D.3.3 Report on Tech Transfer Opportunities and Bottlenecks in the EPC

September 2016

Policy recommendations on how to boost the technology transfer process and fill the research to market gap in EPC countries

The current report has been prepared by TII (lead author), Intelligentsia, Kharkiv Technologies, ISP-NASU, UIIP-NASB, Infopark, IPR-NAS and GTU, within Work Package 3 “Cooperation and Knowledge Transfer Analysis of the SECURE-R2I project” over the course of Tasks 3.1 – 3.3.

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This final report (Deliverable 3.3) presents the findings of the SECURE-R2I project “Reinforcing cooperation with Eastern Partnership Countries on bridging the gap between research and innovation for inclusive and secure societies”, funded by the European Union’s Seventh Framework Programme for research, technological development and demonstration, under the INCO programme.

The content presented in this report refers to the work carried out throughout Work Package 3: Cooperation and Knowledge Transfer Analysis of the SECURE-R2I project. Work package 3 aims to analyse the knowledge transfer process in the Eastern Partnership Countries (EPC) engaged in this project (Armenia, Belarus, Georgia and Ukraine) with a view to understanding better the:

- Barriers to and drivers of knowledge transfer processes in the EPC target areas
- Approaches and models of Knowledge Transfer within EPC research and development institutions (RDI)
- Cooperation patterns with other actors in the value chain and support system in place
- Opportunities for technology transfer and future cooperation among EPC and EU partners

The key conclusions of this analysis are the policy recommendations for addressing the research to innovation gap in EPCs presented in the final chapter of this report.

Such recommendations tackle common issues across the different EPCs (all sharing a common transition process and research endeavour derived from the Soviet period) and aim to inspire EPC policy makers and stakeholders with examples and solutions based on EU experience in boosting knowledge and technology transfer processes across different European countries and regions.

It is important to clarify that SECURE-R2I has not been a study project, but a “learning” exercise addressed primarily to RDI actors in EPCs. The analysis performed was instrumental in enhancing the focus of the learning phase which was built on training paths and practical sessions on research exploitation methods, including coaching and counselling from international peers. Our conclusions have therefore to be considered as suggestions coming from an in situ, practical experimentation with knowledge transfer practitioners, rather than the result of an evidence-based, thorough investigation.

Nevertheless as the findings presented originate from an intensive interaction with EPC (and EU) stakeholders daily engaged with innovation and knowledge transfer processes, we hope they receive the due attention of EPC and EU policy makers, as they surely represent the real needs and constraints in quest of a targeted policy response.
As members of the SECURE-R2i team, we would like to thank all the EPC stakeholders encountered during this project and for their contributions and support throughout the whole process (participation in surveys, audits, policy dialogues and capacity building sessions).

Thanks to this project, a fruitful cooperation among EU and EPC partners has been established. Knowledge and experience have been exchanged resulting in a deeper understanding of conditions and capacities for knowledge transfer. Last but not least, cultural diversity, initially perceived as a barrier, has actually turned out to be an opportunity for enrichment and learning for the whole team, not only as professionals but also as human beings.
# Executive summary

The SECURE-R2I final report provides a critical analysis of the overall conditions (barriers, drivers, regulatory framework and enabling factors) for knowledge transfer in the European Partnership Countries of Armenia, Belarus, Georgia and Ukraine. On the basis of this assessment, a number of policy options and recommendations are offered to EPC stakeholders (in particular policy makers and RDI institutions, but also EC policy makers) to improve their research-to-market processes.

*Fig. 1) Swot analysis of conditions for Knowledge transfer processes in the four EPCs*

<table>
<thead>
<tr>
<th>KEY STRENGTHS/OPPORTUNITIES</th>
<th>KEY WEAKNESSES/THREATS</th>
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<tbody>
<tr>
<td>Well educated population</td>
<td>Underdeveloped SME system, low absorption and demand (low BERD)</td>
</tr>
<tr>
<td>Long tradition of scientific excellence</td>
<td>Weak entrepreneurial culture (risk averse)</td>
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<tr>
<td>Policy makers aware of the importance of innovation (innovation policy)</td>
<td>Brain drain</td>
</tr>
<tr>
<td>Connections with other Eastern Partnership Countries</td>
<td>Supply services for innovation and entrepreneurship still incomplete</td>
</tr>
<tr>
<td>Diaspora researchers</td>
<td>Lack of funding/resources for KT</td>
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<tr>
<td>International donors and funding available</td>
<td>Lack of skills and expertise for technology transfer</td>
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<table>
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<tr>
<th>KEY STRENGTHS/OPPORTUNITIES</th>
<th>KEY WEAKNESSES/THREATS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality researchers</td>
<td>Brain drain, generation gap (old researchers)</td>
</tr>
<tr>
<td>Long traditions of scientific excellence in some fields</td>
<td>Risk-averse culture</td>
</tr>
<tr>
<td>Acquaintance with applied research processes</td>
<td>Lack of funding (low salaries and obsolete equipment)</td>
</tr>
<tr>
<td>Institutions’ policy recognizing the importance of knowledge transfer</td>
<td>No incentives for innovation and knowledge transfer</td>
</tr>
<tr>
<td>Presence of embryonic TTOs</td>
<td>Drawback of IP portfolio</td>
</tr>
<tr>
<td>Connections with emigré researchers</td>
<td>Lack of skills and expertise for technology transfer</td>
</tr>
<tr>
<td>Access to international funding</td>
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The analysis carried out by shows that knowledge transfer (innovation processes based on knowledge exploitation) is still a novel concept in the target EPCs either in terms of general understanding (innovation is often meant as a synonym for research or technology), policy intervention (technocratic, science-based approach) or practice (weak exploitation of research results, as research is often developed unrelated to IPR and market considerations). Initiatives in favour of a systematic exploitation of research results are quite recent and still underdeveloped in the different countries, with limited achievements in terms of economic return for the exploitation effort produced.
**SECURE-R2I RECOMMENDATIONS:**

The analysis performed confirms that knowledge transfer may play a key role in boosting the economic development of our target EPC since a solid scientific base and qualified human capital are present in all of them (good potential). Moreover, given the fragile nature and low level of innovativeness of indigenous industry, this could give rise to a focused stream of knowledge-based companies (rejuvenating the entrepreneurial fabric) as well as offering to EPC RDIs the possibility to access additional resources and contribute to closing the funding gap from which they suffer (good opportunities).

Experience demonstrates that the success of knowledge transfer depends on a well-functioning ecosystem which ensures a steady flow of ideas, people, knowledge and capital, while operating under conducive rules and benefiting from cutting-edge infrastructure. Securing these conditions is the responsibility of innovation policy makers in all countries, including the EPC. This is a challenge which, especially for transition countries, requires a long-term project/vision which can only be achieved step by step.

To address this complex challenge, the SECURE-R2I project proposes a focused set of "actionable" interventions, which, on the one hand, contribute to building up a conducive ecosystem (medium/long term objective) and, on the other hand, capitalize on the key assets for knowledge transfer (skilled human capital, research capacity) to produce tangible effects (successful exploitation creating positive social impact in the EPC) in the medium/short term.

The project identifies three main policy objectives (and related streams of action) which in our opinion (and those of EPC stakeholders engaged by the project) could significantly boost the research exploitation process in EPCs.

1. To enhance the innovation and entrepreneurial culture in general, as well as skills and capacities for knowledge transfer and innovation (culture and human development).

2. To improve the supply of support services and facilities for knowledge transfer and innovation (conducive ecosystem).

3. To strengthen policy impact through enhanced strategy, governance and regulation (targeted positioning also at international level).
Overall aim: 
CLOSE THE RESEARCH-TO-MARKET GAP IN EPCs

1) TO ENHANCE THE OVERALL INNOVATION AND ENTREPRENEURIAL CULTURE, AS WELL AS SKILLS AND CAPACITIES FOR KNOWLEDGE TRANSFER AND INNOVATION (CULTURE AND HUMAN DEVELOPMENT)

1.1 AWARENESS-RAISING AMONG YOUNG PEOPLE AND RESEARCHERS TO STIMULATE A MORE ENTREPRENEURIAL, RISK-TAKING MIND-SET AND BEHAVIOUR

1.2 ENHANCE TT SKILLS AND INNOVATION SERVICE PROVISION (BETTER ACCESSIBILITY AND PROFESSIONALIZATION OF SERVICE PROVIDERS)

2) TO IMPROVE THE SUPPLY OF SUPPORT SERVICES AND FACILITIES FOR KNOWLEDGE TRANSFER AND INNOVATION (BETTER ECOSYSTEM)

2.1 INNOVATION FINANCING

2.2 BRIDGING RESEARCH TO INDUSTRY

3) TO ENHANCE POLICY IMPACT (STRATEGY, GOVERNANCE, REGULATION)

3.1 SUPPORT FOR BETTER INNOVATION POLICY MAKING

SECURE-R2I Recommendations for closing the research-to-market gap in EPC: Objective tree
Recommendation 1: To enhance the overall innovation and entrepreneurial culture, as well as skills and capacities for knowledge transfer and innovation (culture and human development)

This objective addresses the key element which makes innovation and knowledge transfer happen: human capital (knowledge is generated, diffused and empowered by people), by tackling two interdependent components which affect the way people deal with knowledge transfer: culture/attitude and skills/capacities.

Operational objective 1.1: Awareness-raising among young people and researchers to stimulate a more entrepreneurial, risk-taking mind-set and behaviour

Target group: Researchers, students, society in general

Rationale: EPC suffer from a weak entrepreneurial spirit (caused by many decades under the Soviet regime, where the whole economy was controlled centrally with no possibility of taking independent initiatives), a risk-averse culture in which neither policy makers nor society in general contemplates the possibility of failure (risk being closely associated with innovation projects), as well as a conception of innovation as a linear process (technology push).

Possible measures: business idea competitions within HEIs, mini-company projects within schools, creativity camps, inspirational lectures from successful entrepreneurs, awards/prizes with some kind of mentoring and mobility schemes (cf. Erasmus for young entrepreneurs).

Operational objective 1.2: Enhance TT skills and innovation service provision (better accessibility and professionalization of service providers)

Rationale: EPC researchers are in most cases scientists with specialist skills and an over-riding interest in their research field with no business experience. Often, the research generated does not match with market needs and does not consider business issues (e.g. alternative products already available, IPR issues, financial assumptions, etc.). It is necessary that high profile support services (and experts) assist them in the exploitation process.

Target group a): Innovation and TT professionals and intermediaries

Suitable measures: Set up a TT Academy in each county to professionalize the service offer (providing training, good practice exchanges, work placements, twinning schemes between high and low performing organizations, the creation of grant schemes to access external expertise, peer learning for TTO offices (grants for mobility of TTO staff to gain experience in the EU).
Operational objective 1.3: Enhance TT skills among researchers and entrepreneurs

Rationale: Besides external support services, researchers need to build a good level of understanding of the commercialization process, ensuring that market and IP considerations drive the process from the beginning and focusing on results with most potential.

Target group b): Researchers

Possible measures: Global grant (funding & services) for developing an innovative idea, scouting pilot project (training researchers on how to assess the market potential of the results generated), virtual incubation schemes (support and facilities for maturing their business case), entrepreneurial education and mobility schemes.

Recommendation 2: To improve the supply of support services and facilities for knowledge transfer and innovation (better ecosystem)

This objective fosters the creation of a conducive environment ensuring that the system presents all the necessary conditions for innovation to germinate, grow and reach the market successfully (access to capital, people, facilities, skills). This means addressing system failures (e.g. innovation financing) and barriers, while ensuring that the knowledge transfer process is sustained throughout the whole process (from idea generation to market entry).

Operational objective 2.1: Innovation financing

Rationale: Technology transfer is a risky adventure. Traditional funding channels are reluctant to share the risk with the researcher/entrepreneur. In the EPCs, this risk-averse attitude also affects public funding. It is important that the system includes innovation financing mechanisms (specific tools developed specifically for this kind of risky project) to address this gap.

Target group: Researchers and entrepreneurs

Possible measures: Proof of concept grants, crowdfunding platform, grant schemes with universities, incentives for creating new innovative companies, Sidecar Fund

Operational objective 2.2: Bridging research and industry - Absorption and Innovation Capacities:

Rationale: Research and industry often follow separate routes; according to the researchers, industry is not willing to invest in their solution, while according to industry the solution is not known or interesting. There is a clear gap which may be addressed by endowing the system with bridging mechanisms which facilitate collaboration and mutual trust and nurture opportunities for interaction.

Target group: Researchers and entrepreneurs

Possible measures: Technology Transfer Accelerator (TTA), innovation brokers, living labs, technopoles, subsidies for PhD placements
Report on Tech Transfer Opportunities and Bottlenecks in the EPC

Recommendation 3: Strengthen policy impact: strategy, governance, regulation (international positioning)

This objective aims to rationalize and sharpen the EPC innovation policy effort (overcoming the technology push model in order to build the innovation ecosystem), with a view to achieving better impact and positioning at international level (access to international funding opportunities, visibility and strategic partnerships).

Operational objective 3.1: Support for better innovation policy making

Rationale: Innovation policy often tends to imitate successes achieved by advanced economies. In the EPC this means a focus on a science-based development model (technology push) inspired by high-tech strategies of leading regions of the world. The EPC policy style still seems to be influenced by centralized planning features from the Soviet period (top-down) and a hierarchical, multi-level governance system, focusing more on the planning stage, rather than the implementation phase. Targeted support (services and capacity-building processes) would allow EPCs to achieve a better positioning also at international level (bottom-up, evidence-based, outward and forward looking, consensus-based policy making) with better impact on the overall socio-economic framework and a better effect on the overall socio-economic framework, exploiting at best the different funding sources available (including EU funds).

Target group: Innovation policy makers and implementing agents (innovation agencies, centres)

Possible measures: Smart specialization lab (training path of novel methods for innovation policy making), technical assistance/service provision for fine-tuning/strengthening national Innovation strategy and policy mix, introducing innovative concepts like public procurement for innovation and Public Private Partnerships, evidence-based policy-making (benchmarking and scoreboard-type studies), support actions to access international funding (vouchers, prizes)
Introduction

The research to innovation gap

The increasing importance of knowledge as a key ingredient for economic growth and development is a feature of all developed economies. Innovation, as the process that converts knowledge into novel products and services for market and societal uptake, has become the cornerstone of governments’ action aimed to boost competitiveness, job creation and sustainability across all EU countries and policy levels.

Within this framework, universities and research organizations, as primary sources of knowledge creation and transmission, are endowed with an additional role and responsibility, which besides teaching and research, engages them in knowledge transfer processes with industrial and society players, thereby becoming actual suppliers of innovation which benefit the local economy and society.

Moreover, the worldwide economic crisis and the subsequent reduction of public resources for education and increased competition among research and development institutions (RDIs) for funding, has further moved public RDIs towards a model of governance which identifies entrepreneurship and the exploitation of research results as strategic assets to be capitalized on as additional sources of funding.

