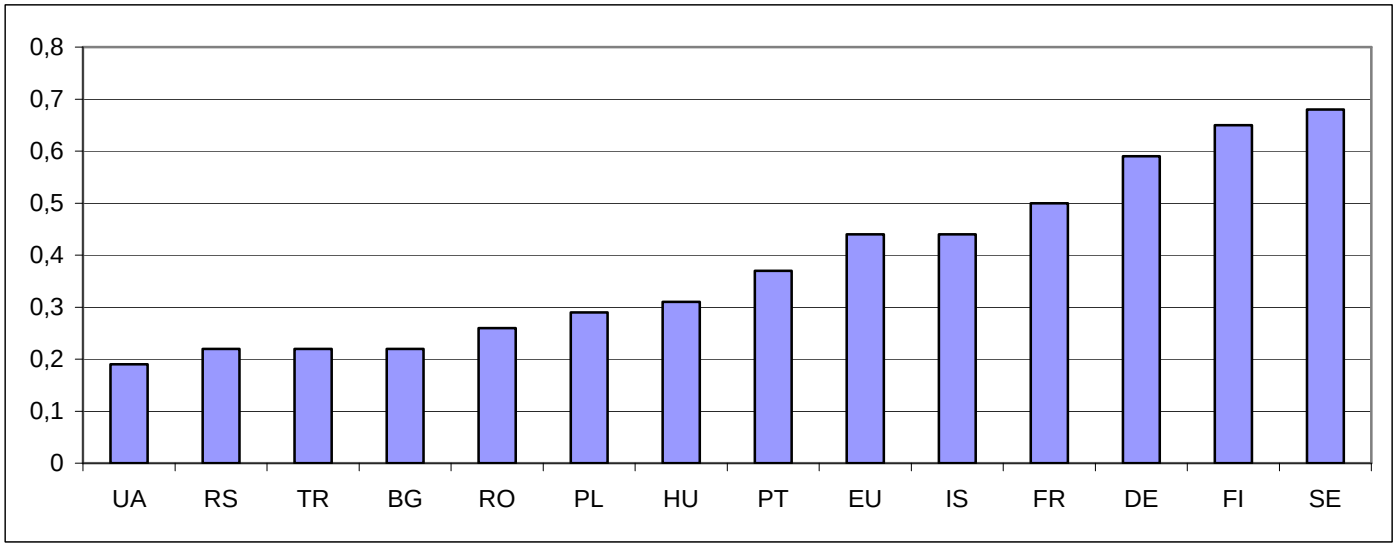


Exhibit 2 (continuation)

The place of Ukraine according to the value of SII (in comparison with selected EU countries),

2008-2009



UA – Ukraine, RS- Russia, TR-Turkey, BG- Bulgaria, RO- Romania, PL- Poland, HU- Hungary, PT- Portugal,

EU- average figure for the EU countries, IS- Spain, FR- France, DE- Germany, FI- Finland, SE- Sweden

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Exhibit 3: European Innovation Scoreboard: country pages for Ukraine

Number	Indicator /Year	2004	2005	2006	2007	2008	2009
1.1.1	S&E and SSH graduates per 1000 population aged 20-29 (first stage of tertiary education)	41,2	44,1	45,6	46,5	48,1	49,7
1.1.2	S&E and SSH doctorate graduates per 1000 population aged 25-34 (second stage of tertiary education)	-	-	-	-	-	-
1.1.3	Population with tertiary education per 100 population aged 25-64	-	-	-	-	-	-
1.1.4	Participation in life-long learning per 100 population aged 25-64	-	-	-	-	-	-
1.1.5	Youth education attainment level	85	86	84	84	85	86
1.2.1	Public R&D expenditures (% of GDP)	0,42	0,39	0,37	0,39	0,41	0,43
1.2.2	Venture capital (% of GDP)	-	-	-	-	0	0
1.2.3	Private credit (relative to GDP)	-	0,3	-	-	0,8	0,3
1.2.4	Broadband access by firms (% of firms)	-	-	-	-	37	56
2.1.1	Business R&D expenditures (% of GDP)	0,34	0,31	0,24	0,2	0,25	0,22
2.1.2	IT expenditures (% of GDP)	-	-	2,6	2,5	2,6	2,7
2.1.3	Non-R&D innovation expenditures (% of turnover)	0,98	1,05	0,91	1,33	1,32	0,9
	Linkages & entrepreneurship						
2.2.1	SMEs innovating in-house (% of SMEs)	-	-	-	-	10,43	11,2
2.2.2	Innovative SMEs collaborating with others (% of SMEs)	-	-	-	-	5,43	5,43
2.2.3	Firm renewal (SMEs entries + exits) (% of SMEs)	-	-	-	-	-	-
2.2.4	Public-private co-publications per million population	-	-	-	-	-	-
	Throughputs						
2.3.1	EPO patents per million population	0,02	0,06	0,08	0,06	0,11	0,11
2.3.2	Community trademarks per million population	0,02	0,11	0,24	0,3	0,2	0,24
2.3.3	Community designs per million population	0,11	0,02	0,05	0,08	0,37	0,07
2.3.4	Technology Balance of Payments flows (% of	-	-	0,12	0,14	0,16	0,13

