Project «Improvement of regulatory and institutional framework of academia- industry knowledge transfer and development of core implementation competencies of knowledge transfer to enhance the knowledge based economy in Ukraine»

Recommendations «Facilitation of Knowledge Transfer in Ukraine Between Research Organistions, Universities and Industry. Actions at Policy and Academic Level»

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Terms and acronyms used in the document:

HEI – higher education institutions

IP – intellectual property

KT – knowledge transfer (KT is a wider concept than technology transfer. KT is not limited to the transfer of technology but it also encompasses the transfer of research results from social sciences and humanities)

PRO – public research organisation

Spin-off – a university owned company that commercialises research results created in the university

TT – technology transfer (interactions taking place between public research organisations and the industry)

TTO – technology transfer office

Academia – universities, research institutes, other research institutions, etc.

EU Recommendations – European Commission Recommendation on the management of intellectual property in knowledge transfer activities and Code of Practice for universities and other public research organisations (2008)[1].

[1] Commission Recommendation on the management of intellectual property in knowledge transfer activities and Code of Practice for universities and other public research organisations. Available at http://ec.europa.eu/invest-in-research/pdf/download_en/ip_recommendation.pdf (1.6.2016).

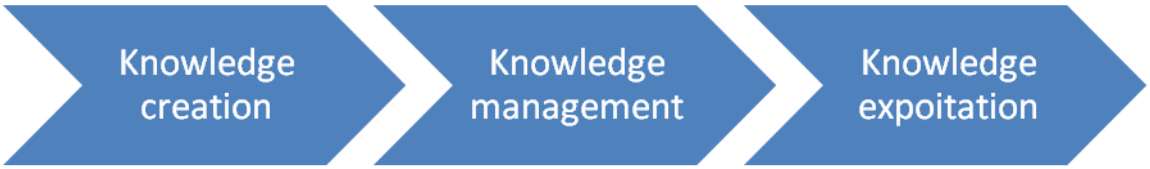
1 Introduction

The aim of this document is to outline directions for improvement of technology transfer and commercialisation of IPR in Ukraine.

The document addresses several intellectual property-related (defined in a broader manner) factors that have an impact on academia[2]-industry interaction and puts forward recommendations to improve knowledge transfer (KT). The authors adopt a process-based approach to conceptualise knowledge transfer and address barriers and enablers within the process. A draft document was discussed during the international seminar «Knowledge transfer and commercialisation of intellectual property by research institutions and universities: improvement of policies and mechanisms in Ukraine, taking into account experience of the EU», which took place on April 12th, 2016 in Kyiv. It has also been prepared by taking into account the results of a survey of leading scientific institutions and universities on the main obstacles hindering commercialisation of intellectual property and knowledge transfer in Ukraine and suggestions to improve knowledge transfer.

To describe a knowledge transfer process in very simple terms, one can say that knowledge transfer starts with the creation of knowledge and ends with its implementation. This kind of one-dimensional linear model does not capture the complexities of the KT process, but it can still be used to address the existing barriers and opportunities to overcome challenges. Knowledge transfer is divided into the following phases: knowledge creation, knowledge management and knowledge exploitation. It should be admitted that the division into different phases is not clear-cut and certain overlaps exist.

Figure 1. The knowledge transfer process



The phases of knowledge transfer process determine the order of recommendations. This means that the recommendations are not structured hierarchically. The recommendations are divided into two main groups and marked accordingly:
1) policy recommendations which can be implemented at the national level (policy recommendations); and
2) recommendations for academia which can be implemented at the research organisation level (recommendations for academia). As a result, the knowledge transfer process is analysed and recommendations are based on the integration of these two levels. It should be emphasised that these two categories of recommendations should not be considered in isolation since they interact with each other. It is crucial that different stakeholders (the government, academia, industry, etc.) interact with one another.

[2] Academia is defined in a broader sense to encompass all universities and research organisations.

The theoretical, methodological and empirical background of this document is explained in an extended report.[3]

Recommendations and the extended report have been analysed and reviewed by Tõnis Mets (Professor of Entrepreneurship, University of Tartu). The review is enclosed as an annex. The review facilitates interpretation and implementation of recommendations. In order to increase the comprehensibility and impact of the review, some of its results are integrated into the extended report.

2 Knowledge creation

Knowledge transfer starts with the creation of commercially viable knowledge. In order to achieve this, several conditions have to be met. The Recommendations suggest the following conditions:

1) Sufficient research funding and definition of prioritised research areas;
2) Creation and protection of knowledge with commercial potential;
3) Extending the scope of transferred knowledge to social sciences and humanities.

2.1 Sufficient research funding and definition of prioritised research areas

International experience shows that resource-exploitation strategies, extraction and primary processing of natural resources in particular, are not sufficient to achieve extensive growth factors in economics and therefore investments into research and development towards more knowledge- or innovation-driven economies providing a higher level of value added, become more relevant.

Already the Lisbon Strategy in the EU stipulates the need (and that was also confirmed by the Europe 2020 strategy) to achieve the target of investing 3% of GDP in R&D, with 1% originating from state expenditures and 2% from private investments. According to European experts, this is the level that can ensure the scale of economic competitiveness necessary in the contemporary world.

Many EU countries, while struggling to achieve that goal, have also individually adopted more realistic goals for year 2020, although this does not override the common European guidelines on the R&D funding level.

Perhaps their achievement will take more time because the average spending in the scientific field in recent years remains at 2% of GDP, growing more slowly than expected. In Ukraine it has been proposed for research funding to reach 1.7% of GDP. Realisation of this goal is an important prerequisite for the transition to intensive type of economic development and its harmonisation with the respective processes of development in the EU.

Besides the goals set in the EU, it is generally known that investments in R&D stimulate the economic growth of a country.