This paradigm shift, extending the RDI mission and impact well beyond a mere research and education function, positions RDIs as the focal points, around which the nurturing and spreading of knowledge spillovers is built, and leads more and more to the creation of advanced economic areas (ecosystems) with high innovation performance and growth.

A new entrepreneurial model, characterized by RDIs intensive cooperation with the surrounding environment and effort on bridging research with the market (via licensing, spin offs, contract research, networking/partnering, etc.), has progressively emerged, whose knowledge transfer functions have been progressively codified and embedded within dedicated structures (Technology Transfer Offices).

This evolution deeply affects the way research organizations are structured and operate: cultural and organizational changes, additional resources and capacities as well as conducive framework conditions have to be secured for which most RDIs (and policy makers) are not yet prepared.

This is why, in spite of a huge potential, there is still not a huge number of RDIs who are successfully accomplishing this new mission. A clear gap exists which prevents a proper exploitation of the knowledge produced by RDIs by industry and society. The result is that too many research achievements never reach a market stage. Research and industry too often follow parallel ways where research is not responsive to market needs and industry ignores solutions and capabilities which are available at research organizations.
The research to market gap still occurs in Europe and even more severely in European Partnership Countries, which are still navigating the transition from the Soviet period to a full market economy after several decades, while in search of a new governance model for their research system which is built on specificities which have now disappeared (multi-country, centrally planned, controlled economy).

The quest of the SECURE-R2I project over the past three years has been to help close the research-to-market gap in EPC by putting in place regular cooperation among EPC and EU partners and exchanging experience and knowledge on how RDIs can innovate more and better.

This final report highlights our findings in relation to conditions for knowledge transfer and innovation in the target EPC (barriers and drivers, existing gaps and needs of stakeholders) which are the basis of the policy recommendations for a better innovation climate and improved knowledge transfer processes by the research actors presented here.

Methodology

The analysis of knowledge transfer (KT) processes in a given environment is a complex, multidimensional activity that encompasses different policy domains (innovation, education, SME policy just to quote some) and depends on multiple factors at system (overall ecosystem and framework conditions) and organizational level (every institution develops its own model for knowledge transfer with its given governance, organization, resources, capacities and ultimately performance).

This dualism has been a key issue in developing the SECURE-R2I approach, as the topic required the capacity to analyse both interrelated dimensions:

- System – looking at the innovation environment of the given countries, its strengths and weaknesses, the policy and regulatory framework, relationships and stakeholders groups as well as the support available for innovation and knowledge transfer;
- Single organization - analysing how single institutions organize knowledge transfer processes, the resources and skills in place, the levels of performance achieved as well as internal barriers which prevent the process.

To understand fully such frameworks, SECURE-R2I employed a holistic methodology that makes use of quantitative and qualitative analysis methods (survey and one-to-one audits), complemented by desk research and policy dialogue with EPC stakeholders.

The project moved from a first level analysis (where a broad understanding of the key features affecting knowledge transfer in EPC was developed via desk research and a survey) to a second stage (where focused, on-site interaction with a targeted sample of stakeholders validated the findings and prepared the way for recommendations).
As the target group of the SECURE-R2I project are EPC research and development actors (the project aims to enhance their capacities in exploiting and transferring knowledge), this stakeholder group has been the privileged channel to access and validate the information, also with respect to the perceived barriers and drivers at system level.
Methodology Package

SECURE-R2I used the following mix:

1. **Desk research** (employed to form an overview of the state-of-the-art in terms of: a) knowledge and innovation conditions in EPC via a literature review of EPC country reports and studies dealing with their National Innovation System and KT; b) assessment and benchmarking of knowledge transfer processes within research and education institutions.

2. **Survey** (questionnaire) and **one-to-one audits** (assessment methodology based on a semi-structured interview) addressed to EPC research and development institutions to identify KT enabling factors, barriers, cooperation patterns with the ecosystem, as well as information on how the KT process is applied and pursued by the organization.

3. **Stakeholder engagement** (policy roundtables/discussion panels with EPC and EU opinion leaders to validate and enrich the information gathered and shape policy recommendations).

Survey

The questionnaire, which consists mainly of closed questions, was distributed to a sample of EPC research and development organizations (around 100) by the EPC project partners in order to:

- Identify the knowledge/technology transfer models applied within the EPC RDI entities and the related strengths and critical issues, investigating the key dimensions of their *Organization and Governance* (strategy, internal organization and human resources) as well as their *Performance* (output indicators);
- Gain an insight into the barriers and enabling factors at system level perceived by the interviewees;
- Identify the 6 RDI organizations to be analysed more in depth via the audit.

The findings of the survey are presented in chapter 3. The questionnaire is included as an annex to this report.

Audit

The audits aimed to enrich the first-level analysis (desk research and survey of technology transfer processes in the EPC) with an in-depth investigation of 6 cases (selected among survey respondents in order to capture diverse KT models in terms of approaches and performance). The audits helped to develop a deeper understanding of KT processes and the needs of RDI actors, while assisting the audited organizations to identify any weaknesses and areas for improvement in relation to their innovation and knowledge transfer capacity and maturity.

The audits were conducted via an on-site visit performed by TII staff, Ms. Francesca Chieruzzi and Ms. Maria Augusta Mancini, and consisted of a semi-structured interview (an assessment tool was developed for this purpose) with the management staff of the institution engaged in technology transfer processes, followed by a tour of the institution’s key facilities.

An audit report with recommendations for areas of improvement at systemic and organizational level was produced (deliverable 3.2). The key findings of the audits in terms of the challenges...
common to the different EPC (key barriers, drivers, suggestions) are presented in the following chapter.

Policy dialogue

When tackling complex systemic challenges with multiple stakeholders, policy domains, resources (and widespread socio-economic impact) such as how to enhance research-to-market processes, the implementation of stakeholder dialogue mechanisms is a powerful means to ensure findings are aligned with societal needs and expectations, while helping to drive long-term sustainability and shared values around identified policy responses. Hence the decision to include a policy dialogue process as a key instrument to shape SECURE-R2I policy recommendations.

The SECURE-R2I policy dialogue was carried out via three policy debates (one per year) which took place in three different EPC (Georgia, Belarus and Armenia). Each debate involved the participation of EPC stakeholders representing the different components of their national innovation ecosystem (research, government, intermediaries and companies), who were invited to join the discussion. A moderator was engaged to stimulate debate.

Each session was introduced by an input statement by TII, briefing the audience and panellists about the project and its key findings, and a key note speech by one or several international experts who presented cases and experience of EU countries and regions in support of innovation and knowledge transfer (lessons learnt, success stories and failures).

The outcomes of each debate were summarized in a policy brief used to feed the policy recommendations presented in the final chapter of this report.

A more detailed overview of each debate is given in chapter 3.
Economy: Armenia’s economy has experienced considerable transformation since independence in 1991. Continuous economic growth, major economic reforms, as well as inflows of capital and remittances have helped to create a market-oriented environment.

The global financial crisis of 2008/2009 had a significant negative impact on the country. The double digit growth rates of the pre-crisis period were replaced by an average 4.0% rate after the crisis. A moderate 3.2% growth in 2013, was followed by 3.5 percent in 2014, which then slowed down to 3 percent in 2015. The positive results from agriculture, mining, and tourism were diminished by sluggish manufacturing and other services. In the medium term, it is expected that economic growth will slow down further to approximately 2-2.5% for the next years before it slowly recovers to the 2015 level of 3 percent by 2018. To support economic activity, the government implemented a relatively large fiscal stimulus in 2015, which expanded the fiscal deficit to about 4.9 percent of GDP and pushed up the public debt to nearly 50 percent of GDP.¹

In 2015, Armenia had an annual GDP growth rate of around 2.8%, GDP per capita of 6,539.8 (PPP$) and an inflation rate of -2%. Unemployment was high at 19.6%, which is a significant driver for migration with the most recent migration rate being -1.4%. Foreign direct investment net inflows amounted to 3.5% of GDP.²

Agriculture is the largest single sector in Armenia accounting for 40% of employment and almost 20% of GDP. The manufacturing sector however represents less than 10% of GDP. Food products and beverages account for around 50% of manufacturing production while basic metals represent around 25%. Construction grew between 2004 and 2008 where it peaked at 25% of GDP and the declined to 10% by 2013.³

69% of Armenia’s population are internet users and approximately 26.9% of total employment is in high tech sectors. There are approximately 24.7 SMEs per 1000 inhabitants. The exports of goods and services from Armenia amounted to 12.8% of GDP in 2015.

Human Development: Armenia has a well-established system of tertiary education that includes 22 state universities, 37 private universities, four universities established under intergovernmental agreements and nine branches of foreign universities. Armenia’s education level is relatively high with 46% enrolment in tertiary education in 2012. Around 2.3% of Armenia’s GDP is dedicated to public spending on education. 15.9% of graduates completed studies in science and engineering, with

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1 World Bank website – Overview of Armenia
2 Global Innovation Index 2015 Report
3 Statista website – Armenia GDP
a total number of 5,460 researchers in the country. Universities in Armenia have a high degree of autonomy in formulating curricula and setting tuition fees. Armenia joined the Bologna Process in 2005, and universities are currently working to align the standards and quality of their qualifications.

The national innovation system/stakeholders

Before independence, scientific and innovation activities in Armenia followed the traditional Soviet model of central planning and control and a linear type of linkages from research to product development. At that time both science and industry in Armenia were closely integrated with the rest of the Soviet economy and were part of large scale value chains in this market. The disintegration of traditional economic, industrial and trade links after the collapse of the Soviet Union rendered much of the R&D sector and local industry obsolete under market conditions.4

Today, state policies for innovation and entrepreneurship are formulated by various committees of the National Assembly, such as the Committees on Science, Education, Culture, Youth and Sport, Financial-Credit and Budgetary Affairs, Social Affairs, Health Care and the Committee of Environmental Protection. Also, the Ministry of Economy is a key body involved in innovation policy development.

Meanwhile, the implementation of innovation and entrepreneurship policy programmes is delegated to a number of agencies, which are subsidiary bodies of the Ministry of the Economy or associated with it. These include the following organisations:

- **The Enterprise Incubator Foundation (EIF)** is responsible for managing various grant schemes and establishing technology parks. Operations are based entirely on mobilizing external resources for Armenia’s innovation support programmes from Governments, other official donors and private sources, including through public-private partnerships.
- **The Armenian Development Agency (ADA)** is tasked with implementing the Strategy of Export-led Industrial Policy and the facilitation of FDI. It serves as a one-stop-shop for foreign investors.
- **The Small and Medium Entrepreneurship Development National Center of Armenia (SME DNC)** supports SME development through: information services; training and consulting; various types of financial support (e.g. loan guarantees for start-ups and for upgrading SMES); micro-franchising support; and international cooperation.
- **The National Center of Innovation and Entrepreneurship (NCIE)** is intended to play an important role in innovation policy design and provide various innovation support services.
- **The Intellectual Property Agency** is the national body responsible for the legal protection of intellectual property in Armenia.
- **The National Competitiveness Foundation** is a public-private partnership that draws on international business executives of Armenian origin to attract FDI, supporting economic development and international competitiveness.

Although Armenia possesses a number of high-tech, ICT related firms5), Armenia’s business sector plays a fairly limited role in the national innovation system. Industry-science linkages and collaboration between R&D institutes and businesses in the domestic economy are weak. These

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4 Innovation Performance Review: Armenia, United Nations Economic Commission for Europe
5 Synopsis Armenia CJSC; National Instruments AM LLC; LT-Pyrkal CJSC; Technology and Science Dynamics Inc.; Locator CJSC; Redinet CJSC; Barva Ltd.; Yerevan Telecommunication Research Institute CJSC; and other high-tech companies (total number over 300)
weak linkages are partly a legacy of the Soviet past, when the policy focus was on developing linkages across the Soviet economy, not within Armenia. R&D institutes and industry were part of value and supply chains within a large market that disintegrated, and domestic businesses have yet to become effective sources of demand for innovation. Nevertheless, there are examples of Armenian universities which cooperate closely with private businesses.6

Innovation governance system of Armenia

Policy and regulation in favour of innovation and technology-transfer

During much of its independence, Armenia did not have a clear vision and policy as to the role of innovation in the national economy. During the 1990s and the first half of the 2000s, the economy was dominated by survival strategies in the context of broken traditional economic links. It was only in the mid-2000s that the policy focus shifted towards science and innovation, and a number of important policy initiatives were launched.

6 Innovation Performance Review: Armenia, United Nations Economic Commission for Europe. Yerevan State University has significant collaboration with Synopsys, which has a branch in the Faculty of Radiophysics, providing educational programmes at all levels, including for doctoral students, and professors working for Synopsys. MIKA-Progresstech, a branch of the Russian Sukhoi airplane company, also works directly with students of the university, while the Central Bank works with students and staff of the Faculty of Commerce. The State Engineering University of Armenia hosts research centres for IBM, Nokia and Oracle. National Instruments collaborates on research supervision and providing supporting software. The company's Armenian office has a mission to support linkages between National Instruments and Armenian scientific organizations and small firms.
A major shift in innovation policy development occurred in 2011 with the government’s adoption of the Strategic Action Plan for the Development of Science for 2011-2015; the Law on the National Academy of Science; the Strategy on Intellectual Property Rights Protection; the Concept Paper on the Initial Strategy for Formation of the Innovation Economy (ISFIE); and the Strategy of Export-led Industrial Policy (SELIP). These documents have laid the grounds for a broader interpretation of innovation policy. In particular, ISFIE has significance in terms of political support and the broadening of policy instruments available for innovation support.

The Strategic Action Plan for the Development of Science for 2011-2015 laid out a strategic vision of building a competitive knowledge-based economy drawing on fundamental and applied research. The State Committee of Science has been responsible for implementing the associated operational programmes, funding instruments and R&D activities in the country.

The Law on the National Academy of Science empowered - for the first time - the Academy and its research institutes to undertake activities targeting the commercialization of R&D results, including through the promotion of spin-offs. However, few practical steps have been taken regarding the commercialization of R&D results so far.

The strategic vision laid out in ISFIE is Armenia’s transformation into an R&D centre for multinational corporations, with key milestones up to 2020 including legal reform; development of innovation and business support institutions and instruments; educational modernization; adoption of international standards; establishment of national centres of excellence; and the internationalization of Armenian technological companies.

On the other hand, the strategy described in SELIP is oriented more towards economic diversification by supporting the international competitiveness of industry sectors with export potential and export growth. Armenia’s export profile is expected to shift from resource-based industries toward skills and knowledge-based sectors as a result of implementation of this strategy. The specific policy instruments envisaged for this purpose seek to address existing market failures and explicitly exclude “picking winners”. Nevertheless, the policy is sector-oriented, based on a sectoral classification that defines some sectors as “high-priority” and hence eligible for support.