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	GDP)						
3.1.1	Technological (product/service/process) innovators (% of SMEs)	-	-	-	-	15,2	15,2
3.1.2	Non-technological (marketing/organisational) innovators (% of SMEs)	-	-	-	-	6,4	6,4
3.1.3	Resource efficiency innovators (% of firms)	-	-	-	-	-	-
3.2.1	Employment in medium-high & high-tech manufacturing (% of workforce)	4,78	4,61	4,73	4,81	4,56	4,31
3.2.2	Employment in knowledge-intensive services (% of workforce)	-	-	-	-	4,16	5,26
3.2.3	Medium and high-tech exports (% of total exports)	14,37	13,33	14,2	15,32	15,21	14,93
3.2.4	Knowledge-intensive services exports (% of total services exports)	-	-	-	-	15,1	16,9
3.2.5	New-to-market sales (% of turnover)	5,8	6,5	6,7	6,7	9,5	9,5
3.2.6	New-to-firm sales (% of turnover)	-	-	-	-	6,3	6,3

Sources: www.mon.gov.ua; www.ukrstat.gov.ua; www.novoteka.ru; www.broadband.org.ua

Comment: The EU Commission has introduced a new set of EIS indicators in autumn 2008. These indicators will be standard ones for 2008-2010. The first calculations of the new indicators were made in January, 2011. It was possible to calculate or assess more than 70% of all indicators for Ukraine. This means that there was a possibility to calculate the innovation index for the country. However, it is important to note that some indicators were assessed on the base of expert information, for instance, broadband access by firms (% of firms), or innovative SMEs collaborating with others (% of SMEs).

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1.3 Identified challenges

Challenge 1: Encourage innovation activities in the business sector

Ukraine suffers from a low level of innovation activities. According to statistical surveys, the proportion of innovative enterprises in the industrial sector declined from almost 30% in 1994 to approximately 12.8% in 2009.

Largely, the overall decline of the number of innovative enterprises is related to the negative structural changes in the Ukrainian economy, where the share of high and medium tech sectors shrunk threefold since the beginning of 1990s, while the shares of the energy and ferrous metallurgy sectors grew substantially. These sectors have a more stable technological base, and they are traditionally less innovative than the high and medium tech sectors. The lack of direction by the government in modernising the national economy and insufficient incentives for developing the high tech sectors are key problems for the country. There is no clear plan of modernisation, bearing in mind the absence of quantitative indicators and the level of financing of the proposed measures. Instead, Ukraine specialises more and more on low-tech products, such as ferrous metallurgy products and basic chemicals, which represent around 60% of Ukrainian exports. The demand for innovation production from the side of domestic consumers dropped substantially in 1990s- 2000s, and it is far from the level of late 1980s. The second group of reasons, which explain poor innovative performance, are related to the unfavourable business environment: The indicators of the time of registration, the number of permission needed, or the price of the establishing a new business are among the most unfavourable in Central and Eastern Europe[108].

Some steps of the Ukrainian authorities aimed at the change of this situation. Likewise, the Ukrainian Parliament has approved a National Strategy (Program) of Development called 'On the Way towards European Integration' covering the period 2004 - 2015 as well as a number of laws related to the innovation sphere. However, these laws do not work effectively. This is the only state document that mentions 'Lisbon strategy' with 3% of GDP devoted to R&D, with the deadline moved to 2015. The new plan of innovation stimulation is currently being prepared in line with the Presidential Programme of Economic Reforms in 2010 – 2014 "prosperous society, competitive economy, and efficient government".

Challenge 2: Restructuring of the state R&D sector

Ukraine inherited a substantial part of the technologically oriented Soviet R&D system[109]. This potential has been used highly ineffectively in recent years. The number of personnel involved in R&D dropped by over 60% between 1991-2009.Engineering disciplines, hard sciences, and development suffered more than others. To a large extent this can be explained by the dominant practice of fund distribution as institutional funding to the academies of sciences (National Academy of Sciences, Academy of Medical Sciences and others) receiving the bulk of budget money directly thanks to the preservation of the established practice and lobbyist qualities of their leaders. It is important to create a new system, where the share of finances distributed through competitive procedures is substantially higher; the number of sources of possible financing of R&D is increased; and the 'output' indicators of scientific activities are used more effectively for the evaluation of results (including internationally recognised indicators such as the number of articles in refereed journals). At the same time, real incentives for companies conducting R&D have to be proposed by the state. This could lead to the redistribution of remaining specialists to the industrial sector.

[108] Biznes N342, 2009 (in Ukrainian)
[109] Characteristics of Ukrainian R&D potential are discussed more extensively in Yegorov I., Voytovich A. Science Profile of Ukraine. – British Council, Kyiv, 2003, 65 p. and some other publications.