For example, in OECD countries, given the contemporary legal framework conditions, investing 1 USD in science provides on average a return of 20-100 USD and a similar investment in applied research yields 6-25 USD respectively. The return depends on the efficiency of the national innovation system which is higher with more qualitative human capital and more efficient

[3] A. Kelli, K. Ukrainski, Y. Kapitsa, K, Shakhbazian (2016). Theoretical, methodological and empirical background report.

governance, but also on how well the research and industry sectors of economy are working together.[4]

Empirical evidence on Ukraine shows that Ukraine enjoys a relatively strong position with regard to human capital indicators (e.g. level of education and expenditure on education, tertiary enrolment, etc.), but the relative R&D related indicators (e.g. funding level, number of researchers in full-time equivalents (FTE)) are not sufficient to sustain the research system of the country alone.

The funding of the R&D sphere is low, 0.76% from GDP in 2013 (and 0,66% in 2014).[5] The number of researchers in FTE declined to less than 70 000 in 2014 (which is only 22% of the corresponding figure in 1990).

Therefore, it is crucial to provide sufficient level of R&D funding. This is also extremely important for the research universities insofar as insufficient funding has a negative impact on the process of dissemination of knowledge in education, and in the long run, on the quality of the academic sector due to the decline in the quality of training of young researchers.

International evidence-based practice indicates that the concentration of research activities increases the level and productivity of knowledge creation. As small countries need to decide how to prioritise their research areas, Ukraine should focus on its historical strengths and the new high-tech growth industries.

If there are no excellent world-class research results, there is nothing to transfer to the local industry (which is competing mainly on the world market, but also targeting the EU markets) as well as to the international businesses interested in R&D procurements.

Since research funding is always limited, it is crucial to prioritise certain areas. In Ukraine, the national legislation sets forth that development of science and technology and innovation activities should take precedence. In particular, such priority areas include: 1) fundamental research on the most important problems of scientific, technical, socio-economic, socio-political, human potential to ensure Ukraine's competitiveness in the world and sustainable development of society and the state; 2) information and communication technology; 3) energy and energy efficiency; 4) environmental management; 5) life sciences, new technologies for prevention and treatment of communicable diseases; 6) new substances and materials. However, due to the lack of financial and other support mechanisms, both scientific – technical and innovation priorities are implemented only to a certain extent or are not implemented at all.

Policy recommendation: at the national level it is extremely relevant to stabilise the R&D investments for sufficient research funding to avoid further contraction of the research system, especially in the prioritised research areas.

[4] This study has been conducted by the former Dutch Minister of Research: van Bochove, C. A. (2012). Basic Research and Prosperity: Sampling and Selection of Technological Possibilities and of Scientific Hypotheses as an Alternative Engine of Endogenous Growth. Available at https://openaccess.leidenuniv.nl/bitstream/handle/1887/18636/CWTS-WP-2012-003.pdf?sequence=2&origin=publication_detail (10.03.2016).

[5] This data originates from the State Statistics Service of Ukraine. Indicator "Scientific personnel and the number of organizations" data is presented, excluding the temporarily occupied territory of the Autonomous Republic of Crimea, Sevastopol and the zone of the antiterrorist operation.

2.2 Creation and protection of commercially viable knowledge in cooperation with the industry

Knowledge transfer starts with the creation of knowledge. If there is no commercially valuable knowledge, then there is nothing to transfer to the industry.

It is crucial to engage in strategically structured cooperation long before any specific transfer project starts. In practice this means that the industry participates in defining problems, providing market feedback, etc.

The assistance from the industry to increase relevance of the research is absolutely essential. According to the Commission Recommendation on the management of intellectual property in knowledge transfer activities and Code of Practice for universities and other public research organisations (hereinafter the EU Recommendations), it is necessary to rely on "the private sector to help identify technological needs and to foster private investment in research and encourage the exploitation of publicly-funded research results".[6]

The knowledge transfer system should not focus solely on IP commercialisation (licensing, IP transfer, formation of spin-offs) but also involve development of collaborative platforms with the industry, development of infrastructure of knowledge transfer.

Information and communication technology (ICT) is becoming increasingly popular and developing fast in Ukraine. Therefore, it is appropriate to consider whether the current law on copyright is supporting ICT research (e.g. digital processing and text content [7]) and activities in the field of IT - business (e.g. software development). In both areas research institutions and universities play an important role.

Recommendation for academia: it is crucial to concentrate on the creation and adequate protection of commercially valuable knowledge. Commercial viability can be achieved through initial well-structured, systematic and strategic industry-academia co-operation. This also creates framework conditions for the subsequent knowledge transfer.

2.3 Extending the scope of transferred knowledge to social sciences and humanities

The European Commission's Expert Group on Knowledge Transfer Metrics has correctly emphasised that "technology is not the only field of knowledge for which transfer is considered important".[8]

The term "knowledge transfer" already implies that the knowledge to be transferred is not limited to technological domain but involves also research results from social sciences and humanities. For

[6] European Commission. Commission Recommendation on the management of intellectual property in knowledge transfer activities and Code of Practice for universities and other public research organisations (2008). Available at http://ec.europa.eu/invest-in-research/pdf/download_en/ip_recommendation.pdf (7.3.2016).

[7] The recommendation to introduce text and data mining in the UK has already made it to the so-called Hargreaves review - I. Hargreaves (2011). Digital Opportunity: A review of Intellectual Property and Growth. Available at http://webarchive.nationalarchives.gov.uk/20140603093549/http://www.ipo.gov.uk/ipreview-finalreport.pdf (10.3.2016).