Innovation performance

Armenia was ranked 61 out of 141 countries in the Global Innovation Index 2015 (GII). However, it was in a group of eleven developing countries (Armenia, China, Georgia, India, Jordan, Kenya, Malaysia, Moldova, Mongolia, Uganda, and Vietnam) labelled “innovation outperformers”, because they met the additional two stringent criteria: (1) their GII score relative to their GDP was significantly higher than it was for other economies for two or more recent years; and (2) they outperformed their income-group peers in a minimum of four out of the seven “innovation pillars” – the GII composite figure is based upon 79 indicators divided into seven innovation input and output groups - for two or more years. Armenia is one of the 10 best performers of the lower income group.

Armenia’s scores and ranking for a number of key indicators that make-up the overall GII 2015 figure are as follows:

[

Global Innovation Index 2015 Report

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The GII 2015 report notes that Armenia was both an innovation achiever and a pillar outperformer in all seven pillars during 2012 - 14. Armenia has made considerable efforts to strengthen its innovation system, which has become one of the strategic priorities of the Armenian authorities. Its strongest performances were in the innovation pillar “Institutions” - thanks to its favourable business environment and labour market flexibilities - and the innovation pillar “Knowledge and technology outputs” - the result of high scores in domestic patent and utility model applications, scientific publications, and communications, computer and information services exports.
Belarus

Socio-economic framework

**Economy:** Until 2008, Belarus’ economy was a strong performer in a fast growing region. During 2001-2008, Belarus’s GDP grew on average by 8.3 percent annually. Rapid economic growth was propelled by a combination of favourable external factors, including strong export demand by key trading partners (the CIS region, especially Russia), under-priced energy imports from Russia, and significant trading profits stemming from exporting goods such as oil products and fertilizers, which saw steep price increases, especially in the years prior to the global economic crisis. The strong growth record, however, was associated with growing macroeconomic vulnerabilities. External imbalances started to emerge in 2006 and the current account deficit began to widen, as Russia started to gradually move towards market-based pricing of its energy exports to Belarus.8

Growth slowed down substantially in the context of the global economic crisis of 2008–2009, and since then, the country has gone through a period of recurring macroeconomic instability. The 2008 global economic and financial crisis was transmitted to Belarus primarily through lower export demand and reduced access to external borrowing. Growth dropped to 0.2 percent in 2009. As of early 2013, initial macroeconomic stability had been restored. Tight monetary and fiscal policy in late 2011 and through 2012 helped to contain inflation to less than 22 percent in 2012. The nominal exchange rate stabilized and appreciated modestly in 2012.

Nevertheless, the macroeconomic crises of the past years have revealed deep structural constraints in Belarus’ state-centred economic policy model. Given the dominance of state-owned enterprises, the private sector and especially small and medium-sized enterprises remain marginalized. The economy continues to depend on energy- and resource-intensive exports. At the same time, productivity growth in non-energy sectors has been stagnating, especially in the state-owned sector.

In 2015, Belarus had an annual GDP growth rate of around -3.6% and GDP per capita of 16,327.4 (PPP$). Exports of goods and services from Belarus were valued at $26.6bn (approx. 35% GDP) and foreign direct investment net inflows amounted to 3.1% of GDP.9 Despite poor growth, the unemployment rate in 2014 was 0.7%, an improvement on 1.5% in 2005.

Industry provides the main source of employment, accounting for 25.8% of GDP, followed by trade and catering (14.2%), education (9.6%) and agriculture (9.5%) (2009). There are approximately 0.8 SMEs per 1000 inhabitants. The country’s net migration rate is +0.7 per 1000 (2015), which indicates that Belarus experiences slightly more immigration than emigration. Technology integration is moderate, with 54.2% of the population being internet users.

**Human development:** Belarus has a well-educated labour force. The gross enrolment rate in tertiary education is very high, reaching 73% in 2008. Furthermore, the level of public spending on education is high in comparison with neighbouring countries at 5.1% of GDP in 2015. A large proportion of the

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8 World Bank website – Overview of Belarus
9 Global Innovation Index 2015 Report
population are science and engineering graduates - 27.2% in 2015 - but only a small percentage work in science disciplines (2% in 2008), which is low compared to other Central and Eastern European countries.

The national innovation system/stakeholders

The national innovation system of Belarus is based upon laws and regulations as well as structural and functional components to support innovation activity. It is managed by the President, the Council of Ministers, republican governments, state governing bodies, the National Academy of Sciences of Belarus, other state agencies, local governing bodies and self-governing authorities within the limits and in accordance with their powers. Management is carried out on a programme-target method which implies an implementation of innovation projects through various levels of formation, adoption and enforcement. The procedures of formation and implementation are specified by the Council of Ministers in consultation with the President.

The Belarusian State supports innovation through the Republican Centre for Technology Transfer and Belarusian Innovation Fund. The Republican Centre for Technology Transfer was founded in 2003 and promotes cooperation between developers and users of high technologies and investors. In particular, the centre provides access to the UNIDO network and other international databases dedicated to technology transfer, research and development. The Belarusian Innovation Fund was founded in 1998 as a non-profit organization subordinated to the State Committee for Science and Technology. It provides financial support to: research, development and technological developments projects carried out in the framework of innovative projects; organization and development of the production of scientific and technical products; and venture projects.

Over the past decade, the concept of the national innovation system has been developed on the basis of the National Strategy 2020; the Technology forecast 2006-2025, and other strategic documents of ministries and other governmental bodies. The Science and Technological Policy Committee of the Council of Ministers approved the concept in June 2006. The concept pointed out some of the weak points in the existing system, in particular, the entrepreneurial sector, which still was not adequately performing the role of chief catalyst for the development of the innovation infrastructure and market.

The Belarusian R&D system reflects the legacy of the Soviet past, as the business enterprise sector is not the major R&D performer, in contrast to what is typical in market economies. Only 12.8% of R&D personnel work in industrial enterprises. R&D is predominantly (71.45%) undertaken externally by R&D institutes within the National Academy of Sciences (NAS). The NAS has 86 institutions with more than 30% of the total number of researchers. Besides R&D institutes, NAS has several manufacturing companies such as the State Scientific and Production Amalgamation of Powder Metallurgy. Another peculiarity is that the NAS coordinates basic and applied research, as well as appropriate state programmes, thus partly playing the role of a ministry.

Over half of all R&D organizations (53%) are located in the extramural R&D sector. However, the R&D system is, in principle, largely oriented towards enterprises. It can be characterized as a system of R&D for, but not in industry. In line with the overall structure of the economy, R&D is mostly

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10 Innovation Performance Review: Belarus, United Nations Economic Commission for Europe
11 State Committee on Science and Technology of the Republic of Belarus website
12 Country Report Belarus 2011, Increast website
conducted in state owned institutions (74%) while the private ones - though growing in number - are still not very visible on the national level.\textsuperscript{13}

Just over thirty thousand people work in R&D. The largest share of researchers is to be found in the NAS and industrial companies subordinated to the Ministry of Industry (30% and 23% respectively).

\begin{figure}
\centering
\includegraphics[width=\textwidth]{distribution_of_researchers}
\caption{Distribution of researchers}
\end{figure}

\textit{Source: On State and Prospects of Science Development if the Republic of Belarus upon the results of the year 2012. Analytical report. State Committee on Science and Technology, National Academy of Sciences of Belarus, 2013.}

In the private sector, Belarus’ IT sector is particularly important employing about 38,000 people and producing exports worth an estimated 750m euro/year. Notably, the establishment of the Belarus Hi-Tech Park in 2005 has led to 152 IT companies becoming resident in this tax free zone. These companies are involved in analysis, design and software development, contributing considerably to innovation in Belarus.

The contribution of SMEs to the national economy is low (11.4% of GDP in 2009). Meanwhile, the overall picture of innovation activity in Belarusian SMEs is somewhat bleak. The number of innovative companies was about 600 in 1997, and decreased in the years that followed. In 2010, the number of innovative SMEs was only 280. These enterprises employed only about 0.6% of all company employees.

\section*{Policy and regulation in favour of innovation and technology-transfer}

\textsuperscript{13} \textit{Country Report Belarus 2011, Increast website}
Starting in the early 1990s, Belarus has openly declared its strategic policy objective to develop an economy based on science and technology. Since then, over 25 Laws and Presidential decrees have been introduced, some 40 governmental decrees have been issued and many other legal acts have been put in place to contribute to this stated aim. All this has created an effect of broad awareness and recognition of the importance of science and technology for the economic prosperity of the country.

In 2007, with the approval of the State Programme for Innovative Development (SPID), the emphasis was placed on building a national innovation system capable of ensuring the generation, dissemination and use of knowledge to generate new products, technologies and services, modernize and upgrade the technological base of the economy, stimulate high-tech exports, achieve import substitution for key products and develop the intellectual potential and creativity of the population.

The SPID was the outcome of a complex process of planning and coordination, and forms the main framework for state programmes and projects. This programme is an aggregation of programmes and projects put forward by the stakeholders or resulting from the application of broad priorities. Coordination of the SPID is assigned to the State Committee on Science and Technology (SCST). The SCST, with the support of the Belarusian Institute of Systems Analysis, is also tasked with the monitoring and reporting to the Council of Ministers on the realization of the Programme.

![Hierarchical structure of the State Programme for Innovation Development (SPID)](image)

The figure above illustrates the hierarchical structure of the State Programme for Innovative Development. The first level corresponds to the State Programmes of Scientific Research, which concern both fundamental and applied research. These programmes are created to develop the priorities for scientific research defined by the government. The NAS has the role of organizing and coordinating the implementation of these programmes. There were 16 of these programmes during the programme period 2011-2015.
The second level corresponds to the *State Science and Technology Programmes*, which are based on the priorities for scientific development approved by Presidential decree. The implementation of these programmes is coordinated by the State Committee on Science and Technology.

The two levels of programmes are grouped according to the priority directions of scientific technical activity in the so-called “State Complex Target Scientific and Technical Programmes”. This integration seeks a better coordination between scientific research and the use of its results for further technical development.

The third level includes state programmes on economic or social affairs and those with a specific sectoral focus, which are approved by the President or the Government. They serve to implement the priorities for the development of the country contained in the National Programme for the Socio-economic Development of Belarus.

R&D institutions as well as industrial companies can make competitive bids for innovation projects that fell under the coverage of the SPID programme levels. Only projects that pass successfully all the stages of this competitive screening process are entitled to funding from the SPID.

Financing mechanisms differed for the 2011-2015 SPID. Budget support was around 85% for the programmes of first level and only 50% for the programmes of second level. For the programmes of third level, state financing could cover fully all the costs or rely completely on other sources of financing, depending on the area of activity. Overall, the State Programme for Innovative Development provided a very detailed list of actions and indicators per ministry, per region and per “state concern” as well as the needs for financing that are defined in relation to the source of financing (e.g. state or local budget, bank credits, loans and own resources, see box 6 for more details on financing arrangements).

Furthermore, the 2011-2015 SPID specified concrete targets to be reached by 2015, including:

- Increasing R&D expenditure in high technology three fold from the average annual level during 2008-2010;
- Increasing high-technology exports by 2.5 to 3 times;
- Increasing financial inputs to R&D and innovation activities to at least 2% of GDP and raising expenditure on the material and technical basis of R&D institutions to 10% of total expenses on R&D and innovation activities;
- Increasing the share of innovation products in the total industrial output to 20%;
- Increasing the share of personnel in high and medium-technology sectors to 7%-10% of the total work force; and
- Ensuring the protection of industrial property rights abroad.

Innovation performance

Belarus was ranked 53 out of 141 countries in the *Global Innovation Index 2015* (GII). Belarus improved upon its 2014 ranking (58th) and became one of the 10 best performers amongst the upper-middle-income countries.\(^\text{14}\)

Belarus’ scores and ranking for a number of key indicators that make-up the overall GII 2015 figure are as follows:

\(^{14}\) Global Innovation Index 2015 Report
Belarus consistently ranks highly for tertiary enrolment and the % number of graduates in science and engineering (innovation inputs). However, the country performs less favourably in transferring these strengths into innovation outputs (e.g. scientific and technical articles and international patents).

Many of Belarus’ issues concerning innovation performance can be attributed to the country’s “unchanged Soviet system”, which has left large parts of the economy under control of the State, resulting in the SME sector remaining underdeveloped. While the country has strong capabilities in policy implementation, there exists a complex system of programmes and governance which complicates processes and therefore affects productivity.  

An identified bottleneck in the innovation performance of Belarus is a lack of willingness to take risks. Risk aversion, whilst ensuring the safety of public funds, leads to the diversification of funds away from SMEs and entrepreneurs which have the highest potential for innovation.  

‘Cbased’ (Community Based Innovations Systems) propose that the expansion and diversification of financial support in Belarus would improve the innovations system if the correct measures were made to promote innovation in companies and coordinated with different areas. They suggest that measures should include the following: tax relief for innovation-oriented activities, new policy instruments introduced such as subsidized loans, innovation grants and guarantee schemes, and the provision of targeted public support to facilitate private equity investments.

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15 Reforming innovation systems in BY, KAZ and UA: Lost in Transition/Translation?, Cbased  
16 Reforming innovation systems in BY, KAZ and UA: Lost in Transition/Translation?, Cbased  
Economy: Georgia signed an Association Agreement with the EU in June 2014 that includes a Deep and Comprehensive Free Trade Area (DCFTA). The Agreement describes the gradual improvements needed in areas such as trade, environment, agriculture, tourism, energy, transport and education to bring Georgia in line with EU standards. The DCFTA is aimed at enhancing Georgia's trade and economic growth through bringing its legislation closer to that of the EU.18

The recession in Russia and slower growth among other trading partners impacted Georgia through lower exports and reduced remittances, particularly from Russia and Greece. The tradable sector suffered the most, with industrial production contracting by one percent in 2015. As a result, growth slowed from 4.6 percent in 2014 to 2.8 percent in 2015. With a decline in external performance, the current-account deficit widened to 11 percent of GDP, and the Lari lost 30 percent of its value since December 2014.

Despite the overall slowdown, growth was supported by non-tradables such as construction, which grew at 16 percent, and services with growth of 3 percent. Foreign direct investment and tourism proceeds remained stable, which also helped increase employment by 20 percent and real wages by 4.7 percent in 2015.

In 2015, Georgia had a GDP per capita of 6,569.9 (PPP$) and an inflation rate of 2.5%. Unemployment was relatively high at 16.7%, which is a key factor driving the migration rate of -4.54%. The country has good international links, with its exports of goods and services accounting for 9.9% of GDP, and Foreign Direct Investing accounting for 5.16% of GDP in 2015. Georgia’s economy is becoming more dependent on services (now representing approximately 68.7% of GDP), and moving away from agricultural sector (9.2%). Industry represents 22.1% of GDP.19

*Human development:* Public spending on education in Georgia has decreased in recent years, with 5% being spent in 2014, and only 2% reportedly spent in 2015. Graduates who have a science and engineering background account for 20.7% and there are approximately 585 researchers per million people in Georgia. 50.6% of Georgia’s population are internet users.