Challenge 3: Improvement of policy design and implementation by creating effective mechanisms for the generation and dissemination of innovations

Ukraine has a number of different laws and other regulatory acts in the R&D and innovation spheres. However, these legal acts do not work effectively. It is important that existing laws are enforced and new laws are formulated with clear explanations on how they should be implemented and quantitative measures for monitoring their effect. At the time, almost all measures aimed at supporting innovation activities are blocked by other legal acts, in particular the Law on Budget, which has a higher legal authority and rejects innovation oriented measures. Ministries and new state-financed organizations and agencies are still ineffective in solving the problems related to this challenge. To a great extent, this could be explained by the fact that the existing mechanisms of harmonization of the legal system are not well designed.

Thus, there is an urgent need to make changes in the legal system, which regulates general economic activities and innovation activities. It would be also important to determine functions and responsibilities of existing state institutions, related to business and innovation activities to avoid duplication and uncertainties in their roles in support of innovation processes.

Ukraine faces a number of challenges in the innovation sphere. Some of them are related to the general economic environment, some are determined by the internal peculiarities of the innovation system. Key innovation challenges could be formulated in the following way as presented in exhibit 4:

Exhibit 4: Main innovation challenges

Description of challenge	Relevant indicators and trends
Encourage innovation activities in the business sector	Number of business enterprises, involved in innovation activities. Share of innovation production in the total volume of production (including services). Volume of available venture capital. The share of business expenditures on R&D and innovations in GDP.
Restructuring of the state R&D sector	Share of finances distributed through competitive procedures. Revenues from commercialisation of R&D results. Number of patents and the number of articles in refereed journals. The share of government expenditures on R&D in GDP.
Improvement of policy design and implementation by creating effective mechanisms for the generation and dissemination of innovations	Quantitative indicators are hardly available for evaluation of this challenge. Expert assessments of the progress could be used.

In parallel, problems concerning innovation development have been formulated more specifically during the annual survey of innovation activities within industrial enterprises conducted by the State Committee of Statistics of Ukraine (Exhibit 5) [110].

Exhibit 5: Factors that prevented innovation activities amongst Ukrainian industrial enterprises in 2007

Factor that prevents innovation activities	The share of enterprises which mentioned the factor from the total number of surveyed enterprises, %
1. Inadequate own financial resources	80.1
2. High required investment in innovation	55.5
3. Inadequate financial support from the side of the state	53.7
4. High level of economic risk	41.0
5. Poor legal base for innovation activities	40.4
6. Long period for return on investment	38.7
7. Lack of financial resources of potential consumers to buy innovative products	33.3
8. Lack of qualified personnel	20.0
9. Difficulties in establishing co-operation with research institutes and other enterprises	19.7
10. Inadequate information about consumer markets	17.4
11. Inadequate information about innovative products	17.3
12. Low demand for innovative products in the market	16
13. Unwillingness of the enterprise to innovate	15.5

Based on the results in the above table, the most important barrier to innovation activities for Ukrainian enterprises is the lack of financial resources. It is really difficult to use bank loans to finance innovation activities, as the interest rate in Ukraine is prohibitively high. It varied between 14 and 21% in 2006-2009, depending on the currency of the loan (USD, Euro or the national currency Hryvna).

[110] Nauka i Innovatsii v Ukraiyni. Statistichny zbirnyk.- the State Committee of Statistics of Ukraine, Kyiv, 2008 (Science and Innovation in Ukraine – in Ukrainian).

It is worth to mention that in 2007 the State Committee of Statistics of Ukraine stopped to supply data on barriers for innovation activities on a regular basis. At the same time, similar data were collected during the so-called Survey of Competitiveness and during the first experimental Survey of innovation activities according to the EU standards (EIS)[111].

1.4 Policy Responses to Identified Challenges

Exhibit 6: Innovation challenges and policy responses

Key challenge	Measures responding to the challenge
Encourage innovation activities in the business sector	- National Strategy of Development 'On the Way of European Integration' for 2004-2015. New plan of innovation development is under preparation at the moment. - Law on Innovation and other legal acts. But these acts are not in operation. This means that this response in not effective enough. Despite some clauses of the Law are aimed at the support of innovation activities, their implementation is blocked by other laws. - Cost of capital remains high and the innovation sphere is losing to the property development sector. - The draft laws on support of innovative SMEs, creation of innovation venture funds and some others are ready but it is not clear when it will pass through Parliament.
Restructuring of the state R&D sector	There are a number of plans to reform R&D in Ukraine, but they are not effective. Therefore, growth of financing of R&D on competitive basis (through grants) is very slow. Financing of R&D through State Foundation for Fundamental Sciences is less than 0.2% of the total expenses on R&D. However, the share of financing of Ukrainian R&D from the side of the business sector remains low, and it has the tendency to further decline. -The system of special presidential and other stipends for scientists is ineffective, as the size of these stipends is relatively low and their number is limited. A special state program 'Science in Universities' for 2008-2012 is brought into operation along with some other programs but its level of financing is extremely low.
Improvement of policy design and implementation by creating effective	Key problems of the government innovation policy lie in poor implementation of already

[111] Yegorov I., Pugachova M. Complex approach to the assessment of the level of innovation activities in Ukraine. – Problems of Science, 2008.- N.12. –p.3-11

mechanisms for the generation and dissemination of innovations	existing laws on innovations and contradictions in the Ukrainian legal system. In reality, implementation of laws on innovation is not obligatory, if they are vetoed by the Law on Budget. This shows that innovation is not among the priorities of the Ukrainian authorities. At the same time, the government does not exert efforts to make really serious changes to the industrial structure. It continues to provide subsidies to resource-based sectors (directly and indirectly). For instance, the coal-mining sectors receive direct subsidies plus subsidies in the form of supplying energy with long delays of payments for these supplies.