[8] The European Commission's Expert Group on Knowledge Transfer Metrics (2009). Metrics for Knowledge Transfer from Public Research Organisations in Europe, p. 4. Available at http://ec.europa.eu/invest-in-research/pdf/download_en/knowledge_transfer_web.pdf (9.2.2016).

instance, the University of Tartu has joined forces with the Mercedes-Benz Driving Academy (intervention technique to increase transport safety), AS Põltsamaa Felix (marketing), etc.[9]

Although the majority of spin-off companies of the University of Tartu[10] are engaged in technology, there are also companies whose competitive edge can be attributed to research results in social sciences (e.g. Psühhobuss OÜ[11] offers entertaining psychology-related demonstrations and tests and performs at corporate parties, birthdays and schools, etc.).

Wider dissemination and use of such results could principally include participation of research scientific organisations and HEIs in the legislative drafting process taking places in the ministries, committees of the Verkhovna Rada of Ukraine.

Policy recommendations and recommendation for academia: it is advisable to define the knowledge transfer so widely that it would encompass the transfer of research results from the field of technology, social sciences and humanities, and also to introduce mechanisms and incentives for wider dissemination and use of such results.

3 Knowledge transfer management

3.1 Establishment of well-functioning knowledge transfer offices

This section concerns the following topics:

1) Establishment and effectiveness of knowledge transfer offices (TTOs);
2) Adequate governmental support to knowledge transfer activities;
3) Qualification of knowledge transfer professionals;
4) Access to knowledge transfer services.

The EU Recommendations on knowledge transfer emphasise that "it is essential to have access to professional knowledge transfer staff and/or external services for sound advice on legal, financial, commercial or IP protection issues."[12]

In Ukraine, according to Art. 8 of the Law of Ukraine "On the state regulation of activities in technology transfer sphere" and Resolution № 995 of the Cabinet of Ministers of Ukraine dated 1.08.2007 on the formation of structural divisions on technology transfer, innovation and intellectual property stipulated for Universities and research institutions of Academies of Sciences.[13] Certain ministries, the National Academy of Sciences of Ukraine have adopted their own regulations on the activities of these offices.

[9] The University of Tartu. From the university to our partners. Available at https://www.ut.ee/sites/default/files/www_ut/from_the_university_to_our_partners_2015.pdf (7.2.2016).
[10] Spin-Off Companies of University of Tartu. The list of companies is available at http://www.ut.ee/en/business/spin-companies-university-tartu (10.3.2016).
[11] About Psychobus. Information available at http://psyhhobuss.mozello.com/about/ (10.3.2016).
[12] Recommendations on knowledge transfer, p. 17.
[13] Model Regulation of the structural division for technology transfer, innovation and intellectual property of the ministry, other central executive authority, the National Academy of Sciences and national branch academies of sciences, approved by the Cabinet of Ministers of Ukraine on 1 of August, 2007 № 995 "Some issues of implementation of the Law Ukraine "On state regulation of activities in the field of technology transfer."'

However, they are currently facing the following problems:

- Lack of sufficient funding to hire qualified personnel for these departments,
- Lack of system of state commissioned staff training in the field of intellectual property and technology transfer for public research institutions accompanied by yet another problem - significant funds required from educational institutions to finance such training,
- Absence of system of qualifications improvement for the experts, of continuous exchange of experience, of adequate methodological support.

A key issue here is the existence of well-functioning and effective knowledge transfer offices. This calls for adequate state-level support to knowledge transfer activities and advancement of qualifications of knowledge transfer professionals. It's relevant to stipulate that the staff of the TTO will include positions of researchers dealing with patent research, marketing, market research and technology transfer issues. High-level expertise is needed to perform these tasks.

Policy recommendation: the government should support universities and other public research organisations in developing knowledge transfer strategies (e.g. by providing advice, hiring intellectual property management experts) and provide funds for seeking IP protection (especially in the western countries).

A system of sharing and describing experience in the KT sphere should be introduced - several round-tables and seminars should be organised to discuss the issues of knowledge transfer.

It is imperative to create a system of retraining specialists in technology transfer and intellectual property protection and of skills improvement of specialists in order to provide research institutions and universities with qualified personnel.

Introduction of courses on intellectual property and technology transfer at universities are highly recommended.

The ministries and the Academies of Sciences are encouraged to develop recommendations on the tasks and functions of the departments of technology transfer, innovation and intellectual property of research institutions and universities, as well as prepare strategies (manuals) of the institution on creation, protection and use of intellectual property rights and technology transfer, taking into account that the establishment of such departments (approved by the Cabinet of Ministers of Ukraine on 1 August 2007 r. № 995) is aimed at the central executive authorities and does not fully reflect specific work of the institutions directly involved in the protection of intellectual property and knowledge transfer.

Recommendation for academia and policy recommendation: a well-functioning knowledge transfer office (KTO) should be integrated into the activities of public research organisations and it should be accessible to researchers and the industry. Several round-tables and seminars should be organised to discuss the issues of knowledge transfer.

The effectiveness of the activities of KTO should be developed and reinforced at all levels (university, the Academies of Sciences, ministries) in the following areas: 1) communication

area (availability of the KTO's staff, user-friendly access to information and transparency of the procedures), 2) scientific area (assessment of the viability and potential development of the invention; 3) information area (availability of adequate information tools and services related to patent information, search of prior art, freedom of operation, evaluation of possible markets); 4) legal area (assistance in IP protection, enforcement, drafting technology transfer agreements, etc.), 5) funding area (availability of IP protection and commercialisation of funds - the availability of sufficient funds to involve qualified personnel in departments of technology transfer and intellectual property protection and patenting) and 6) commercial area (assessment of the commercial potential of the invention, marketing, business network access, search of suitable partnerships, business development, negotiation and administration of licensing contracts etc.). Financial and career incentives should exist for knowledge transfer professionals and researchers participating in the transfer process.