### The national innovation system/stakeholders

In the former Soviet Union, research and innovation was performed by the Academy of Sciences, which was organized centrally. The academies of the republics - including Georgia’s - specialized in specific lines of research that were set by the All-Union Academy of Sciences. This resulted in a
severe fragmentation of the innovation system after the collapse of the Soviet Union, with dramatic differences between the new independent countries in terms of capacity and specialization.  

Georgia was left with a strong Cybernetic Institute and a Biotechnology Centre that had been devoted to the development of biological weapons for military use as well as a number of other research areas. The nearly 100 R&D organizations (mostly belonging to the Georgian Academy of Sciences) became independent entities with limited basic funding, which implied the need to compete for grants.

As a consequence, many institutions merged together, integrated with universities, or closed down entirely. The result is that approximately 50 research centres are operating today, with highly heterogeneous performance. The severe lack of funds for education and research that occurred during the first years after the collapse of the Soviet Union forced many researchers to leave the country, further weakening Georgia’s research system. In 2010, the country was estimated to have 3200 researchers working in public and private organizations, as well as 31 research organizations.

Today, Georgia’s national innovation system features the following main organizations:


- **The Georgian Innovation and Technology Agency (GITA)** was established under the auspices of the Ministry of Economy and Sustainable Development in April 2014. It is a key player in the innovation environment in Georgia. The state-controlled agency has the responsibility of ensuring successful innovation and technological development based on economic welfare. In particular its primary objective is the coordination of the innovation ecosystem and the implementation of measures supporting innovation, particularly programs advancing private and public sector knowledge, innovation, the commercialization of research, and promoting innovative entrepreneurship.

- **The Research and Innovation Council, chaired by Georgia’s prime minister, was established in January 2015 and consists of the cabinet of ministries and representatives of business and science. The Council’s responsibility is the strategic development and coordination of the country’s science, technology, and innovation policy. GITA acts as a secretariat for it.**

- **Enterprise Georgia** was established in March 2014 under the Ministry of Economy and Sustainable Development. It is mandated to facilitate private sector (and in particular SME) development through a variety of financial and technical support mechanisms (including entrepreneurship and development of an entrepreneurial culture), as well as export support.

- **The National Intellectual Property Centre (Sakpatenti)** represents Georgia in the World Intellectual Property Organisation (WIPO). Its main task is to examine applications filed for protection of intellectual property. In 2014, Sakpatenti established the Technology Transfer Center of Georgia, a department dedicated to actively transferring technologies.

- **The Shota Rustaveli National Science Foundation** was created in 2010 via a merger of the Georgia National Science Foundation and the Rustaveli Foundation for Georgian Studies, Humanities and Social Sciences. The main mandate of the newly created foundation has

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20 Global Innovation Index 2015 Report  
21 Country Report Georgia 2012, Increast website
been to reform the humanities and social sciences in Georgia and introduce mechanisms to fund research through open competition and international research programmes. In the past, the Georgian National Science Foundation has invested over 11 million Lari (approx. 5 million EUR) in innovation and technology transfer projects.

- **The Georgian National Academy of Sciences (NAS)** performs an advisory function in research and innovation development, while the National Academy for Agricultural Sciences has the same role in the respective thematic fields of research.

- **Higher education institutes**: Georgian Technical University, Caucasus University, Tbilisi State University, Tbilisi State Medical University, Agrarian University and Georgian School of Management.

- **The Centre for Enterprise Restructuring and Management Assistance (CERMA)** is a privately owned management consultancy involved in running the Technology Business Incubator in Georgia which aims to assist in the commercialization of start-up company results.

- **The International Science and Technology Center (ISTC)** is an intergovernmental organization connecting scientists from Kazakhstan, Armenia, Tajikistan, Kyrgyzstan, and Georgia with their peers and research organizations in the EU, Japan, Republic of Korea, Norway and the United States. ISTC facilitates international science projects and assists the global scientific and business community to source and engage with CIS and Georgian institutes.

- **The Science and Technology Center in Ukraine (STCU)** is an intergovernmental organization dedicated to the non-proliferation of nuclear, biological and chemical weaponry and related technologies. It was established in 1993 to help scientists involved in R&D and production of nuclear, biological and chemical assets in former Soviet member states – including Georgia - to transition from military to civilian, market oriented careers in their fields of expertise.

A major weakness in Georgia’s national innovation system is the lack of innovative companies. Their firms are especially poor at R&D and technology-transfer. According to a 2012 World Bank Entrepreneurship Survey conducted to gauge new firm growth in in Georgia:

- More than 90 percent of the surveyed firms had no R&D expenditures in the previous five years and did not envision spending on R&D in the next two years.
- Only 7 percent of the surveyed firms indicated that they had introduced a new or substantially improved product or service in the previous three years.
- The most important sources of knowledge for business opportunities were clients or customers and market research from sales in the domestic market and other competitors. Universities, technical institutes, R&D firms, and external commercial labs were among the least important sources of knowledge, indicating the lack of innovative activities and industry-relevant research in these enterprises.

Policy and regulation in favour of innovation and technology-transfer

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22 *Fostering Entrepreneurship in Georgia, World Bank*
The Georgian Government has been preparing a National Innovation Strategy 2020, with support of the World Bank, where the overarching vision proposed for the Government’s consideration is to “maximize Georgia’s growth potential by creating an entrepreneurial, knowledge-based economy, where innovation-led growth will foster increased economic productivity and growth.” The Government has also defined ambitious goals for the development of the ICT sector by 2020, including (i) 40,000 IT experts working in the country; (ii) IT exports reaching $1.1 billion; and (iii) the country ranking in the top 10 of global ICT-related rankings.

In late 2014, GITA launched a mini-grant programme for technology innovation open to individuals, NGOs, research organizations and universities. Building on project evaluation by international experts, grants of up $25,000 were awarded to proposals aimed at establishing and/or further developing the commercial viability of a new technology-based product, process or service and finding new applications of existing technologies.

Furthermore, GITA was responsible for the construction of a major Tech Park opened in January 2016 in Tbilisi that will serve as the anchor of a proposed national network of innovation centres aimed at stimulating innovative activities and promoting awareness of the benefits of innovation.

In February 2015, a Research and Innovation Council was established as a strategic coordinator of the country’s innovation policies. The Council is tasked with developing strategic policies and programmes to promote business innovation and development, research, advanced human capital, technology transfer, technological infrastructure, attraction of innovative FDI, and development of exports more aligned with world demand for high-tech products and services. The Council’s long-term focus will be to reduce inconsistencies in policy-making generated by the political cycle and the subsequent short-term horizon of many policy decisions. This “second generation” of reforms is aimed at fostering innovation and entrepreneurship and addressing remaining business environment constraints by facilitating public-private dialogue, enforcing property and intellectual property rights, establishing a competition framework aligned with international standards, and connecting SMEs to markets, finance, and information.

The reform of tertiary teaching and public research is being targeted by a State Commission on Education and Science Reforms. The Ministry of Education and Science and Ministry of Economy and Sustainable Development have also committed to cooperate on better alignment of education policy to market needs and international best practices, and in raising the overall quality of the Georgian educational system.

**Innovation performance**

Georgia was ranked 73 out of 141 countries in the Global Innovation Index 2015 (GII). However, it was in a group of eleven developing countries (Armenia, China, Georgia, India, Jordan, Kenya, Malaysia, Moldova, Mongolia, Uganda, and Vietnam) labelled “innovation outperformers”, because they met the additional two stringent criteria: (1) their GII score relative to their GDP was significantly higher than it was for other economies for two or more recent years; and (2) they outperformed their income-group peers in a minimum of four out of the seven “innovation pillars” for two or more years. 23

Georgia’s scores and ranking for a number of key indicators that make-up the overall GII 2015 figure are as follows:

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23 Global Innovation Index 2015 Report
The GII 2015 report notes that - despite the overall good performance in human capital and research - Georgia is still facing the challenge of a fragmented research system and the loss of researchers who left the country after the collapse of the Soviet Union. Georgia scored low on government expenditure in education (129th) and R&D funds per researcher are 10 times less than the same indicator for Belarus, Ukraine and the Baltic States. To solve these issues, the Georgian government has increased salaries for researchers (250%, a high amount, but earlier remuneration was minimal), offered incentives to high-skilled Georgians who return to the country (the Diaspora Ministry, established in 2008, has identified approximately 500 Georgian researchers worldwide), and reformed the education system to bring it closer to the European standard.

The Georgian business sector suffers from low capitalization, lack of training, low levels of patenting activity, and low levels of knowledge-intensive industries, which are reflected in its low levels of intangible assets and a poor use of ICTs, which severely hampers innovation capacity. The business sector is also poorly linked to university and research organizations (ranked 124th). Investment in firms’ innovation capabilities is needed - a major challenge for countries with very limited resources.

<table>
<thead>
<tr>
<th>GII 2015 Innovation Input / Output Performance Indicator</th>
<th>Score (0-100) or value (hard data)</th>
<th>Rank (out of 141 countries)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tertiary enrolment, % gross</td>
<td>33.1</td>
<td>73</td>
</tr>
<tr>
<td>Graduates in science &amp; engineering, %</td>
<td>20.7</td>
<td>51</td>
</tr>
<tr>
<td>QS university ranking, average score top 3</td>
<td>0.0</td>
<td>73</td>
</tr>
<tr>
<td>University/industry research collaboration</td>
<td>27.3</td>
<td>124</td>
</tr>
<tr>
<td>Gross expenditure on R&amp;D, % GDP</td>
<td>0.2</td>
<td>94</td>
</tr>
<tr>
<td>GERD performed by business, % of GDP</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Venture capital deals/tr PPP$ GDP</td>
<td>0.1</td>
<td>37</td>
</tr>
<tr>
<td>PCT resident patent app./bn PPP$ GDP</td>
<td>0.0</td>
<td>87</td>
</tr>
<tr>
<td>Scientific &amp; technical articles/bn PPP$ GDP</td>
<td>16.3</td>
<td>47</td>
</tr>
<tr>
<td>New businesses/th pop. 15–64</td>
<td>4.9</td>
<td>22</td>
</tr>
<tr>
<td>Royalty &amp; license fees receipts, % total trade</td>
<td>0.0</td>
<td>75</td>
</tr>
<tr>
<td>High-tech exports less re-exports, % total trade</td>
<td>0.3</td>
<td>90</td>
</tr>
</tbody>
</table>
Ukraine

Socio-economic framework

**Economy:** Severe shocks, combined with a backlog of structural reforms, resulted in a serious economic crisis in 2014-2015. The economy has been hit by unprecedented double shocks from the conflict in the east of Ukraine and a considerably weaker external environment, including lower global commodity prices.

Real GDP contracted by 6.8% in 2014 and by a further 10% in 2015. The currency depreciated sharply in 2014-15, while the consolidated fiscal deficit reached 10.1% of GDP in 2014 and public and guaranteed debt spiked to 82% of GDP in 2015. The banking sector experienced deposit outflows, rising levels of non-performing loans, and large numbers of bank failures.

Decisive reforms have helped to stabilize the economy, reduce large imbalances, and cushion the impact of the shocks on the population. Key reforms adopted with the support of the international community included: moving to a flexible exchange rate; undertaking significant fiscal consolidation; reforming energy tariffs and strengthening the social safety net system; stabilizing the banking sector by putting in place the framework to resolve and recapitalize banks and strengthen supervision; streamlining the business environment; making public procurement more transparent and putting in place external verification of financial disclosures.

As a result of the reforms, the economy has begun to stabilize, with real GDP contracting by only 1.4% year-on-year in the fourth quarter of 2015, compared to 16% in the first half of 2015. Furthermore, large imbalances have been reduced, with the general government deficit reduced to 2% of GDP in 2015. A very gradual economic recovery is expected, with growth of 1-2% in 2016 and 2-3% in 2017.

Against these harsh conditions, Ukraine experienced an annual GDP growth rate of around -9.9% and GDP per capita of 7,552.4 (PPP$) in 2015. The country has a well-educated labour force, with 26% of total employment being in high-tech sectors, and a large domestic market (agriculture 9.9% of GDP, industry 29.6% and services 60.5%). The country’s unemployment rate was recently measured at 9.21% and net migration at -0.86 per 1000 people (2015), which are both relatively good given the country’s circumstances. Foreign Direct Investment accounted for 2.1% of GDP whilst exports of goods and services contributed about 38 billion euro to the economy.

**Human Development:** 5.3% of public spending per GDP was allocated to education, with 25.6% of graduates specializing in science and engineering. There are approximately 1163 researchers per million people in Ukraine. 56% of Ukraine’s population are internet users.

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24 World Bank website – Overview of Ukraine
The national innovation system/stakeholders

Currently, not all of the main components of a typical national innovation system exist in Ukraine. However, some important preconditions for the effective development of innovation activity are certainly in place. The highest level comprises the Parliament and relevant committees (Level 1). The parliament primarily approves the framework which governs the science and technology systems. The Cabinet of Ministers, ministries and state agencies constitute a second level of system governance (Level 2), with the third level consisting of R&D funding recipients (Level 3).

The State’s Role in the National Innovation System

Important bodies illustrated in the above figure include:

- The **Ministry of Education and Science** is responsible for two sectors: “education” and “science”, with education being the main one. The Ministry has several departments, one of which is responsible for co-ordination of innovation development. The Ministry administers public funds allocated to innovation development based on a list of innovation priorities and S&T programmes approved by the Parliament. A special Department of Innovation operates within the Ministry. This Department is the most closely involved in innovation policy matters. The Ministry controls a system of information centres, such as the Ukrainian Institute for Science and Technology Information and regional branches of this institute.

- The **State Department of Intellectual Property** is also a part of the Ministry of Education and Science, but it has a high degree of freedom in its operations. The Department has its own research institute, and it registers new patents and utility models.

- The **Ministry of Economic Development and Trade** is also responsible for supervision of some science and technology programmes, but it also oversees so-called science and technology aspects of programmes of economic development. The Ministry has a department, which is responsible for problems connected with innovation development.
The Ministry supervises a number of different programmes aimed at improving productivity and competitiveness. The Ministry is responsible for implementation of economic development programmes, especially aimed at SMEs.

- **The National Academies of Science of Ukraine** (NAS) is a main research and education player in innovation in Ukraine. It comprises six state academies of sciences and 200 research establishments. The academy is independent of the Ministry of Education and Science but they coordinate their activities together.

- **Branch institutes** were important research and education players prior to the collapse of the Soviet-type economy; some have now been reformed into research or production companies and science-based SMEs.

- Ukraine has about 350 **higher education** establishments. However, few substantial research projects have been produced by universities. The majority of research institutes work under the supervision of a ministry or the NAS.  

It is also important to mention industry in the context of the national innovation system. Ukraine’s industrial sector contributed to 23% of the country’s GDP in 2012 and covers about 20 major industries including: mining and production; iron and steel; chemical industry; defence industry; fuel and energy industry; automotive industry; aircraft and aerospace industry; ship building; agriculture; and IT.