A key problem is the discrepancy between the stated goals and actual implementation of policy measures. Real innovation challenges, identified on the basis of R&D and innovation are not defined clearly in the official documents. Declarations on the need of innovative development are not supported by carefully tailored measures and, especially, by the mechanisms of their implementation. Notes about the need to improve business climate, reform state R&D sector and policy implementation and design are dispersed in different state documents but they are not backed by exact measures, or these measures are not effective because of juridical controversies in the process of their implementation.

The second important problem is the lack of the established system of monitoring of innovation development. This problem is related to the first one. The lack of corresponding mechanisms makes it difficult to control the process of innovation activities.

Thirdly, responsibilities of key actors are not well defined. There are several state ministries and agencies in Ukraine, which are responsible for support of innovation activities in the country. But their competences are overlapping, and not clearly determined. Some of these agencies have not enough resources to conduct innovation policy effectively. The administrative reform, which started in December 2010, might change the situation with clear distribution of functions, rights, and obligations.

Mechanisms for implementation of innovation policy tend to be weak because innovation policy is not the main focus of the state authorities. Legal acts on innovation support have a lower priority when compared with some other state acts (e.g. Law on the State Budget). This opens the way for innovation initiatives to be blocked. To some extent, this is a general problem of the Ukrainian system of governance, although positive changes in recent years are evident. Thus, in the innovation –related sphere positive trends are especially visible in the IPR protection area (with Ukraine having joined major international IPR agreements and having established unified rules for supporting patent for foreign and domestic companies).

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2. Public support to innovation

2.1 Recent changes regarding public support to innovations

Almost all Ukrainian governments in the last decade have declared their intentions to support innovation development and to stimulate structural changes in the national economy to make it more innovative and competitive.

The Cabinet of Ministries of Ukraine has also confirmed its interest in innovation issues by accepting the 'Conception of development of national innovation system (till 2020)' on June 17th, 2009[112]. It contains a description of two main variants of the development of innovation system in the country. The first one is oriented on preservation of existing tendencies. The second one is associated with a more balanced and accelerated development. It includes such measures as:

- Provision of innovation orientation of education
- Growth of effectiveness of the R&D system and the strengthening of its impact on development of the national economy
- Strengthening ties between universities, academies of sciences and branch sectors of the national research system
- Provision of bank loans to competitive S&T and innovation projects
- Further development of innovation infrastructure
- Provision of information and analytical support for innovation activities
- Creation of favorable conditions for technology transfer and IPR protection
- Introduction of transparent and effective state support of S&T and innovation, which will be in line with the EU practice and standards
- Introduction of effective forms of public-private partnership, which will be oriented on predominant utilization of domestic technologies
- Protection of national producers
- Formation of positive attitude to innovation in Ukrainian society
- Development of cadre potential (R&D and innovation manpower) in innovation sphere

All these measures include some specific steps, aimed on their realization. However, these steps have no quantitative characteristics.

The section 'Expected results' of the concept have several quantitative indicators. According to authors of the concept prepared by the Institute of economy and forecasting at the request of the Cabinet of Ministers, the share of innovation production has to reach 50% in the total volume of industrial production in 2020. The share of innovation companies in the total number of all companies has to be at the level of 60%, while the share of hi-tech sectors has to reach 30% in manufacturing industries. Export of high- tech 'products and technologies' have to jump by 5-7 times within 15 years.

It is worth to mention that other documents contain variations of these goals of innovation development.

The Ukrainian Parliament arranged special hearings 'Strategy of innovation development of Ukraine for 2010-2020 in conditions of globalizing challenges' in summer 2009 prepared by the STEPs Center on request of the Parliament. The document, which has been discussed during the hearings, may wish to be consulted when updating (after recommended amendments) the current Strategy. The existing Strategy was prepared before the "Orange revolution" and the crisis of 2008 and 2009, and it passed the Parliament in 2004. Multiplicity of program documents, which

[112] Conception of development of national innovation system.- Ekonomist, June, 2009, p.15-17

determine strategic directions of innovation development in Ukraine, makes it difficult to determine priorities and to control innovation processes at the state level.

In 2008-2010, some changes were made in innovation legislation. The Ukrainian Parliament has approved several documents. The most important of them is the Law on Ratification of Ukrainian Application for a Membership in European Innovation and R&D Programme "EUREKA", N 610-IV, passed on 01.10.2008[113].