Organisation of seminars and round-tables to exchange experience in the field of knowledge transfer is advised.

3.2 Intellectual property management policy

The EU Recommendations on knowledge transfer emphasise that "effective management of intellectual property requires the establishment of internal policies to ensure an adequate handling of the results of research".[14]

According to the document, the following areas should be covered:

1) clear rules regarding disclosure of research results with commercial potential, ownership regime, record keeping, management of conflicts of interests;

2) promotion of identification, exploitation and protection of intellectual property;

3) career and financial incentives for researchers and knowledge transfer experts;

4) creation of IP portfolios;

5) promotion of broad dissemination of research results.[15]

Recommendations on KT identify the need to develop an official comprehensive guide for intellectual property management in every scientific institution and university. The practice of protection of intellectual property and technology transfer of institutions in Ukraine shows that in some cases, in particular as regards the NAS of Ukraine, the Regulation on the use of intellectual property has already been adopted i.e. guidelines for such activities in academic institutions[16].

However, in many universities and research organisations such activities are governed by the statutory objectives and requirements of the legislation of Ukraine that regulate only certain policy issues on protection of intellectual property rights and technology transfer.

In the EU Recommendations the centre of attention is on the creation of a system of disclosing results of commercially-oriented researches in PROs and HEIs. In order to disseminate and increase the visibility of research conducted at the Ukrainian public research organisations it is appropriate to:

[14] Recommendations on knowledge transfer, p. 16.
[15] Recommendations on knowledge transfer, p. 10-11.
[16] Resolution of Presidium of the National Academy of Sciences of Ukraine "On departments of technology transfer, innovation and intellectual property" of 16.01.2008, № 15.

1) publicise the work results of public research organisations on their websites and make available lists of research results offered for use and the contact person responsible for academia-industry relations. The information should be in English (possibly in other languages as well). The information should be kept up-to-date by;

2) disseminating information on new developments through e-mailing lists sent out to subscribers;

3) using information networks, Enterprise Europe Network[17] in particular, to disseminate information on developments in Ukraine, the EU and other countries.

Recommendation for academia: it's important for public research organisations (independently or together with the ministries, the Academies of Sciences, to which they are subordinated) to develop detailed regulations concerning the notification procedure of research results (protectable by copyright, related rights and industrial property) with commercial potential, the ownership of research results, the assessment and protection of research results and remuneration (starting from 1/3 of net income) to inventors and authors. Financial and career incentives should be used to achieve the implementation of strategic goals.

Recommendation for academia: it is advisable to develop principles that will become part of IP management policy by supporting dissemination of research results of Ukrainian public research organisations. It is important to strike a balance between commercial exploitation of research results and their free dissemination. Commercial exploitation can cause postponing of publication of research results. It is crucial for researches, conducted by the Ukrainian public research organisations, to be visible to national and international partners. All channels of dissemination should be used.

3.3 Development of the system of knowledge transfer indicators

Management and also steering of the system of knowledge transfer requires a set of indicators describing its functioning. The indicators have to reflect the fulfilment of specific policy goals and measures at specific policy and institutional (R&D institutes and HEIs) levels. There are several, to some extent contradictory, aspects which should be considered while developing the indicator system:

- cost-efficiency ensuring that the value of collected data should be higher than the costs of collecting the data;
- comparability ensuring that the development of the system can be monitored via international comparisons and the data are available for decision-makers (for comparison with transition countries, but also socio-economically and politically relevant regions for integration (the EU);
- alignment taking into the account the Ukrainian socio-economic conditions. Ukraine can certainly learn from the best practices of other countries. However, these practices need to be adjusted to make them compatible with the Ukrainian environment;
- combination of quantitative and qualitative data. One of the most informative knowledge transfer indicators is the profit a PRO or HEI has earned through knowledge transfer.

[17] Enterprise Europe Network. Available at http://een.ec.europa.eu/ (7.3.2016).

The problem lies in the fact that knowledge transfer unites many otherwise not self-sustainable subjects which makes it necessary to use additional quantitative (e.g. number of patent applications, academia-industry joint publications, etc.) and qualitative indicators (e.g. analysis of KT routines, commercialisation strategies, functioning of KT units, etc.).

Compared to other countries, Ukraine has achieved significant results as to how the knowledge transfer system operates: it can provide statistical data for different internationally comparable indicators, for example in GII (the Global Innovation Index) Ukraine is one of the few countries with the lowest number of missing indicators. In Ukraine the collection of data on R&D implementation and technology transfer is carried out by the Ministry of Education and Science of Ukraine and the State Statistical Services of Ukraine.

For better integration with the EU, Ukrainian specialists have developed and implemented indicators subject to the principles of the EU Innovation Scoreboard[18], but it is important to undertake regular surveys also for other indices (e.g. regular overview of indices of the Community Innovation Survey, other indicators of R&D and innovative activity) and also take into consideration developments in the EU standards.

With regard to knowledge transfer, different approaches to evaluation have been proposed in the EU[19] and it is recommended that Ukraine should also actively participate in developing these indicators to evaluate knowledge transfer and as well as monitor the progress that has been made by the HEIs and PROs in these activities. Therefore, it is advisable to create a working group consisting of experts from relevant ministries and the Academies of Science and university representatives, but also representatives of the State Statistical Service under the auspices of the Ministry of Education of Science of Ukraine to exchange experience and analyse activities in the HEIs and PROs in the field of knowledge transfer. The incorporation of these organisations is extremely relevant as many proposed indicators for knowledge transfer activities can only be obtained by surveying the PROs and HEIs. At later stages, these knowledge transfer indicators can be used also for strategic development of the knowledge creation and transfer activities.

The practical value of the received institution-level data can also be used for management of research institutions and HEIs, as it is not advisable to provide financial support based only on statistical data (such as the number of patent applications).