Within industry, most innovation activity is undertaken by large firms. According to a 2014 survey conducted by the State Statistics Committee of Ukraine, 43.4% of large firms were innovative compared to 25% of medium and 16.9% of small firms.  

A number of foreign foundations and non-governmental organizations also play an important role in supporting Ukraine’s research and innovation systems.

- **Science and Technology Center in Ukraine** (STCU) is an intergovernmental organization dedicated to the non-proliferation of nuclear, biological and chemical weaponry and related technologies. It was established in 1993 to help scientists and researchers involved in R&D and the production of nuclear, biological and chemical assets in former Soviet member states to transition from military to civilian, market oriented careers in their fields of expertise.

- **CRDF Global** is an independent non-profit organization that promotes international scientific and technical collaboration, technological innovation and entrepreneurship through grants, technical resources, training and services.
Policy and regulation in favour of innovation and technology-transfer

The development of Ukraine’s national innovation system has languished for many years as a consequence of its poor governance structure.

Ukraine has a complex legal environment with more than 80 different legal documents determining science, technology and innovation activities in Ukraine. This multiplicity of programme documents, which determine the strategic directions of innovative development in Ukraine, makes it difficult to determine priorities and control innovation processes at the state level. While simplification and harmonization of the legal environment has been a priority in recent years, strategy and governance of the national innovation system remain fragmented and relatively ineffective, with the roles, responsibilities and financial obligations of the various state bodies being insufficiently well-defined.

Over 200 innovation programmes officially entitled to state financing were launched during the period 1998-2010. However, more than half did not receive financing due to a lack of corresponding procedures during the parliamentary approval phase, together with the rigidities of state budgeting. The financing approved by the Parliament is therefore often not allocated for disbursement.

A 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” was issued in December 2010. This decree assumed that a comprehensive Plan of National Development with a specific chapter on “Development of S&T and innovation spheres” would be elaborated in early 2011. However, rather than such a plan, the Cabinet of Ministers of Ukraine issued a new decree reiterating key positions of the Presidential Decree in the form of the State Programme of Investment and Innovation Activities. Some ideas received further development in this document.

Meanwhile, the Law of Ukraine “On priority directions of innovative activity in Ukraine” aimed to determine “strategic” and “mid-term” priorities in the innovation sphere for 2011-2021. While strategic priorities were not clearly defined in this document, mid-term priorities included:

- New technologies for energy transmission, energy saving, and renewable energy;
- New technologies in transport, space and defence areas;
- New materials, including nanotechnologies;
- New technologies in agriculture;
- New pharmaceutical substances;
- Broad utilization of environmental technologies; and
- ICT and robotics.

These priorities formed the basis for the development of specific state goal-oriented programmes. However, 28 of these programmes were cancelled in mid-2011, and very few new programmes were initiated subsequently.

Two of the state goal programmes that were maintained included the Programme for the Development of the System of Information and Analytical Support of State Innovation Policy Implementation, originally approved in 2008. It was designed for three years with a total budget of UAH 10.5 million. The key goal of the programme was to create effective instruments of monitoring of the state innovation policy at the level of central government and on the level of regions.
The second programme was the “Programme of Creation of Innovation Infrastructure in Ukraine”. It was designed for five years with a budget of UAH 280 million. The government hoped to attract investors to create technology transfer centres for small businesses within this Programme.

Unfortunately, neither programme received adequate financial resources in the period 2009-2012.

In 2011-2012, Ukrainian authorities created several expert working groups that started work on redrafting existing laws related to science, technology and innovation. New drafts of the Law “On innovation activity”, the Law “On higher education” and the Law “On S&T activities” were prepared. However, only one of these had been passed to the Parliament by May 2012. A group of experts began working on a draft Innovation Strategy to 2020 for Ukraine at the end of 2011 for submission to the Parliament via the Council of Ministers, but it was never completed.

According to recent news\(^\text{27}\), the Ukrainian government is scheduled to adopt later in 2016 the Strategy of the development of high-tech industries until 2025, the creation of the High Tech Office, and the accession of Ukraine to the Innovation Union Scoreboard. Time will tell if this proves the case.

Innovation performance

Ukraine was ranked 64 out of 141 countries in the Global Innovation Index 2015 (GII) and its innovation performance was stable (63rd in 2014). It was amongst 14 middle-income countries that outperformed others in their income group (Moldova, China, Vietnam, Armenia, Senegal, Mongolia, Malaysia, Montenegro, Ukraine, India, Bulgaria, Thailand, Morocco, and Jordan). Also, Ukraine was amongst fifteen economies that outperformed their peers in at least four innovation input or output pillars during 2011-2014. This contributed to the country being an “innovation achiever” - a country that outperforms in their overall GII score relative to their level of development.\(^\text{28}\) Ukraine was one of the best performers of the lower income group.

Ukraine’s scores and ranking for a number of key indicators that make-up the overall GII 2015 figure are as follows:

<table>
<thead>
<tr>
<th>GII 2015 Innovation Input / Output Performance Indicator</th>
<th>Score (0-100) or value (hard data)</th>
<th>Rank (out of 141 countries)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tertiary enrolment, % gross</td>
<td>79</td>
<td>13</td>
</tr>
<tr>
<td>Graduates in science &amp; engineering, %</td>
<td>25.6</td>
<td>20</td>
</tr>
<tr>
<td>QS university ranking, average score top 3</td>
<td>29.4</td>
<td>46</td>
</tr>
<tr>
<td>University/industry research collaboration</td>
<td>41.7</td>
<td>72</td>
</tr>
<tr>
<td>Gross expenditure on R&amp;D, % GDP</td>
<td>0.8</td>
<td>44</td>
</tr>
<tr>
<td>GERD performed by business, % of GDP</td>
<td>0.4</td>
<td>36</td>
</tr>
<tr>
<td>Venture capital deals/tr PPP$ GDP</td>
<td>0.0</td>
<td>51</td>
</tr>
<tr>
<td>PCT resident patent app./bn PPP$ GDP</td>
<td>0.4</td>
<td>44</td>
</tr>
<tr>
<td>Scientific &amp; technical articles/bn PPP$ GDP</td>
<td>13.2</td>
<td>58</td>
</tr>
<tr>
<td>New businesses/th pop. 15–64</td>
<td>0.9</td>
<td>70</td>
</tr>
<tr>
<td>Royalty &amp; license fees receipts, % total trade</td>
<td>0.2</td>
<td>40</td>
</tr>
<tr>
<td>High-tech exports less re-exports, % total trade</td>
<td>2.4</td>
<td>47</td>
</tr>
</tbody>
</table>

\(^\text{27}\) Groysman’s plan: phantom or reality?, 2 June 2016, UNIAN Information Agency
\(^\text{28}\) Global Innovation Index 2015 Report
The GII 2015 report notes that Ukraine scores highly in the innovation pillar “Knowledge and technology outputs”, in the form of Knowledge creation through utility models. Also, Ukraine is the sole country amongst the lower-middle-income innovation achievers to perform exceptionally well in the innovation pillar “Human capital and research”. This is thanks to its performance in tertiary education, in particular tertiary enrolment; other lower-middle-income innovation achievers find it difficult to excel in this area.
Benchmarking exercise: EPCs common traits and specificities

Based on the outcomes of the desk research and the performance indicators of the GII 2015 study, a comparison of the different countries was carried out. This exercise reveals common traits in relation to innovation and knowledge transfer across all four EPCs involved (and of course their own individual peculiarities).

According to the GII 2015 study used as a source for this exercise, countries are categorized according to income levels. Armenia, Georgia and Ukraine are categorized as belonging to the lower income group while Belarus is categorized as being in the Upper Group. Therefore, besides looking at the specific countries, our comparison also takes into consideration their performance in relation to the whole Upper group and Lower income group and the mean calculated by the above mentioned study.

In the graphs below the 4 EPCs are compared in terms of innovation inputs and outputs/ performance. The graphs show that EPCs are characterized by a good innovation capacity with a high proportion of well-educated people, a strong specialization in technical domains (science and engineering) and a relevant endowment in terms of research centres and universities.

In spite of these strengths, collaboration with industry, which was in any case very limited during the transition from the Soviet period (GERD performed by business is lower than the related GII groups and the mean), is not well-established and the capability to translate the generated knowledge into market outputs is rather weak in the whole target area. Weak PCT patent ownership and the lack of ability to derive an economic return from them, a lack of venture capital deals and a fragile entrepreneurial culture (lack of attractive fast growing companies) are other common features.
Besides these common traits, some country-specific conditions emerge: Ukraine and Belarus seem to possess stronger assets in terms of tertiary enrolment and R&I endowments, in addition to a higher return of R&D investments on GDP, while Georgia and Armenia score better in terms of new company creation.
INNOVATION CLIMATE: STAKEHOLDERS’ VIEW

Survey of the Technology Transfer Process - Key findings

The survey was addressed to EPC RDIs in the four countries with a view to studying the role played by knowledge/technology transfer in the institution, how the institution runs such processes, as well as the related strengths and critical issues, both at organization and system level (external barriers).

Organization level: governance, outputs and internal barriers

Governance and organization

Compared with a good level of awareness of the importance of technology transfer (TT) policy (65% of responding RDI declare that they have a formal policy embedded in the organization’s mission and multi-annual strategic plan), just 35% translate this statement into a concrete action such as the establishment of a dedicated TT unit. Moreover, existing TT units are in most cases recently established (60% have been operating for less than 5 years).

<table>
<thead>
<tr>
<th>Formal TT policy</th>
<th>Presence of a TTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes 35%</td>
<td>Yes 35%</td>
</tr>
<tr>
<td>No 65%</td>
<td>No 65%</td>
</tr>
</tbody>
</table>

TT policy components

- 1.a. Commercial/management relation
- 1.b. Spin-off/start-up regulation
- 1.c. Technology transfer part of the mission of the...
- 1.d. Multiannual strategic plan
- 1.e. Other (specify)

%
TT units, in most of cases are managed by small teams (around 67% with less than 5 people), often also with the involvement of external experts (practice experienced by around one half of the respondents). The TTOs service portfolios seem quite broad (from idea incubation to relations with industry and international cooperation, training/IPR support).
Performance

In spite of this full-fledged service provision declared by respondents, innovation performance does not seem to be satisfactory.

As shown in the graph below, the results in terms of international patents, licensing agreements and spin off creation are quite weak as well as the access to international partnerships. TTOs seem to obtain more results in supporting teams to secure contract research agreements with industry.

Internal Barriers
Performance is also affected by several internal barriers, as shown by the graph below, which are mainly related to a lack of dedicated skills and resources, a lack of incentives and a clear regulatory framework, as well as a poor aptitude of researchers in collaborating with industry.

System level: External barriers

This limited performance may also be explained by the fact that TTOs’ internal capacities are still limited as in some case the staff engaged have a scientific rather than a business background. In addition, according to our sample, the surrounding environment (see graph below) presents key barriers which negatively affect the TT process, such as a lack of innovation culture/entrepreneurship, a lack of funding, the absence of collaboration with industry, a weak industrial ecosystem and an unclear policy framework.
Report on Tech Transfer Opportunities and Bottlenecks in the EPC
Audit

The audit process looked at six RDI organizations in the EPC target areas (2 in Armenia, 2 in Georgia, 1 in Ukraine and 1 in Belarus). The interview addressed people in charge of knowledge transfer activities (Technology Transfer Offices) within the organization or in management positions in the event that this kind of activity was not yet formalized.

The audit considered how each institution deals with (and positions itself in relation to) knowledge transfer processes and asked people which barriers and enabling conditions should be taken into consideration to improve the process. In the following section, the key elements extracted from this analysis in terms of common challenges and enabling conditions expressed by the different institutions are presented, while specific considerations in relation to internal resources and capacities for knowledge transfer as well as recommendations for improvement are not included in this chapter (they have already been delivered in the form of a confidential report as part of Deliverable D3.2).

Key findings

The key issue arising from the audit is that knowledge transfer is still a minor activity within the organizations interviewed. The analysis suggests that in relation to the target group of the audit, it is more correct to talk about technology transfer, rather than knowledge transfer, as the institutions focus exclusively on technology development for uptake by industry (contract research), while other knowledge transfer mechanisms like IP exploitation, strategic partnering between research and industry, start-up creation, the placement of graduates/post docs in companies (and vice-versa) are not in place. We will therefore refer to technology transfer for the purpose of presenting these findings.

Irrespective of the maturity level of the audited institutions, which vary for the different countries (specific features/issues have been addressed in the single audit reports), the following common traits and gaps at macro (system) and micro (organization) level have been identified.

Common barriers and gaps at system/policy level

As the EPC are de facto transition countries with relatively young market economies (small domestic markets and low innovation absorption capacity of local SMEs), frequently unstable political conditions (e.g. Ukraine) and a policy framework which only very recently addressed innovation as a leverage for economic development, some common barriers regarding the overall innovation framework have emerged from the audit. They are the following:

- A fragile ecosystem and incomplete innovation support supply chain
- A weak research to industry collaboration culture
- Risk-adverse attitude of public funding and a scarcity of dedicated resources and incentives for technology transfer
- Regulatory burdens (drawbacks of patent protection, spin-off creation, IP management rules within RDI organizations)
- Lack of technology transfer skills
Organizational level: bottlenecks

The most important bottlenecks identified by the audits are:

- A weak policy for innovation and technology transfer in research organizations
- A shortage of skilled TT personnel (teams of TTOs are often lacking market expertise/practical experience, their career path is not defined and they have limited access to external experts)
- A lack of appropriate internal regulations (unclear rules for IP and spin-offs, absence of incentives for exploitation, etc.)
- A lack of dedicated budget streams/financial resources to fund innovation and TT support
- Drawbacks associated with the IP portfolio (focus on national IP rights, scarce ability to access international patent procedures)
- Weak credibility/reputation of the organizations in the international arena (RDI need to access international markets as the current domestic market has little demand for their specialism)

Policy dialogue

The policy dialogue process consisted of three debates which involved innovation stakeholders from the target EPCs as well as Europeans with first-hand experience of innovation policy design and implementation. An overview of each session is offered in the following paragraphs.

Snapshot of Policy debate 1 – Tbilisi, 2 June 2015

**Title of the panel:** How to boost technology transfer processes in Eastern Partner Countries: the Georgian perspective (organized in cooperation with the ener2i project)

**Speakers:**

- Ms. Francesca Chieruzzi, Innovation Policy Expert (TII)
- Prof. Gert Jervan, Dean of Faculty of Informatics (Tallinn University of Technology)
- Mrs Mariam Lashkhi, Head of International Relations (Georgian Innovation and Technology Agency)
- Dr Oliver Reisner, Project Manager (EU delegation to Georgia)
- Mr. Manfred Spiesberger, Innovation Policy Expert (ZSI, debate moderator)

**Host organization:** Georgian Technical University

Main Findings

This first debate confronted the stakeholders with the results of the survey of RDI institutions as a starting point for a better understanding of which needs, barriers and bottlenecks influence innovation and technology transfer in EPC and Georgia in particular.