The Law on technoparks, which was prepared for the second hearings, could not pass the Parliament in mid-January, 2009 and in May, 2010, and it has to be considered again later this year.

In 2008, the government developed and approved two state goal-oriented programmes. The first is a Programme of the development of the system of information and analytical support of state innovation policy implementation. The key objective of the Programme is monitoring of innovation development of the Ukrainian economy[114]. It was designed for three years with a total budget of 10,5 mln. Hr. The key idea of the Programme is to create effective instruments of monitoring of the state innovation policy at the level of central government and on the level of regions. Initially, there were plans to establish special groups at the state and regional levels, which could collect data, conduct surveys and prepare analytical materials on the situation in the innovation sphere. These groups had to work under the guidance of the Ministry of Economy of Ukraine. However, in 2009, only very limited funds were provided (less than 5% of the initial budget), and some basic instruments for assessing innovation activities were developed and proposed to the Ministry.

The second programme is the Programme of creation of innovation infrastructure in Ukraine[115]. It was designed for five years with the budget of 280 mln. Hr. Ukr. It is assumed that the Programme will receive financing from different sources: from the state budget (104 mln. Hr.), local budgets (about 80 mln. Hr.), and other sources (private business and international donors - 96 mln. Hr.). The government hopes to attract investors to create technology transfer centres for small businesses within this Programme. Private companies could benefit from using the newly-created elements of infrastructures by provision of different services and products to innovation companies and by obtaining some privileges, including access to cheaper (subsidised) bank loans, information and expertise from the state research centres. Unfortunately, this programme had also no proper financial resources in 2009 and in 2010.

Several other programmes were initiated in the second half of 2009, including a programme on support of nanotechnologies. However, these new programmes have to receive approval from the side of the Parliament.

The Ukrainian Parliament has passed the new State Goal-oriented Space Program for 2008-2012. This Program is the fourth such program in Ukrainian history since 1992. The main aim of the program is to integrate activities of enterprises and research institutes in the space sector and to utilize R&D results more effectively up to the needs of sustainable development and national security. The program includes eight subprograms (similar to the third programme), aimed at development new satellites for communication and the research of the Earth from the space; further development of infrastructure; experimental projects on new space technologies; and joint commercial projects with other countries, first of all – Russia, the USA, EU countries, Brazil and so on. Ukraine has substantial S&T potential in certain important space technologies but during the economic crisis of the 1990s the country lost some of it. Now the country has to utilize more effectively the existing capabilities and has to develop new technologies and products to be involved in international efforts in space research and commercial exploitation of space technologies. In fact, it is very difficult to conduct space programmes without co-operation with key international players in this area. That is why such co-operation is foreseen in the programme.

[113] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=610-17
[114] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=439-2008-%EF
[115] http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=447-2008-%EF

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The state budget provides a minimal financing at the level of 1460 million Hrn. per five years for the Space Programme. A substantial part of the funding comes from the alternative sources (so-called non-budget funds), controlled by government (1035 million Hrn.) and foreign customers (3000 million Hrn)[116].

2.2 National Research and Innovation Strategy

Ukraine had no new innovation strategy after passing the Strategy-2004 through the Parliament.

In June 2009, Ukrainian Parliament arranged special hearings 'Strategy of innovation development of Ukraine for 2010-2020 in conditions of globalizing challenges'. The document, which has been discussed during the hearings, has to substitute (after recommended amendments) the existing Strategy, which passed the Parliament in 2004.

Key indicators of the proposed new Strategy were based on the EU TrendChart data and decisions of the Parliament on the level of financing of R&D. The new documents also included a number of different measures, aimed at acceleration of innovation development. Some of these measures duplicated proposed measures of the concept. The draft of the new Strategy has been approved by experts, who participated in hearings but it has not become a formal law, as the previous Strategy. Strategy and Concept are quite different: The Strategy contains descriptions of goals and tasks, while the Concept is more of a declarative document. They vary in indicators. There is some need to harmonize the Concept and the Strategy. At the end of 2010, a group of specialists was formed tasked to carry out the harmonization.

At the same time, at the very end of December 2010, the Presidential Decree 'On measures, aimed at the provision of effective implementation of the Programme of economic reforms for 2010-2014 Wealthy society, competitive economy, effective state"[117] was issued. This Decree assumes that a comprehensive Plan of national development with a special chapter 'Development of S&T and innovation spheres' will be elaborated by special working group at the beginning of 2011. Proposed stages of the Plan (reforms in S&T and innovation) include:

First stage - 2010-2011:

- determination of principles of public-private partnership in S&T and innovation spheres;
- determination of principles and mechanisms of provision of the state support of investment in innovation activities;
- negotiations with the EU on joining the ERA.