The report of the EU working group on the issues of knowledge transfer emphasises the importance of using indicators at institutional level, as they are relevant for international comparisons and can be used as a basis for more complex indicators of knowledge transfer (e.g. indices), including indicators of patents and publications used in international organisations (such as WIPO, Thomson Reuters, Scopus) and indicators of academic institutions level (e.g. ETER in Europe).

It should be noted that a sufficient explanation of terms used in the survey is extremely important. For instance, the Latvian Community Innovation Survey (CIS) revealed that the lack of explanation of terms was reflected in low innovation indicators (e.g. an alternative survey with adequate explanations gave better results).

The actual knowledge transfer efforts of organisations should be supported and this requires appropriate assessment of these efforts on KT support undertaken at national level.

Policy recommendation: it is recommended at national level to develop, maintain and also

[18] Innovation Ukraine 2020. National Report. Editors-in-chief: prof. V.Heits, NAS of Ukraine (2015). Available at http://ief.org.ua/wp-content/uploads/2015/07/Інноваційна-Україна-2020++.pdf (8.6.2016).

[19] European Knowledge Transfer Report 2013. Knowledge Transfer Study. 2010–2012. Version 1.1, June 2013, 384 Available at https://ec.europa.eu/research/innovation-union/pdf/knowledge_transfer_2010-2012_report.pdf (10.3.2016).

publish standardised surveys related to knowledge transfer by taking into account methodologies on knowledge transfer evaluation in the EU.

Policy recommendation: at national level it is recommended to create a working group involving HEIs, PROs, ministries and the State Statistical Service under the auspices of the Ministry of Education of Science of Ukraine to exchange knowledge transfer experience and arrange assessment and indicators in the field of knowledge transfer. This should comply with the EU experience on KT assessment.

Recommendation for academia: at the PROs and HEIs level it is advisable to generate indicators for assessing knowledge transfer at the organisation level by collecting and collating data from national and international sources. Possibilities to align these with TTO efficiency analysis should be explored.

4 Knowledge exploitation

4.1 Guides on knowledge transfer at the level of public research organisations and higher education institutions

In the earlier innovation policy consultations, Ukrainian decision-makers were advised to agree on national mid-term (3-5 years) strategic plans on R&D and innovation, and also to engage various stakeholders (including companies, HEIs/PROs) in the strategy-building process (EU Project Innopolicy, 2009-2011)[20].

The above is essential as a basis for the introduction of systematic measures for the transfer of knowledge using a set of measures of state support: financial, credit, tax, infrastructure knowledge transfer and more.

Pursuant to Art. 8 of the Law of Ukraine on Technology Transfer the departments on technology transfer, innovation and intellectual property (TTOs) should be created within the framework of the Academies of Sciences, in HEIs and PROs of ministries.

Unfortunately, the lack of financial, credit and tax mechanisms supporting knowledge transfer (technology transfer) in Ukraine resulted in the fact that these departments are now more engaged in the collection of knowledge transfer data and its reporting while lagging behind in development of their potential impact on technology transfer.

Therefore, it is the Government's primary responsibility to create a system of state support for knowledge transfer.

The experience on protection of intellectual property and technology transfer of research institutions and universities in Ukraine shows that in some cases, in particular as regards the NAS of Ukraine and other organisations, provisions regulating the use of intellectual property were adopted that function as guidelines for this activity in scientific institutions.

[20] Innovation Policy: European Experience and Recommendations for Ukraine (2011). – Volume 3. – Innovations in Ukraine the suggestions for policy actions.–K.: Fenix, p. 39.

It would be useful for scientific institutions and universities in Ukraine to adopt the guidelines and regulations regarding knowledge transfer and commercialisation of intellectual property in line with the provisions of the EU Recommendations.

It is a challenge for the governing bodies of institutions to adhere to strategic goals because the revenue received from knowledge transfer activities is relatively modest in most universities. For example, the share of business contracts in research budgets of Estonian universities constitutes about 4-6% of the research budget (which is at a comparable level internationally), yet licensing revenues remain much smaller. However, the costs of competence building for creating TTOs together with enforcement of knowledge transfer systems within a research organisation might be substantial.

In Ukraine a system exists (in compliance with the EU recommendation on KT) which stipulates that the right of an employee's IP object belongs to the HEI or PRO.

It's unlikely that we should change this principle even if in some EU Member States there is negative practice concerning the implementation and enforcement of this principle, and in some countries material intellectual property rights are acquired by university employees.

Patent applications and the issued patents (provided they have been subject to intense scrutiny) should be deemed research results and allowed to be part of a PhD thesis and support academic career (similarly to high level research articles). This approach should motivate researchers to patent.

It's relevant to define in scientific institutions and universities:

The overall size of remuneration to authors and inventors of IPR;

The principles of distribution of funds, received by an institution from the use of an IP object, among:

– inventors, authors (s) of IP objects,
– unit in which they work (TTO),
– and the institution.

Policy recommendation: it is relevant that the practices of knowledge transfer between the HEIs, PROs and industry should be made a continuous political and operational priority for all public research funding providers (incl. the relevant ministries procuring applied research). Each ministry and regional government body that carries out knowledge transfer activities should designate an official responsible for support and monitoring the knowledge transfer activities. It's reasonable to organise regular meetings of such persons in order to exchange information and discuss ways to improve knowledge transfer.

Recommendation for academia: it's advisable in scientific institutions and universities to adopt guidelines for the protection of intellectual property and knowledge transfer (technology transfer) by taking into account the EU Recommendations in this field, and to allocate resources for this activity by emphasising the idea of importance of knowledge transfer to researchers and mid-level managers and by offering incentives to employees who create objects of intellectual property rights .