The key challenges identified dealt with:
• A low absorption capacity of local SMEs (low demand and low investment in R&D)
• A weak innovation and entrepreneurial culture
• A fragmented and incomplete innovation support chain

These challenges are set against a background of scarcity of resources, brain-drain and increasing societal divide.

Different policy options were discussed, all pointing to human capital development (awareness raising for innovation and entrepreneurship, education, skills enhancement for entrepreneurship, innovation and TT, cooperation between research and industry) as the key leverage for enhancing competitiveness, inclusiveness and sustainable growth.

Around this cornerstone, encompassing different areas and domains (knowledge is created and transferred via a human being), other suggestions offered by the panellist included:

• Stimulating demand (enhancing absorption by SMEs)
• Improving the innovation support system (developing a conducive eco-system and innovation support value chain)
• Ensuring enabling framework conditions (regulation and governance issues)

Snapshot of Policy debate 2 – Minsk, 19 November 2015

**Title of the panel:** Boosting technology transfer in EPCs (focus on Belarus): challenges and policy responses

**Speakers:**

- Dr. Nina Bohdan, Innovation Policy Expert (Belarus State Economic University)
- Ms. Francesca Chieruzzi, Innovation Policy Expert (TII)
- Mr. Anatoli Hryshanovich, Executive Director (Belarusian Innovation Fund)
- Prof. Gert Jervan, Dean of, Faculty of Informatics (Tallinn University of Technology)
- Mrs. Marina Lebedova, Project Coordinator (Republican Confederation of Entrepreneurship, Belarus)
- Dr. Tatyana Lyadnova, Head of International RTD&I Cooperation and Belarus’ H2020 ICT National Contact Point (BellSA, Belarus)
- Ms. Maria Augusta Mancini, Senior Consultant (TII)

**Host organization:** Infopark

**Main Findings**

After sharing with the panel the results of the analysis and first policy debate, as well the case of an international university and its experience with knowledge transfer (Tallinn University of
Technology), the discussion focused on the features of the Belarus context for innovation and technology transfer, with particular reference to:

- An industrial fabric which is not investing in innovation and a widespread risk-averse culture among the population
- A significant portion of the population which is well-educated
- Good research capacity (within public institutions) with excellence in engineering, medicine, natural sciences and IT
- Policy support focusing on science-based innovation.

The key recommendations expressed by the panel were:

- Support not only science-based innovation but also non-technological innovation, paying attention to issues like eco-innovation and social innovation
- Support the creation and development of innovative start-ups and differentiate support with respect to existing firms
- Steer the development of an entrepreneurial and risk-taking culture
- Build capacities in TT skills and innovation support services
- Bridge the gap between research and industry also via the development of Public Private Partnerships.

Snapshot of Policy debate 3 – Yerevan, 4 May 2016

**Title of the sessions:** Innovation policy as a driver for strategic positioning in the international economic arena (session 1), Policy responses (measures and support mechanisms) to support technology transfer and innovation in the EPC (session 2)²⁹ -

**Speakers:**

- Ms. Francesca Chieruzzi, Innovation Policy Expert (TII)
- Nugzar Chitaia, Head of Science Development (Ministry of Education and Science of Georgia)
- Alexey Dick, Deputy Director (BellSA, Belarus)
- Ruben Gevorgyan, Head of Department of Technological Development (Ministry of Economy of Armenia)
- Arevik Khnkoyan, Head of Division for Commercialization of Scientific Results and Innovation Programs (State Committee of Science of Armenia)
- Oleg Khymenko, Deputy Director of the Innovation Policy Department (Ministry of Education and Science of Ukraine)
- Ms. Maria Augusta Mancini, Senior Consultant (TII)

**Host organisation:** National Academy of Sciences of the Republic of Armenia

**Main findings**

²⁹ The event was organized in conjunction with the IUS (Innovation Union Scoreboard) policy workshop “From innovation performance assessment to innovation policy”, organized in partnership with the IncoNet Eap project
This third and last discussion was designed to conclude the dialogue with a final step of validation of the overall findings of the project (needs, challenges, enabling conditions) as well as building consensual recommendations to address the most recurrent (and relevant) failures (at system and organizational level) across the different EPC countries involved, and reflecting on lessons learnt in the EU. For this purpose, the session was split into two parts, one devoted to presenting EU experience in boosting knowledge transfer (approach, trends, lessons learnt, cases) followed by a debate where representatives of the four countries engaged offered an overview of current and forthcoming policy efforts deployed by their country to address this issue.

The following common assets of the four EPC include:

- Well-educated population
- Good research capacity (within public institutions) with excellence in specific sectors
- Policy-making committed to invest in innovation (focus on science-based innovation)
- Openness to international collaborations (research side)

These were recognized by the stakeholders present as key strengths to capitalize upon, while the key barriers to be overcome were identified as follows:

- Low absorption capacity of local SMEs (low demand and low investment in R&D)
- Limited resources and funding (both in private and public sector)
- Brain drain (especially with regard to skilled young people)
- Aging research population
- Low engagement with industry
- Fragile positioning in the international arena
- Fragmented innovation ecosystem
- Risk-adverse culture

Within this overall picture, a general consensus was reached in relation to three key policy intervention areas which could significantly improve a better research-to-market process in the EPCs arising from the project:

- Enhanced innovation culture, skills and capacities (human capital development)
- Reinforcement of the innovation ecosystem and supply chain
- Targeted positioning: strategy, governance and regulation

For each pillar, a mix of successful (and unsuccessful) policy schemes applied in the Europe Union were showcased to offer a living, experience-based inspiration to the EPC policy makers.
Conclusions

Key drivers of and challenges, barriers to research-to-innovation processes in EPCs

The analysis process carried out by the SECURE-R2I consortium shows that knowledge transfer (innovation processes based on knowledge exploitation) is still a novel concept in the EPCs surveyed either in terms of general understanding (innovation is often meant as a synonym for research or technology), policy intervention (technocratic, science-based approach) or practice (weak exploitation of research results, as research is often developed unrelated to IPR and market considerations).

Notwithstanding specificities typical of each EPC area addressed (in terms of policy mix, economic fabric, resources and capacities available), some common traits and challenges in relation to research and innovation emerge:

SYSTEM LEVEL (framework conditions)

- All EPCs are transition economies (lower or middle-income group) progressing towards a functioning market economy: important steps have been made by introducing fundamental economic reforms (privatization, labour and market regulations) while less attention has been paid to cultural issues (development of a collaborative, entrepreneurial, risk-taking culture) and incentivizing/rewarding innovation activities by firms and research actors.
- The enterprise system is still underdeveloped, especially concerning small and medium-sized enterprises. Most of them do not invest in innovation (extremely low BERD across all countries), leading to low innovation demand and absorption capacity.
- Innovation in SMEs often takes the modernization route (incremental innovation); they adopt existing products and processes from more developed countries and adapt them to local conditions rather than searching for domestic solutions (alone or in collaboration with local research actors).
- All ECP have a long tradition of scientific excellence (and a well-educated population), but have faced a dramatic decrease in their R&D intensity since the early 1990s. This led to the shutting down or reorientation of many research branches as well as a significant decrease in the number of researchers, with some countries also suffering a serious generational gap and brain drain.
- The research system follows a dipartite structure with, on one side, the universities (teaching function primarily) and on the other, the research institutes of the National Academy of Science (research function). The latter suffer in particular from a severe lack of funding impacting both at the infrastructure level (obsolete equipment and premises) and in terms of salary policy for researchers and staff.
- Because of the difficulties they are facing, all countries have launched ambitious national strategies to modernize and boost their research and innovation systems, notably through improving conditions for encouraging business activities and the commercialization of R&D outcomes.
• In spite of such ambitions, resources invested by governments in research and development are quite low across all four countries (GERD level ranges from 0.2 in Georgia, to 0.8 in Belarus)

• Looking at the innovation policy approach, all countries, although with different degrees of intensity, follow a science-based model (technology push approach) and focus on specific scientific sectors. In particular, their innovation policies tend to follow trends set by leading countries at the global technological frontier and focus on the creation of technologies.

• State funding for research and development is generally addressed towards public organizations (research centres, universities), while private players are less incentivized.

• Support for public research organizations takes the form mainly of direct funding (budget for the institutions) or grant schemes for R&D projects (technology development) which are generally assigned via competitive procedures, while other forms of support (support for IPR protection, access to market and business development skills, access to risk capital) are less frequently available.

• In terms of country specificities, Ukraine and Belarus appear slightly more oriented (and advanced) towards sustaining product/process innovation for industry uptake (also because of a larger domestic market and a more structured enterprise system), within given priorities, while Georgia and Armenia seem more focused on supporting SME creation/entrepreneurship. Nevertheless, despite the underlying differences in countries’ levels of development, innovation policies appear surprisingly similar.

**SINGLE ORGANIZATION LEVEL (research and development institutions)**

The analysis shows that initiatives in favour of a systematic exploitation of research results are quite recent and yet underdeveloped in the different countries, with limited achievements in terms of economic return for the exploitation effort produced. Among the key critical issues we find:

• RDI institutions tend to focus on technology transfer as a key research-to-market vehicle, while broader knowledge transfer mechanisms involving long term collaboration, exchange and interaction (also concerning tacit knowledge) with the surrounding environment (industry, users/customers) are not yet in place;

• Weak policy for innovation and technology transfer in the research organization (generic statements not translated into operational practice);

• Lack of capacity in TT strategy and practice (TT units are still in an embryonic phase with a shortage of market expertise/practical business experience, limited engagement of external experts and an inward looking attitude that does not consider the international scenario);

• Lack of appropriate internal regulations (unclear rules for IP and spin offs, absence of incentives for exploitation, career path not defined for TT professionals and researchers who successfully commercialize their research results, etc.);

• Scant resources for adequately engaging in commercialization activities (and in some cases even for maintaining and upgrading equipment);

• Drawbacks associated with the IP portfolio (focus on national IP rights, scarce ability to access international patent procedures also because of the related high costs, difficult access to patent attorneys);
• **Weak visibility at international level** (RDI need to access international markets as there is currently little demand in the domestic market for their specialism, which, in most cases, originates from the role they played during the now collapsed Soviet era).

**Key intervention areas**

The analysis performed confirms that knowledge transfer may play a key role in boosting the economic development of our target EPC since a solid scientific base and qualified human capital are present in all of them (*good potential*). Moreover, given the fragile nature and low level of innovativeness of indigenous industry, this could give rise to a focused stream of knowledge-based companies (rejuvenating the entrepreneurial fabric) as well as offering to EPC RDIs the possibility to access additional resources and contribute to closing the funding gap from which they suffer (*good opportunities*).

Experience demonstrates that the success of knowledge transfer depends on a well-functioning ecosystem which ensures a steady flow of ideas, people, knowledge and capital, while operating under conducive rules and benefiting from cutting-edge infrastructure. Securing these conditions is the responsibility of innovation policy makers in all countries, including the EPC. This is a challenge which, especially for transition countries, requires a long-term project/vision which can only be achieved step by step. Moreover, the limited resources available ask for focused choices and interventions (prioritization process), based on the real needs and potential of countries and regions.

These are the principles guiding the formulation of the SECURE-R2I recommendations to close the research-to-market gap (which is just a component of the knowledge transfer process) in EPC countries. We propose a focused set of "actionable" interventions, which, on the one hand, contribute to building up a conducive ecosystem (medium-long term objective) and, on the other hand, capitalize on the key assets for knowledge transfer (skilled human capital, research capacity) to produce tangible effects (successful exploitation creating positive social impact in the EPC) in the medium/short term.

The project identifies three main policy objectives (and related streams of action) which in our opinion (and those of EPC stakeholders engaged by the project) could significantly boost the research exploitation process in EPCs.

4. To enhance the innovation and entrepreneurial culture in general, as well as skills and capacities for knowledge transfer and innovation (culture and human development).
5. To improve the supply of support services and facilities for knowledge transfer and innovation (conducive ecosystem).
6. To strengthen policy impact by enhanced strategy, governance and regulation (targeted positioning also at international level).

We have divided each stream into operational objectives (activity level) with related policy measures (funding mechanisms coherent with the given objective). This is meant to offer inspiration on a wide
range of instruments which may be selected and customized according to own specificities and resources for a given objective.

The key beneficiaries of these recommendations are research and development actors (leading producers of knowledge in EPCs and the key target of the SECURE-R2I project) that have to be encouraged, sustained and accompanied in their research-to-market journey with better skills, services and resources.

Given this target audience and fitting with the conceptual framework followed by our project (knowledge transfer is influenced by the context but also depends on each institution’s choices, capacities and resources), we include the case of the University of Leuven and its successful practice of knowledge transfer as an inspirational model for those RDI willing to make progress on their exploitation path.

Furthermore, as cooperation with EPC receives increasing attention from EU policy - with three of the four EPCs involved (Ukraine, Armenia and Georgia) recently becoming associate members of Horizon 2020 (plenty of funding opportunities) - we describe specific EU funding programmes that can provide practical research-to-innovation support to their researchers, entrepreneurs and policy makers (Annex 1).

Recommendation 1

To enhance the overall innovation and entrepreneurial culture, as well as skills and capacities for knowledge transfer and innovation (culture and human development)

This objective addresses the key element which makes innovation and knowledge transfer happen: human capital (knowledge is generated, diffused and empowered by people), by tackling two interdependent components which affect how people deal with knowledge transfer: culture/attitude and skills/capacities

Operational objective 1.1: Awareness-raising among young people and researchers to stimulate a more entrepreneurial, risk-taking mind-set and behaviour

Target group: Researchers, students, society in general

Rationale: EPC suffer from a weak entrepreneurial spirit (caused by many decades under the Soviet regime, where the whole economy was controlled centrally with no possibility to take own initiatives), a risk-averse culture in which neither policy makers nor society in general contemplates the possibility of failure (risk being closely associated with innovation projects), as well as a conception of innovation as a linear process (technology push).

Possible measures: business idea competitions within HEIs, mini-company projects within schools, creativity camps, inspirational lectures from successful entrepreneurs, awards/prizes with some kind of mentoring and mobility schemes (cf. Erasmus for young entrepreneurs).
Operational objective 1.2: Enhance TT skills and innovation service provision (better accessibility and professionalization of service providers)

Rationale: EPC researchers are in most cases scientists with specialist skills and an over-riding interest in their research field with no business experience. Often, the research generated does not match with market needs and does not consider business issues (e.g. alternative products already available, IPR issues, financial assumptions, etc.). It is necessary that high profile support services (and experts) assist them in the exploitation process.

Target group a): Innovation and TT professionals and intermediaries

Suitable measures: Set up a TT Academy in each county to professionalize the service offer (providing training, good practice exchanges, work placements, twinning schemes between high and low performing organizations, the creation of grant schemes to access external expertise, peer learning for TTO offices (grants for mobility of TTO staff to gain experience in the EU).