Second stage – till the end of 2012:

- development of infrastructure for innovation activities;
- implementation of mechanisms for the state support of innovation activities;
- increasing financial independence of research institutes and universities in utilization of the research money, received from different customers;
- transition to international criteria of evaluation of the research results and the individual scientists, optimization of the structure of the state research system;
- increase of the budget share of expenses on applied R&D;

Third stage – till the end of 2014:

- renovation of equipment in research institutes and the universities

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http://www.nkau.gov.ua/nsau/catalogNEW.nsf/160776743F0D4A37C3256BB30050B196/6FAF7E382FEEA2A2C225726D00425D75?OpenDocument&Lang=U

117 Presidential Decree N1154, dated 21.12.2010 'On measures, aimed at the provision of effective implementation of the Programme of economic reforms for 2010-2014 Wealthy society, competitive economy, effective state" .

Indicators of success:

- growth of the share of innovation enterprises from 10,7% till 25%.

- increase of GERD from 0.95% to 1.5%.

It is assumed that the Plan will be developed and, probably, corrected in the first half of 2011.

Multiplicity of program documents, which determine strategic directions of innovation development in Ukraine, makes it difficult to determine priorities and to control innovation processes at the state level.

Exhibit 7: Main innovation policy documents

Innovation policy documents	Associated objectives
The Strategy of National Social and Economic Development 2004-2015 (2004)	-the last strategic document, related to S&T and innovation development, which was approved by the Parliament -contains special chapters, which describe the role of innovation in economic development and some indicators of this development.
Conception of development of national innovation system (till 2025)' (2009)	- contains detailed tasks and directions of innovation development - approved by the Cabinet of Ministries
'Strategy of innovation development of Ukraine for 2010-2020 in conditions of globalizing challenges' (2009)	- contains description of the situation in R&D and innovation - to reinforce the role of innovation - to improve funding of R&D
Presidential Decree N1154, dated 21.12.2010 'On measures, aimed at the provision of effective implementation of the Programme of economic reforms for 2010-2014 "Wealthy society, competitive economy, effective state" (2010)	- to develop special plan, aimed at acceleration of S&T and innovation development - to increase the share of innovation enterprises - to increase GERD

2.3 Innovation governance system

On December 16, 2010 President Victor Yanukovich has signed a Decree N1085/2010, which changed the landscape of the executive power substantially.

As a result, almost all state organs had to be reformed within two months. The number of central ministries and agencies has been reduced from 111 to 64. Some of them are merged with others, some are liquidated, and their functions are redistributed among remaining ministries and agencies. The staff has to be reduced by 30%. The list of the new ministries and agencies has been published, while their functions and the structures of some of them were determined in summer of 2011 only.

This creates certain problems with the description of the system of governance in innovation and R&D spheres.

The most important changes are related to the creation of the new State Committee on Science, Innovation and Informatisation (SCUSII), recently renamed State Agency on Science and Innovation and Informatisation (SASII).

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It is important to stress that important changes took place in the Ukrainian government during 2010, which have led to a strengthening of presidential authority at the expense of the other branches of power. Administrative reform, announced at the end of 2010, has to lead to growth of control and order in the state structures and to change functions and areas of responsibilities between the ministries and the state agencies in Ukraine.

The highest level of governance is comprised of the Parliament, including corresponding Parliamentary Committees, and the President, including his Administration. The Cabinet of Ministries, the ministries, and the state agencies constitute the second level, while the third level consists of the recipients of R&D funding, including state-supported academies of sciences and their institutes, which are independent of any ministry and play specific role in Ukrainian R&D and innovation system.

The **Parliament of Ukraine** (*Verkhovna Rada*) primarily approves the regulatory framework within which the science and technology system operates. In addition, Parliament is required to define the basic principles and directions of public policy in the fields of innovation and technology activity, and approve priority directions of national goal-oriented programmes of S&T and innovation development. Two committees within Parliament are especially important for formulating and implementing R&D and innovation policy: the Committee on Education, Science and Innovation and the Committee on Budget.

The **President of Ukraine** has the highest executive power, and controls the activities of the Cabinet of Ministries. The President has also the right to create various commissions and advisory councils, which work on recommendations for the executive authorities in the area of S&T and innovations. The most well known council is the S&T Policy Council but it was not active during the previous president in 2005-2009.

The Cabinet of Ministers ensures control over the establishment and operation of the public administration system in science, technology and innovation areas, and determines priorities in S&T and innovation. The Cabinet also develops strategies for science, technology and innovation development, and considers propositions from the ministries regarding the effective use of funds from the State Budget of Ukraine, in order to improve the system of science administration, training and certification. The functions of the Cabinet of Ministries were reformulated and, in fact, reduced after the presidential elections in 2010.

The Ministry of Education, Science, Youth and Sports (MESYS) has several departments that deal with science policy. The Ministry also oversees several branches of research institutes, along with the bulk of R&D in the university sector. It was announced that the special State Committee (Agency) on Science, Innovation and Informatisation is subordinated to the Ministry. Initially, the role of this Committee had to be al leading within the system of governance in S&T and innovation spheres. However, now it would have to play subordinate role to the MESYS, and it is not clear, how the functions of the structure of the agency would be changed[118].