4.2 Raising awareness and building capacity (international, national and institutional levels)

Awareness raising and capacity building are key issues in all the phases of knowledge transfer. Since the two previous phases are to some extent preparatory and knowledge transfer actually takes place in the exploitation phase, then issues relating to awareness and capacity will be addressed below.

The precondition of successful knowledge (including technology transfer) is that the actors of the Ukrainian innovation system possess and develop their innovation and technology related capabilities and can do it in sustainable manner. In 2011 an EU funded project «Enhance Innovation Strategies, Policies and Regulation in Ukraine» prepared a document «Innovation in Ukraine: proposals for political action» which included a whole array of policy-related recommendations given to develop the Ukrainian innovation system.

Recommendations were submitted in the following areas:

- better governance in favour of innovation,
- enhancing innovation in enterprises,
- bridging R&D potential with industry,
- more innovation in regions,
- developing an innovative culture,
- globally competitive eco-innovation,
- prioritisation of policy options.

Performance of the outlined activities is important. These activities are necessary preconditions of effective functioning of knowledge transfer at national level.
It has been recognised by the EU that Ukraine has been successful in integration with the European research area via the Framework Programmes for research and innovation and active involvement in Horizon 2020. It was brought out that in the 7th FP, traditionally strong research schools in Ukraine on material sciences, space and aero-technology, welding equipment, shipbuilding, biochemical, but also ICT have been strong and attractive partners for western countries.
We strongly support this integration with partners from the EU.
Estonia's experience in the field (e.g. the SPINNO Program in the early 2000s) demonstrated how unprepared the HEIs were for knowledge transfer and how long it has taken until these ideas have been implemented into specific practices of organisations (as universities are democratic organisations it takes very long to accept the changes in routines).
Additionally, in Estonia the governance of KT activities seems often to fall between academic affairs and research (traditional activity fields in HEI), meaning there is no commitment to it across different management levels (top level, faculty level, research unit level).
The awareness of researchers of knowledge transfer roles has to be increased. It has been well-documented that the mind-sets and competences of individual researchers (facilitated by appropriate leadership of management) are determining the researchers' behaviour and extent to which scientists engage in knowledge transfer. In technical fields and natural sciences, the awareness is typically more comprehensive; however, limited knowledge of KT possibilities in social sciences at national level is true in many countries, including Estonia.
In literature, the importance of integration of research activities across the international scientific communities has been recognised for achieving better quality, but also dissemination of the research (including knowledge transfer).
Therefore, it is imperative to promote participation of the Ukrainian PROs and HEIs in Horizon2020.
It is very important that the success has been evident in priority areas e.g. nanoscience, nanotechnologies, materials and new production technologies; biotechnologies and space.
There is a need to establish clear rules as to the owner of intellectual property resulting from publicly funded research and that these rules are made easily available.
In addition, access to research results generated during the EU Framework Programme for Research and Innovation, the legal regime of intellectual property objects, financial conditions for participation in the EU calls should be laid down in international agreements on scientific and technical cooperation between Ukraine and the EU subject to the EU legislation regulating such research.

Public authorities, the Academy of Sciences should disseminate information about the new regime of intellectual property rights pertaining to results of research and development works created at the expense of budgetary costs as well as service inventions among foreign partner institutions.

Policy recommendation: at the government level it is appropriate to solve strategically important questions of formation of an environment ensuring knowledge transfer in particular by taking into account the recommendations of the EU projects. In years 2009-2015, as part of the EU project "Enhance Innovation Strategies, Policies and Regulation in Ukraine" and of the other innovation -oriented EU projects, European experts offered recommendations in that area, but so far they have not resulted in practical solutions.

It is important to remove barriers to participation of the Ukrainian scientists in the Framework Programme of Research and Development, including in particular, the ability to be coordinators of consortia, to manage financial resources, to remove restrictions for employees to qualify for funding of international projects.

It's also essential to raise awareness concerning the knowledge transfer process by establishing a stable system of training in knowledge transfer and IP fields. This is also relevant for introduction of reliable indicators concerning knowledge transfer.

Policy recommendation / Recommendation for academia: it is crucial to build awareness concerning protection of IPR on research results, including rights on background and foreground intellectual property, but also IP ownership of cooperative researches funded by foreign donors.

Recommendation for academia: training programmes should be organised in PROs and HEIs aimed at improving skills of knowledge transfer, entrepreneurship and intellectual property protection as well as involvement of students in marketing research, business plan development in the sphere of new technologies.

It's important also to align knowledge transfer with traditional research and educational practices and policies (routines) of academic organisations. Creation of TTOs remains clearly insufficient if knowledge transfer objectives and activities are not integrated into other management elements (e.g. if they are not integrated into the criteria for academic staffing, or if the faculties and research units fail to put these activities into practice, etc.). Broader integration is necessary for achieving greater impacts on society at large (here the EU and OECD activities towards knowledge triangle (KT) can be outlined).

4.3 Development of open access policies

Research results should be made as widely available as possible. Today's technology offers several opportunities to do so. Open access policy should help research organisations and universities to disseminate their research results.

When developing open access policies, it is advisable to take into consideration the following:

1) open access publishing requires additional resources. At the moment we are experiencing changes in publication models. In addition to publishers who sell subscriptions to their journals, there are publishers who make publications freely available on the internet. The publication

costs are shifted onto someone else. Often the author has to incur the publication expenses which could be considerable;

2) open access publishing could have an adverse impact on quality. Since open access publishers are selling the opportunity to publish and not subscriptions, then the quality of research papers is not necessarily their primary concern;

3) very extensive open access policy contradicts commercial knowledge transfer. In case all research results are made available without any restrictions (e.g. copyright is waived) then it is very hard to commercially exploit them (no one is willing to pay for something which can be used for free);

4) commercial exploitation of research results should not unduly limit publication. The EU Recommendations on knowledge transfer suggests to "develop and publicise a publication/dissemination policy, promoting the broad dissemination of research and development results (e.g. through open access publication), while accepting possible delay where the protection of intellectual property is envisaged, although this should be kept to a minimum".[21]

In Ukraine there are practices of open access and archiving in the system of NAS of Ukraine and some universities, but there is no comprehensive regulation on the principles of open access. The introduction of open access in Ukraine is delayed because of the need to introduce changes in the Ukrainian copyright legislation that would regulate the use of open access licenses[22]. This mainly concerns transaction format requirements.