Operational objective 1.3: Enhance TT skills among researchers and entrepreneurs

Rationale: Besides external support services, researchers need to build a good level of understanding of the commercialization process, ensuring that market and IP considerations drive the process from the beginning and focusing on results with most potential.

Target group b): Researchers

Possible measures: Global grant (funding & services) for developing an innovative idea, scouting pilot project (training researchers on how to assess the market potential of the results generated), virtual incubation schemes (support and facilities for maturing their business case), entrepreneurial education and mobility schemes.

Recommendation 2

To improve the supply of support services and facilities for knowledge transfer and innovation (better ecosystem)

This objective fosters the creation of a conducive environment ensuring that the system presents all the necessary conditions for innovation to germinate, grow and reach the market successfully (access to capital, people, facilities, skills). This means addressing system failures (e.g. innovation financing) and barriers, while ensuring that the knowledge transfer process is sustained throughout the whole process (from idea generation to market entry).

Operational objective 2.1: Innovation financing

Rationale: Technology transfer is a risky adventure. Traditional funding channels are reluctant to share the risk with the researcher/entrepreneur. In the EPCs, this risk-averse attitude also affects
public funding. It is important that the system includes innovation financing mechanisms (specific tools developed specifically for this kind of risky project) to address this gap.

**Target group:** Researchers and entrepreneurs

**Possible measures:** Proof of concept grants, crowdfunding platform, grant schemes with universities, incentives for creating new innovative companies, Sidecar Fund

**Operational objective 2.2: Bridging research and industry - Absorption and Innovation Capacities:**

**Rationale:** Research and industry often follow separate routes; according to the researchers, industry is not willing to invest in their solution, while according to industry the solution is not known or interesting. There is a clear gap which may be addressed by endowing the system with bridging mechanisms which facilitate collaboration and mutual trust and nurture opportunities for interaction.

**Target group:** Researchers and entrepreneurs

**Possible measures:** Technology Transfer Accelerator (TTA), innovation brokers, living labs, technopoles, subsidies for PhD placements

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**Recommendation 3**

Strengthen policy impact: strategy, governance, regulation (international positioning)

This objective aims to rationalize and sharpen the EPC innovation policy effort (overcoming the technology push model in order to build the innovation ecosystem), with a view to achieving better impact and positioning at international level (access to international funding opportunities, visibility and strategic partnerships).

**Operational objective 3.1: Support for better innovation policy making**

**Rationale:** Innovation policy often tends to imitate successes achieved by advanced economies. In the EPC this means a focus on a science-based development model (technology push) inspired by high-tech strategies of leading regions of the world. The EPC policy style still seems to be influenced by centralized planning features from the Soviet period (top-down) and a hierarchical, multi-level governance system, focusing more on the planning stage, rather than the implementation phase. Targeted support (services and capacity-building processes) would allow EPCs to achieve a better positioning also at international level (bottom-up, evidence-based, outward and forward looking, consensus-based policy making) with better impact on the overall socio-economic framework and a better effect on the overall socio-economic framework, exploiting at best the different funding sources available (including EU funds).

**Target group:** Innovation policy makers and implementing agents (innovation agencies, centres)
Possible measures: Smart specialization lab (training path of novel methods for innovation policy making), technical assistance/service provision for fine-tuning/strengthening national Innovation strategy and policy mix, introducing innovative concepts like public procurement for innovation and Public Private Partnerships, evidence-based policy-making (benchmarking and scoreboard-type studies), support actions to access international funding (vouchers, prizes).
## Turning policy into action: support measures and cases

<table>
<thead>
<tr>
<th>Instrument</th>
<th>How does it work</th>
<th>Managing organisation profile</th>
<th>Funding sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business idea competition</strong></td>
<td>Awards (funding + services) to the best business ideas (mainly knowledge based) submitted by students, researchers and aspiring entrepreneurs. The typical support package foresees training and coaching (often with the engagement of experienced entrepreneurs/consultants) on designing a sound business model and drafting a robust business plan. The evaluation panel usually consists of venture capitalists, business angels, entrepreneurs, representatives of business associations/intermediaries.</td>
<td>Intermediary organisations such as university TTOs, chambers of commerce, innovation agencies, high schools Start-up centres, incubators</td>
<td>European Social Funds, National/regional funds, Private sources (e.g. venture capital funds, local banks, business angel networks, foundations, universities)</td>
</tr>
</tbody>
</table>

| Mini companies | A mini-company is a pedagogical tool based on practical experience by means of running a complete enterprise project, and on interaction with the external environment (i.e. the business world). There are two main models: ask students to develop a real business although in a protected environment or simulate it (virtual or training firms) where students work in teams in an enterprise project outside the school environment carrying out their tasks under the supervision of business people. Target group: secondary schools. | Schools + advisors, Business consultancies, Chambers of commerce, Entrepreneurship foundations, National/local innovation agencies | National funds European Social Funds |

| Creativity camps | Idea laboratories where youngsters are provided with training (real-life examples, testimonials, coaching sessions, workshops) aimed at stimulating creativity & entrepreneurship skills. Age groups generally correspond to the different stages of life & | Consultancy companies Innovation development agencies Entrepreneurship foundations | Private sources (from schools, chambers of commerce), Regional/national funds |
### Report on Tech Transfer Opportunities and Bottlenecks in the EPC

<table>
<thead>
<tr>
<th>Personal Growth: 14-18 year-old high school students, 19-25 year-old university students and 26-35 year-old young professionals. This format can also address other groups of beneficiaries, such as women, temporary workers or the unemployed and immigrants.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Inspirational lectures</strong></th>
<th>Inspiring lectures from successful entrepreneurs/business men and women aimed at encouraging students/aspiring entrepreneurs to seek the appropriate knowledge about entrepreneurship (entrepreneurial learning through role models).</th>
</tr>
</thead>
</table>
| **European Social Fund**  | **Entrepreneurial education entities**  
Start-up centres, incubators  
Chamber of commerce/industrial associations with schools/universities  
Private sources (grants from foundations) |

<table>
<thead>
<tr>
<th><strong>Brain Back scheme</strong></th>
<th>Typically this kind of program aims to encourage the return of talent who went abroad to acquire new skills/working practice, by providing financial incentives and support services in view of engaging him/her in the creation a new company or in running a promising project with local people.</th>
</tr>
</thead>
</table>
| **Innovation agencies** | **European Social Fund**  
Public entities responsible for or active in the field of the economy, business support or related issues  
Start-up centres, incubators  
|
# Case Study - PREMIO NAZIONALE PER L’INNOVAZIONE (PNICUBE) - Italy

## Short description
PNICube is an not for profit association with 41 members including universities and incubators.

PNICube is running the National Award for Innovation (Premio Nazionale per l’Innovazione), which is a business plan competition of the best innovative enterprise ideas and the event Start Up of the Year, which rewards the young high tech enterprise achieving the best market success.

The National Award for Innovation includes two stages:

1. The first stage is the local business idea contests (Start Cups) held throughout the Italian university system each year, which provides selected participants with training and coaching for the preparation of their business plan.
2. In the second stage the winners of the Start Cups take part in the National Award, benefiting from a dedicated support package (tangible and intangible services, office accommodation, management consultancy, networking) for the fine-tuning of their business plans.

Winners are rewarded with prize money and incubation services.

## Aims and target groups

**Aims:**
- to stimulate the creation of new knowledge based companies
- to foster an entrepreneurship culture among students and researchers at Italian universities

**Target group:**
Aspiring or young entrepreneurs with a business idea based on an innovative product/service.

## Funding

While PNICube funding comes from the associates’ fees (admission fee of €1,000, and an annual membership fee determined by the Board of Directors), the Premio Nazionale dell’Innovazione is funded by private sponsors (such as large companies, venture capitalists, banks) and private bodies (regions, Chamber of Commerce).

While on average the winning projects of local Start Cups get around €3 000-5 000, the National Award for Innovation provides a €100 000 cash award shared among the four best business plans as well as a complimentary support package.

## Achievements

On average each year around 16 local business plan competitions (Start Cups) take part in the National Award for Innovation. As an example, in 2010 some 786 business ideas were generated with 2 149 participants and 354 business plans submitted.

## Success factors
- Selection process managed conducted by a panel
- Panel consists of investment fund experts, specialists in early stage financing and business managers.
- Cooperation with the other innovation stakeholders, such as incubators, private companies with regional administrations.
1.2 Enhance TT skills and innovation service provision

<table>
<thead>
<tr>
<th>Instrument</th>
<th>How does it work</th>
<th>Managing organisation profile</th>
<th>Funding sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT academy</td>
<td>Training/skills development courses for researchers, academic entrepreneurs or for technology transfer and innovation support professionals. The training topics will therefore reflect the main areas of intervention required in the innovation support value chain. The training sessions generally offer a balanced mix of presentations, case studies and group work by technology transfer practitioners/experts.</td>
<td>Technology transfer association/foundation</td>
<td>Self-sustainable (fee-based)</td>
</tr>
<tr>
<td>Twinning schemes</td>
<td>‘Twinning’ is an &quot;exchange&quot; instrument, which can take place between two or more entities/organizations and can focus on a whole range of issues and involve a wide range of actors. In this area, twinning schemes generally engage an experienced agency and others without prior experience to address a specific challenge (e.g. innovation support services, management of specific tools, knowledge based entrepreneurship).</td>
<td>Technology transfer association/foundation</td>
<td>Horizon 2020 calls</td>
</tr>
<tr>
<td>Voucher schemes for</td>
<td>Small grants/vouchers (co-financing, matching grant, 100% grant) for redemption of consultancy services generally provided by pre-approved service providers under pre-defined areas of expertise (e.g. strategic/business planning, innovation management, marketing, product development/prototyping/design). Generally there is a limit on the number of vouchers to be received (up to 2 per consultancy area).</td>
<td>Innovation /local funding agencies</td>
<td>National/regional funds</td>
</tr>
<tr>
<td>external expertise</td>
<td></td>
<td>Private organisation selected via public procurement procedures Start-up centres, incubators</td>
<td></td>
</tr>
<tr>
<td>Angel investing academy</td>
<td>Training/skills development courses for &quot;young&quot; angel investors generally provided by business angel networks/clubs delivering best practices and practical training on key topics such as: • How to identify attractive opportunities • Understanding angel Investing • Tax and legal issues • Due diligence process • Negotiation and investment syndicates</td>
<td>Business angel network/club</td>
<td>Private sources</td>
</tr>
</tbody>
</table>
Case Study - TII summer school

Short description
Since its creation in 1984, TII (www.tii.org), Europe’s longest-standing, independent grouping of innovation support and technology transfer organizations, provides its members (150 members in 40 countries) with a dedicated set of services in the field of capacity building and networking, good practice exchange and study visits with best in class TT professionals. Since 2001, the association has been organizing dedicated training sessions (TII summer school) for innovation intermediaries to professionalize the delivery of support services to SMEs/aspiring entrepreneurs. The summer schools tackle the different aspects of the innovation support value chain from choosing the right exploitation route through to developing a business case for a new technology to negotiating a technology transfer and business planning for a start-up activity. The exact topics are streamlined to the needs and expectations of the target audience, e.g. researchers, TTOs, innovation and business support intermediaries.

The training course (generally 5 days) offers a balanced mix of presentations, case studies and group work, delivered by international technology transfer practitioners/experts. Networking and knowledge sharing are encouraged during "informal" events such as study visits to centres of excellence and high performing TT units.

Aims and target groups

Aims
Empowering innovation intermediaries and thereby improving the quality of the innovation support offer

Target group
Technology transfer professionals, TTOs, researchers with an entrepreneurial spirit, managers, representatives of public/private organisations operating in the innovation fields (e.g. Ministries, Chamber of Commerce, Business Support Agencies)

Funding
On average, a 5-day course costs in the region of €25 000 to organise and deliver. This can be covered by a grant or public funding or can be paid through registration fees paid by each attendee.

Achievements
Over the past 15 years some 350 people have been trained from all over Europe, including delegates from EPC.

Success factors
The TII summer school is unique because it is delivered by practitioners who base their training on the methods they have tried and tested over the years and on their own personal experience of dealing with technology transfer. The trainers’ case studies and anecdotal evidence contribute to the practical nature of the training which equips the participants to use their new knowledge in their own TT and research commercialization activities.
### 1.3 Enhance the TT skills among researchers/innovative entrepreneurs

<table>
<thead>
<tr>
<th>Instrument</th>
<th>How does it work</th>
<th>Managing organisation profile</th>
<th>Funding sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global grants (funding + services)</td>
<td>Global grants offer an integrated system of support services from grants (salaries for the selected teams + small grants) to free services consisting of technical assistance and tutoring (idea incubation), training, advisory services, vouchers for participating in inter-university Masters, International Mobility Pilot Action.</td>
<td>Innovation Development Agencies Start-up centres, incubators</td>
<td>European Social Fund National public funding (e.g. Ministry of Economic Affairs)</td>
</tr>
<tr>
<td>Scouting</td>
<td>Identification of promising technologies/patents within R&amp;I entities to be further exploited via a structured market driven evaluation process.</td>
<td>TTOs Start-up centres, incubators</td>
<td>Budget of R&amp;I organizations Chamber of commerce</td>
</tr>
<tr>
<td>Incubation schemes</td>
<td>Generally incubation programmes provide aspiring/young entrepreneurs with support services, covering the pre-incubation (idea shaping), incubation (opportunity recognition/business development) and post-incubation (acceleration/internationalization) phases. Often they also include a “Virtual Space” with information, tutoring, working tools and access to business people/business angels/VCs who are involved from the selection stage. Often, they are focused on a specific sector (e.g. IT, Life Sciences).</td>
<td>Start-up centres, incubators/science parks Universities and research centres Innovation/development agencies</td>
<td>Ministry of Economics/Innovation</td>
</tr>
<tr>
<td>Entrepreneurship education</td>
<td>Entrepreneurship courses generally consist of a variety of classes intended to provide the basis of a broad understanding of business practices. The coursework of entrepreneurship is often split between conventional business studies topics (marketing, accounting and management) and courses intended to foster the entrepreneurial spirit (identifying opportunities, locating funding sources and developing an entrepreneurial mind-set). These courses could have different targets: undergraduates, graduates, young entrepreneurs. Some universities have included entrepreneurship courses within the university curricula.</td>
<td>Universities/academia Start-up centres, incubators</td>
<td>Private Funds</td>
</tr>
<tr>
<td>Mobility schemes</td>
<td>Cross-border business exchange programmes which give new or aspiring entrepreneurs the opportunity to work with and learn from experienced entrepreneurs running small businesses in other countries/regions (up to 6 months). The applicant generally receives a small &quot;salary&quot; + the reimbursement of travel expenses while the host benefits from fresh perspectives on his/her business and gets opportunities to cooperate with foreign partners or learn about new markets (sometimes in case of administrative costs for hosting, such as insurance, they are covered by the project or reimbursed).</td>
<td>Business associations and business support networks; Public entities responsible for or active in the field of the economy, enterprise, business support or related issues; Chambers of commerce Start-up centres, incubators; Institutes of (higher) education</td>
<td>European Social Fund Erasmus +</td>
</tr>
</tbody>
</table>
Case Study - SPINNER - Services for the Promotion of INNovation and Research (EMILIA ROMAGNA REGION - ITALY)

**Short description**
Spinner was the first Global Grant in Europe devoted to create a knowledge community in Emilia Romagna. In 2000, the regional public authorities set up a consortium responsible for promoting specific intervention policies and acting as an intermediate body. With the purpose of contributing to regional development, Spinner aimed at improving human capital qualifications and promoting industrial research projects by providing researchers and graduates with:

- Assistance to innovation/TT project proposals
- Pre-seed financial support (scholarships, cost reimbursements, vouchers for specialist advice)
- Training and e-learning (finance, marketing, technology transfer, early stage finance)
- Mentoring for business idea development (entrepreneurship)

Companies, universities and research centres were involved in the project, with the final purpose of creating a "lively" community.
Spinner was funded under two regional operational plans (2000-2006 and 2007-2013).