The Ministry of Industrial Policy was one of the biggest actors in the area of R&D and innovation policy, and supervises over 300 research institutes and design bureaus in 2000s. However, the Ministry lacks funding for R&D on even the most minimal level. Other ministries also have relatively small budgets, and must rely on external customers, rather than the state budget, to finance their institutes. With administrative reforms, the Ministry of Industrial Policy has become a part of the **Ministry of Economic Development and Trade (MEDT)**.

[118] New guidelines for the agency's activity have not been approved at the moment of writing of this report. According to the materials from the official web-site of the Agency, it acts according to regulations, prepared in mid-2010.

MEDT has specialized Department of Investment, Innovation and PPP but the functions of the Department were determined in July 2011 only, and at the moment of writing of this report no head of this department was nominated.

There is no single ministry or agency that is responsible for making or co-ordinating research policy in Ukraine. The key ministry responsible for the formulation and implementation of S&T policy is the Ministry of Education, Science, Youth and Sports, which distributed roughly 14% of the state's R&D budget in over the past decade to end users (universities and research institutes). In addition, the Ministry of Education, Science, Youth and Sports had direct control over one fifth of all research establishments. It is important to note that the National Academy of Sciences of Ukraine[119], along with the Ministry of Education, Science, Youth and Sports was a key player in decision-making on science policy. These organizations along with MEDT are able to formulate science policy under formal control of the Cabinet of Ministries or Presidential Administration.

The State (Branch) Research Institutes are R&D entities supervised by different Ministries (institutes, central laboratories and R&D centres). In fact, these institutes have minimal state support and mostly work on contracts they receive from Ukrainian industrial enterprises and foreign customers.

Higher education establishments. The number of higher education establishments has varied between 340 and 360 in the 2000s in Ukraine. However, only a few universities have conducted substantial research projects. Only the two biggest universities in Kiev (National Shevchenko University and National Technical University KPI) have had research budgets in excess of 35 million Hryvnas (5m million euros). Total expenses on R&D for all Ukrainian universities do not exceed 300 million Hryvnas (42 million euros). An absolute majority of universities have no research capacities (only 172, or about half of the total, did any research in 2008-2009), and the university professors are usually overwhelmed with teaching duties.

The system of the National Academies of Sciences of Ukraine. This system comprises of six state academies of sciences: National Academy of Sciences, Ukrainian Academy of Agrarian Sciences, Academy of Medical Sciences, Academy of Pedagogical Sciences, Academy of Legal Sciences and the Academy of Arts. Approximately 75% of the academy's potential resides within the National Academy of Sciences of Ukraine. The Academy has more than 200 research establishments, most of them in the area of natural and technical sciences. Institutes from the National Academy of Sciences have often formed the base for Ukraine's most successful technoparks. The research activity of the Academy is financed mainly by the State.

Academy is not subsumed to Ministry of Science and Education but it has to co-ordinate its activities with the Ministry. As well, the Ministry attracts representatives of the Academy, if it launches any program for fundamental sciences. Academy has also a strong voice in the State Foundation for Fundamental Sciences. Academician Platon Kostiuk, one of the most cited Ukrainian scientists, is the President of the Foundation.

Non-governmental organizations and professional associations. These associations are not active in innovation development, despite almost all of them proclaiming their intentions to stimulate and promote innovation. Only recently some non-governemntal organizations are trying to play more active role in innovation policy. So, Ukrainian Union of Industrialists and Entrepreneurs with the technical support of PROUN program has started several municipal innovation and investment programs. However, it is too early to evaluate their results[120].

[119] Institutes of the National Academy of Sciences of Ukraine receive almost half of the state R&D budget directly from the Cabinet of Ministries, not through any specific ministry

[120] Stepankova T.M. Instruments for development of innovation market and innovation infrastructure. - Problemy i Perspsktivy Innovatsionnogo Razvitia Ekonomiki. Materialy XIII mezhdunarodnoi nauchno-prakticheskoi konferentsii po innovatsionnoi deyatelnosti. – Kiev-kherson -Simferopol, 2007. – P. 35-37 (in Russian)

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2.3 Innovation support measures

Probably, the best example of innovation policy is related to two technoparks, based on Institutes from the National Academy of Sciences. The idea of technoparks has been very popular since the beginning of 1990s. The country's first technopark in Brody, Western Ukraine, was not successful because the organizers failed to develop a sustainable business strategy. In addition, disputes relating to property rights for land and buildings created a poor business environment, which discouraged the creation and expansion of new companies. In 1999 a new attempt to create technoparks was made. It is important to mention that according to the legislative documents on technoparks, only innovative projects with the overheads they transfer to the technopark management were exempted from standard taxation procedure. Not companies themselves can receive different types of state aid. After several years of relatively successful development, all privileges to technoparks were abolished in early 2005. In May 2007, a new law on technoparks passed its first hearings (Law N1064-V on May 22, 2007). However, thanks to differences in approaches within the Parliament to the problems of innovation development, it is not clear when the second and the third hearings will take place. The new law determines IPR, the rights and duties of the park's management, definitions of the basic elements of technoparks, and so on. It is also establishes zero- level custom duties on the import of new equipment and raw materials that are not produced in Ukraine.