Policy recommendation: it is recommended to adopt in Ukraine an EU member states policy on open access, which takes into account the need for additional resources, safeguards quality and divergent interests between open access publishing and commercial exploitation of research results. The use of standard licences such as Creative Commons, GPL, etc. should be made possible. The potential users of these licences should be educated about the terms, conditions and potential impact (e.g. copyleft clauses) of these licenses.

It's recommended at governmental level to develop guiding principles and recommendations on open access to scientific publications in conformity with the EU legislation and experience in this sphere.

Recommendation for academia: it is recommended to develop a policy on how to support open access publication of research results and how to guarantee quality of these publications.

4.4 Efficient intellectual property enforcement as a precondition for knowledge-based business

In order to support knowledge based businesses, attract foreign investors and have functioning trade relations, it is crucial to efficiently protect IP.

[21] Recommendations on knowledge transfer, p. 11.

[22] Kapitsa Y.M. Protection of copyright in commercial or free distribution of free access to scientific publications in the internet: requirements, restrictions, experience // Science Ukraine in the global information space. № 11, 2015, P. 45-55.

According to Special 301 Report, Ukraine is on the Priority Watch List in 2015. One of the deficiencies concerns "failure to implement an effective means to combat the widespread online infringement of copyright and related rights in Ukraine, including the lack of transparent and predictable provisions on intermediary liability and liability for third parties that facilitate piracy, limitations on such liability for Internet Service Providers and enforcement of takedown notices for infringing online content".[23]

The EU policy document, envisaging future IP developments for the EU which are also relevant for Ukraine, emphasises that it is crucial to focus on "commercial-scale infringements, inter alia to clarify, as appropriate, the rules for identifying infringers, the application of provisional and precautionary measures and injunctions and their cross-border effect, the calculation and allocation of damages and legal costs".[24]

Since knowledge based business is not confined to technology protected by patents but it also encompasses IT solutions (e.g. software, databases), then it is required to protect and encourage these investments. It practical terms it means adoption of relevant regulation and its systematic and efficient implementation.

Europe 2020: A strategy for smart, sustainable and inclusive growth recommends the EU member states to improve the conditions for enforcing intellectual property at the national level.[25]

Policy recommendation: it is essential to guarantee adequate and balanced protection for intellectual property. IP infringements, committed on a commercial scale causing considerable damage, should be prosecuted as criminal offences. In addition to adoption of adequate regulation, it is crucial to have it prioritised and effectively implemented.

4.5 Development of knowledge exploitation policies (sale of IP rights, licensing, spin-off)

Formal knowledge transfer takes place through the following channels:

1) licensing;
2) assignment of rights;
3) spin-off (licence or transfer of rights to a company).

Recommendations on knowledge transfer suggested to the PROs and HEIs to develop and publish their licensing and spin-off policies.

The aim of these policies is to harmonise practices within the public research organisations and HEIs, to ensure conformity of technology transfer with legislative requirements, determine adequate compensation, and concerning spin-offs: determining long-term relations with such companies.[26]

[23] United States Trade Representative. 2015 Special 301 Report, p. 55. Available at https://ustr.gov/sites/default/files/2015-Special-301-Report-FINAL.pdf (11.2.2016).

[24] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Towards a modern, more European copyright framework. - Brussels, 9.12.2015. COM(2015) 626 final, p. 11. Available at http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52015DC0626&rid=1 (4.3.2016).

[25] Communication from the Commission. EUROPE 2020 A strategy for smart, sustainable and inclusive growth. Brussels, 3.3.2010. COM (2010) 2020, p. 15. Available at http://ec.europa.eu/eu2020/pdf/COMPLET%20EN%20BARROSO%20%20%20007%20-%20Europe%202020%20-%20EN%20version.pdf (11.2.2016).

[26] Recommendations on knowledge transfer, p. 11.

This document should define policy objectives such as the development of Ukrainian economy, safeguards allowing the continuation of research (e.g. in case where research results protected as a patent are sold, it should still be possible to conduct research in this field), etc. which have to be adhered to. In the absence of such policies, practices of public research organisations could substantially differ which could have an adverse impact on national and international cooperation.

Without clear regulation, undesirable behavioural patterns (e.g. conflicts of interests cannot be avoided, etc.) could emerge. The EU recommendations on knowledge transfer suggest to carefully assess transfers of IP ownership and exclusive licences.

Particular emphasis is placed on the provision of corresponding compensation for granting licences - either financial or any other kind.

When we consider licensing as a mechanism of knowledge transfer, it could be said that in Ukraine some PROs and HEIs have experience in concluding licensing agreements and other technology transfer agreements.

However, concerning a large number of organisations, there is lack of professional support to help draft contracts and negotiate appropriate terms (especially with foreign partners). It is important to have guidelines how to determine royalty rates. The data on royalty rates and other marketing information should be collected and analysed, as well as possibilities of getting marketing information about national and foreign markets should be set forth.

When we regard the creation of spin-offs as a mechanism of knowledge transfer, it could be said that Ukrainian research organisations gained experience in the formation of small innovative enterprises (spin-off companies) from the 90s and early 2000s. However, due to the adoption of the Law of Ukraine "On management of state property object" in 2006 and the limitation of rights of budgetary institutions to set up such companies, this activity has actually stopped.

In connection with the proposals of the National Academy of Sciences of Ukraine, the Centre of Intellectual Property and Technology Transfer of the NAS of Ukraine, supported by the Ministry of Education and Science of Ukraine, a new version of the Law of Ukraine "On scientific and scientific - technical activities" envisaged a simplified procedure for the establishment of enterprises by scientific institutions and universities for the use of intellectual property objects. The law was adopted in 2015.

It should be noted that unlike in the EU, Ukraine has no system of financial, credit and tax support for the formation of spin-off companies and their development. The policy should also provide principles for the involvement of employees of public research organisations in the activities of spin-off companies and clarify relations between public research organisations and their spin-off companies.

Policy recommendation: it is advisable to develop a central mechanism to support knowledge transfer, including direct finance support for KT joint projects of PROs and HEIs and the industry partners, preferential credit support to spin-offs and tax incentives for R&D results commercialisation. It's necessary to develop recommendations on licensing, creation of spin-offs in order to support national and international cooperation and to ensure fairness and transparency of the entrepreneurial activity.

Recommendation for academia: it is recommended to work out policies of PROs and HEIs on licensing, assignment of rights and spin-offs to support national and international cooperation and to ensure fairness in transactions and transparency. The policies should cover licensing

objectives, conditions for transfer of IP rights, relations between spin-off companies and public research organisations and HEIs and their employees.

4.6 Knowledge transfer through public-private partnerships

A key mechanism of knowledge transfer (technology transfer) is the transfer of knowledge within public-private partnership, that includes joint scientific research projects by R&D institutions, universities and enterprises, participation in technology transfer projects, joint creation of knowledge transfer infrastructures and others.

Implementation of an effective system of public-private partnerships in research and innovation was addressed in the EU policy documents: Communications "Leading initiative on creation of Innovation Union"[27], "Review of innovation policy of the Community in a constantly changing world"[28] and others.

Ukraine has no effective contractual mechanisms and organisational means to raise state funds, funds of public institutions and private partners, aimed at financing development and technology transfer. The aforesaid is a fundamental difference from the leading practices of the European Union and its member states.

Lack of public-private partnerships in the research and innovation sphere in Ukraine exists due to the stipulated limits for public organisations to conclude agreements on joint activity.[29] Also, the Ukrainian legislation allows conclusion of consortium agreements only together with the establishment of a legal entity. Moreover, this practice contradicts the formation of consortium agreements within the Framework Programme of Researches and Developments "Horizon 2020" and creates barriers for the implementation of the Agreement between Ukraine and the EU on scientific and technological cooperation.

Policy recommendations: there is an urgent need to make amendments to national legislation enabling scientific institutions and higher education institutions to undertake joint research projects and implement technology transfer together with enterprises on the basis of cooperation agreements and consortium agreements.
Priority should be accorded to the introduction of financial programmes, credit and tax mechanisms to attract businesses to jointly implement technology transfer projects and conduct applied research and development together with research institutions and universities.

4.7 Development of model contracts

[27] Communication "Europe 2020 Flagship Initiative Innovation Union", Brussels, 6.10.2010. COM(2010).
[28] Communication "Reviewing Community innovation policy in a changing world", Brussels, 2.9.2009. COM(2009) 442 final.
[29] Resolution № 296 of the Cabinet of Ministers of Ukraine of 11 April 2012 On approval of procedure to conclude cooperation agreements, commission agreements, agency and property management for state enterprises, institutions, organisations and commercial companies, whose authorised share capital of the state exceeds 50 percent.

Several EU member states (Great Britain[30], Germany[31] and others) have developed model R&D and KT contracts with industry partners offering different options for the ownership and use of IP.

In Great Britain, the Lambert Toolkit was created by the Lambert Working Group on Intellectual Property, endorsing an initiative of the UK Treasury in 2003 to review collaborations between universities and companies. Five Model Research Collaboration Agreements covering different collaboration scenarios and IP terms between one academic/university and one industrial/business partner have been prepared, as well as four Model Consortium Agreements (multiparty agreements) covering different mechanisms for IP ownership and exploitation of results in research collaboration whereby multiple parties (more than two) are involved.

In Ukraine, terms and conditions of the contracts with companies on intellectual property rights are generally determined on a case-by-case basis. There are no recommendations on the acquisition and use of IP rights in the variety of contracts entered into between institutions and enterprises to conduct R&D and KT. It should be noted that separate requirements for such contracts are stipulated in acts of NAS of Ukraine. [32]

It is advisable to:

1) develop agreements on conducting R&D and on technology (knowledge) transfer recommendations on acquisition and use of IP rights (including background, foreground and sideground IP and access rights) to be incorporated into licensing and research contracts;

2) it is reasonable to coordinate this work at the governmental level and develop standard clauses and contracts which are used by all Ukrainian public research organisations.

Policy recommendation: at national level it is advisable to develop recommendations and model contracts including terms on the acquisition and use of intellectual property rights and the variety of relations between research institutions, universities and enterprises regarding conducting research and technology transfer, as well as electronic guides to facilitate contract selection and to make them available to all Ukrainian public research organisations and universities.

[30] Lambert toolkit. Available at http://www.ipo.gov.uk/lambert (13.3.2016).

[31] Federal Ministry of Economics and Technology (BWMi), Sample Agreements for research and development cooperation - Guidelines for cooperation between the academics sector and industry, second edition, April 2010. Available at http://www.bmwi.de/EN/Service/publications,did=385934.html (9.3.2016).

[32] Art . 6.2 "The conclusion of the agreement on the use of intellectual property objects" of the Statute on Using of Intellectual Property Objects at the National Academy of Sciences of Ukraine".