All legal initiatives, related to technoparks are 'frozen' at the moment. One draft of the law on technoparks was sent back to the parliamentary committee for substantial changes. Another draft, proposed by SASII has not been considered yet by the Parliament. The number of projects within ttechnoparks declined sharply in recent year, while revenues also plunged by motre than 10 times in 2006-2010. There is a need to ensure efficient state support for 'technoparks' activities on the basis of sufficient monitoring and evaluation to be carried out by independent experts.

At the same time, Ukrainian Parliament passed specials Law on Science Parks in 2009. This Law had to amend the Law on Science Park on the base of the University 'Kiev Polytechnycal Institute (KPI)'. However, this experience was not very successful. No new science parks have been created in 2010 in Ukraine. Science Park in KPI had 8 innovation and research projects with total financing of less than 170 thousand Euros in 2010. Partially, this low level of activities could be explained by the economic crisis. However, there is a need to review existing regulations independently to understand better, why science parks have not been created in other universities, and what are the barriers on the way of the more effective functioning of existing science park in KPI.

The number of innovation –support organisations has stagnated in Ukraine in recent years (see exhibit 8).

Exhibit 8 Dynamics of number of innovation support organisations in Ukraine in 2002-2010

Elements of innovation infrastructure/ years	2002	2004	2008	2010
Technoparks (registered, some of them are not active)	15	16	16	16
Business incubators	63	73	72	76
Centres of innovation development	-	-	13	13
Science parks	-	-	1	1

Source: MESYS database (received from UKRNTII), 2011

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Even existing organisations are not active in innovation sphere. Their level of financing is relatively low, and industrial companies do not express enthusiasm for working with them.

2.4 Innovation projects

The understanding of the selection of innovation projects is vital to understanding innovation policy in Ukraine. The state does not support innovation activities of commercial companies or R&D organizations but the innovation projects that they undertake. It is assumed that all such projects are selected on a competitive basis. This situation is in striking contrast with the support of R&D, where the state provides the bulk of financing to organizations in 'block grants' and institutional financing, not on a competitive basis.

Innovation projects are selected on the basis of the Law of Expertise and the Law on Innovation Priorities.

According to the Law, the following projects and programmes are objects of the obligatory expertise:
- state S&T programs;
- international S&T projects, which are undertaken in the Ukrainian territory and according to the international agreements between Ukraine and other countries;
- branch and inter-branch S&T and innovation programs;
- innovation programs and projects of the state –level importance[121].

The criteria considered when selecting innovation projects include:
- project has to be relevant to the national priorities in S&T and innovation sphere (these priorities are changed every five years by Parliament);
- project has to aimed at the practical implementation of new, high-tech or energy-saving technologies or competitive products;
- financial indicators of the project have to be justified, and documentation has to meet technical, ecological and social standards;
- technical characteristics of the new product have to meet high standards;
- legal problems, related to the project, have to be resolved in advance;
- financial and legal status of the enterprise undertaking the project has to be appropriate to meet the eligibility criteria of the project.

A special Inter-ministerial Commission is responsible for project selection, if the project is really large and it comprises different organizations from different ministries. It includes representatives of different ministries and state agencies. The Commission has different sections, which are responsible for different sectors of the economy (engineering industry, agriculture and so on). If the project is undertaken within one ministry or agency, the commission from this ministry or agency considers the project.

It is expected that the system of the state programme and the procedures of selection of innovation projects will be changed soon. On June 22, 2011, Cabinet of Ministries of Ukraine has issued a Decision N704, which reduced the number of state programmes substantially. Foresight –type Programme on S&T forecasting is in the list of those programmes, which will be terminated. Other programmes have to be revised. Programme on creation of innovation infrastructure, Programme of support of nanotechnologies and some others are among them.

Conclusion

Ukrainian authorities have made several steps, aimed at support of innovations, including creation of the new agencies and announcement of several initiatives in S&T and innovation spheres. However, proposed measures need to have more quantitatively verifiable indicators and they need to be accompanied by reinforcement of the law and

[121] Shkvorets Yu.F. Zakonodavcha y normativno- pravova basa tsilyovyh program v krainah SND: Porivnyalnyi analis – Problemy i Perspsktivy Innovatsionnogo Razvitia Ekonomiki. Materialy XIII mezhdunarodnoi nauchno-prakticheskoi konferentsii po innovatsionnoi deyatelnosti. – Kiev-Simferopol-Sevastopol, 2008. – P. 97-101 (Legal base of the goal-oriented programs in CIS countries; Comparative analysis. – in Ukrainian)

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effective implementation. It is clear that the creation of an innovation-friendly environment has to be among the key tasks of the Ukrainian authorities.

Among key problems that have to be solved are:

- reform of the state R&D sector, which includes revision of the governing structure and broad introduction of competitive principles of financing of research;
- introduction of real financial incentives for innovation activities, especially through indirect stimuli;
- enforcement of laws in the innovation sphere which are currently blocked by existing legal regulations.

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