**Aims and target groups**
Spinner aims
To foster the qualification and empowerment of human resources in S&T in order to:

- support the knowledge economy by exploiting technological and research potential (new KICs)
- strengthen regional competitiveness through the networking of knowledge production centres and companies: knowledge and technology transfer.

**Target groups:**
Researchers; PhD students/researchers, teachers, lab technicians, graduates with a particular focus on the unemployed and women.

**Funding**
Total: (amount €): 15.2 million (ESF) for 2009-2012
From 2008 to 2014 Spinner contributed to:

- 500,000 people informed
- 5,653 applications for incentives/services
- + 3,267 applications admitted
- 440 innovation projects
- 1,099 TT projects
- 220 organizational innovation projects
- 1,876 beneficiaries
- 153 new companies created

**Success factors**
Active engagement and cooperation with the key actors of the entrepreneurship and technology transfer ecosystem.
### Key action 2 - Ecosystem and innovation value chain

#### 2.1 Innovation financing

<table>
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<th>Funding sources</th>
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</thead>
<tbody>
<tr>
<td><strong>Proof of concept grant</strong></td>
<td>The Proof of Concept Programme supports the pre-commercialization of R&amp;D results emerging from universities and research institutes by providing grants which allow researchers to perform a feasibility study (with the support of an external consultant) up to the elaboration of an actionable business plan. Typically, the financial support is a grant, but other forms are also possible (i.e. loan, repayment scheme.)</td>
<td>Public financial/innovation agencies</td>
<td>National/regional funds European Investment Fund (EIF)</td>
</tr>
<tr>
<td><strong>Crowdfunding platform</strong></td>
<td>Crowdfunding platforms makes it possible for technology/social startups and entrepreneurs to raise seed/start-up capital (as microfinance, equity) for further deploying their business idea through the support of the crowd (accredited and non-accredited investors, individuals). To favor equity crowdfunding, specific regulations must be in place.</td>
<td>Financial intermediaries</td>
<td>Private sources</td>
</tr>
<tr>
<td><strong>Grant schemes with universities</strong></td>
<td>Grant schemes for SMEs who have to develop an R&amp;I project with the support of a local university/research centre (R&amp;D performer, 100% paid). They usually work via competitive calls; market potential and business feasibility form part of the evaluation criteria; they also foresee a private co-financing rate.</td>
<td>Public authorities National/regional development agencies</td>
<td>European Regional Development Fund National funds</td>
</tr>
<tr>
<td><strong>Incentives for creating new innovative companies</strong></td>
<td>Grants/soft loans for start-up creation (different co-funding rate, mix formula between grant/loan). Eligible costs are: personnel, consultancy (i.e. marketing, product design, strategic planning, quality control), equipment/furniture, establishment and first year costs, overheads.</td>
<td>Public authorities National/regional development agencies</td>
<td>European Regional Development Fund National funds</td>
</tr>
<tr>
<td><strong>Sidecar Fund</strong></td>
<td>A sidecar fund is a pooled investment vehicle (generally public funded) that invests alongside an angel group/institutional investors (often automatically without additional due diligence. Different models have been already tested across the EU.</td>
<td>Financial Intermediaries</td>
<td>National funds Private sources (e.g. angel networks)</td>
</tr>
</tbody>
</table>
# Case Study - Proof of Concept Programme (Western and Eastern Scotland)

## Short description

The Proof of Concept Programme (PoCP) was set up in 1999 to make available funding support for supporting the commercialization of R&D results from universities and research centres.

The PoCP supported the pre-commercialization of leading-edge technologies not only providing funding for the creation of a new business but also supporting the setting up of a proper managerial team and reinforcing entrepreneurial skills. By 2007, 22 Scottish institutions had received awards for projects aimed at performing:
- a full lab-scale demonstration of the technology.
- any pre-production development/prototyping.
- preparatory activities to reach the market

## Aims and target groups

**Aims**

- to commercialize research results through the provision of funding for early stage development activity within universities and research institutes;
- to contribute to Scottish Enterprise’s cluster development by facilitating the exploitation of enabling technologies
- to contribute to the longer-term development of a strong knowledge-based economy in Scotland.

**Target groups:**

Scientists/researchers with early-stage ideas which have typically reached patent level, and could lead to the creation of new businesses, or licensing innovative technologies

## Funding

Funded in the period 1999-2008 (ERDF: July 2004 – March 2008), the programme had a total budget of £49.1m of which an ERDF contribution of £10.1m and national budget £39m (Scottish Enterprise / Scottish Government)

## Achievements (end 2007)

- 830 applications received from seven funding rounds
- 201 projects funded
- 34 spin-out/start-up companies created
- 11 stand-alone licenses sold and 7 collaborations launched
- + 500 new jobs through 38 spin out/start-up companies and 35 licensing deals

## Success factors

- High professional level of the management team
- In-depth understanding of the research-to-market gap
- Outreach and promotion to a broad range of stakeholders
- Synergies with the other support measures of the innovation ecosystem
## 2.2. Bridging research and industry - Absorption and Innovation Capacities

<table>
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</thead>
<tbody>
<tr>
<td><strong>Technology Transfer Accelerator (TTA)</strong></td>
<td>A TTA generally consists of: i) a fund established to focus on the commercialization of investment opportunities coming from university or research centres, proof-of-concept projects, and ii) a support line of advisory services and networking for further improving the R&amp;D commercialization capabilities of technology transfer offices and researchers.</td>
<td>Regional/national development agencies + private intermediaries for running the fund (via a competitive call) Consultancy companies</td>
<td>European Investment Fund Ministry of Science, Industry and Technology Private sources (e.g. multinational companies, angel/VC networks, banks)</td>
</tr>
<tr>
<td><strong>Innovation brokers</strong></td>
<td>Voucher schemes which make it possible for SMEs to hire an innovation broker (a person or organization that, from a relatively impartial third-party position, is able to catalyse innovation through bringing together actors and facilitating their interaction).</td>
<td>Regional/national development agencies + private intermediaries for running the fund (via a competitive call)</td>
<td>European Regional Development Fund National funds</td>
</tr>
</tbody>
</table>
| **Living labs**                      | A living lab integrates both user-centred research and open innovation, involving users and stakeholders in the following four main activities:  
   - Co-creation: bring together technology push and application pull (i.e. crowd sourcing, crowd casting)  
   - Exploration: engage all stakeholders, especially user communities, at the earlier stage of the co-creation process for discovering emerging scenarios  
   - Experimentation: live test beds  
   - Evaluation: assess new ideas and innovative concepts in real life | Research centres/ technopoles Regional/national development agencies + private intermediaries for running the fund (via a competitive call) Consultancy companies | European Regional Development Fund Private sources                                |
| **Technopoles**                      | Technopoles are networks which host and organize activities, services and facilities for industrial research, experimental development and technology transfer in a specific sector. Aiming at narrowing the gap between demand and supply of research, they also provide services for dissemination, demonstration and information activities, as well as premises for innovative spin-offs, private enterprises and research laboratories. | Research centres National development agencies + private intermediaries for running the fund (via a competitive call) | European Regional Development Fund                                                |
| **Subsidies for PhD placement**      | The scheme provides subsidies to graduates/PhDs to run an innovation project within a company/organisation which is interested in the specific topic, also with a view to its possible commercial exploitation. | Research centres/ Universities/national development agencies + private intermediaries for running the fund (via a competitive call) | European Social Fund National funds                                              |
### Case Study - DEMOLA PLATFORM (Finland)

#### Short description
Funded by the Creative Tampere Programme and managed by a consortium of local actors (Hermia Ltd with Tampere University of Technology, University of Tampere and Tampere University of Applied Sciences), Demola is a Finnish open innovation platform for the "inventors" (students/companies) of next generation products and services. Demola provides a collaborative and multi-disciplinary innovation environment where students from three regional universities deploy demonstrators of novel solutions based on company concepts. Involvement of the participant is voluntary, nevertheless students were rewarded with €500.

#### Aims and target groups
**Aim:**
- to boost a multi-disciplinary agile innovation culture
- to encourage entrepreneurship in the Tampere region

**Target groups:**
Students, companies operating in the target area (SMEs, large companies, public or private actors)

#### Funding
Funding of €200 000 (to €300 000) per year financed through the City of Tampere Business Development Programme (2006-2011), ‘Creative Tampere’

#### Achievements
Winner of the Regional Innovation Award from the Assembly of European Regions in 2010, Demola achieved interesting results with
- + 500 students engaged (30% from other countries)
- + 110 projects completed
- 96% of results are licensed to project partners
- new companies and + 10% of students headhunted

#### Success factors
A well-developed evaluation process, continuously adjusted with methods and tools.
Neutral location, not dependent on any one partner or university
Key action 3 - International positioning: strategy, governance, regulation

3.1 Support for better innovation policy making

<table>
<thead>
<tr>
<th>Instrument</th>
<th>How does it work</th>
<th>Managing organisation profile</th>
<th>Funding sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer learning for agencies</td>
<td>Twinning of innovation agencies or innovation stakeholders is a mobility scheme aimed at supporting exchanges and cross fertilisation for the purpose of exploring ‘an innovation support challenge’, such as the design of new instruments for a specific target group, re-thinking the policy mix for specific issues, solving specific technical issues such as monitoring, impact assessment.</td>
<td>Public entities responsible for or active in the field of the economy, enterprise, business innovation support</td>
<td>EC funds, National funds, European Investment Bank</td>
</tr>
<tr>
<td>Smart specialization labs</td>
<td>Practical workshops/short training courses for decision makers/policy makers where innovation practitioners/international experts share their practical experience in designing/implementing the smart specialization concept.</td>
<td>Consultancy companies, Smart Specialisation Platform, Innovation networks/associations</td>
<td>Private (Public e.g. DG Regio of European Commission, World Bank, OECD)</td>
</tr>
<tr>
<td>Support actions in the field of innovation strategy</td>
<td>Support schemes aimed at strengthening both policy implementation capacity (up to a detailed and effective design of an innovation support mechanism) and regional absorption (territories' implementation readiness). This kind of scheme generally includes: best practice exchange/study visits, international experts giving specialist advice (to supply detailed design and specialist know-how tailored to the needs of the action line to be implemented), capacity-building support (to empower policy makers/implementing agents).</td>
<td>Consultancy companies, Innovation networks/associations</td>
<td>European Commission, Other donors such World Bank, Infodev</td>
</tr>
<tr>
<td>Grants to enhance participation in international programmes</td>
<td>Voucher schemes to enhance proposal writing skills for international calls and to build a robust consortium. The target audience could comprise SMEs, universities and intermediary organizations. The co-financing could work on the basis of a &quot;success fee&quot; formula (remuneration is granted only in the event of a positive evaluation of the proposal).</td>
<td>Regional/national innovation intermediaries</td>
<td>National sources</td>
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</table>
SMART SPECIALIZATION STRATEGY (RIS3)

Why?
For decades innovation has been at the heart of EU policy debate: innovation is acknowledged as Europe’s engine for growth and competitiveness, giving rise to the “knowledge-based” society (Lisbon strategy). During these years, policy support to innovation has improved and matured: better understanding, methods (evidence-based, bottom-up, consensual, territorial-based) and practices for enhancing policy impact. Among these evolutions a key step has been to recognize the importance of local conditions (economic fabric, rules, skills and capacities of a given territory) and proximity (externalities, critical mass) in the innovation process. This has led to a focus on territorial specificities as the starting point for effective innovation policy-making (RIS3). This method is applied across all EU territories to exploit EU funding provisions (ESIF)

What is it?
Smart Specialization or RIS3 (Research and Innovation Strategies for Smart Specialization) is a strategic approach to regional economic development through targeted support for research and innovation. It involves a process where national or regional authorities develop a vision, identify the territorial best potentials to focus upon, develop multi-stakeholder governance mechanisms and make focused investments.

According to funding rules of the EU, all national and regional entities across the EU shall design their RIS3 so that the European Structural Investment Funds (ESIF) can be used in a more effective way and synergies between different policies, as well as public and private sources, can be further exploited.

How does it operate?
By setting up a participatory process which engages all key stakeholder group, a strategy for policy intervention in favour of innovation is developed and operationalized, capitalizing on 2 main attributes:

SMART:

1. Evidence-based: assets vs ambitions
2. Dynamic/entrepreneurial discovery process (not top-down, but user-driven)
3. Shared vision (engaging key stakeholders)
4. Building on potential competitive advantage & potential for cooperation
5. Forward and outward looking
6. Source-in knowledge and technologies etc. rather than re-inventing the wheel

SPECIALIZED:

1. Focused priority-setting
2. Excel with something specific
3. Focus investments on regional competitive advantage
4. Accumulate critical mass
5. Cross-fertilizations
### Case Study - Innovation Coach: Support Action for Innovation Mainstreaming within the Enlarged Europe (funded by EC)

| **Short description** | Innovation Coach was an accompanying measure aimed at supporting/optimizing the implementation of a Regional Innovation Strategy in 16 regions of the New Accession Countries (NAC) by improving their policy implementation capacity (detailed and effective design of their selected innovation support mechanisms) and regional absorption (territories’ implementation readiness). The project offered a support package consisting of:
- Provision of good practices (learning from others’ experience);
- Counselling schemes (international experts providing the best solution for high-performing innovation schemes/tools);
- Clustering and networking (horizontal actions for creating synergies and exploiting the international dimension). |

| **Aims and target groups** | **Aims:**
- Empowering regional stakeholders in the innovation supply chain
- Optimizing the implementation of regional innovation strategies in the NAC regions |

**Beneficiaries:**
Innovation stakeholders and decision makers of 16 regions of the New Accession Countries (NAC) in Central and Eastern Europe with a special focus on the key strategic issues of boosting entrepreneurship, access to finance and early stage investing for knowledge based businesses

| **Funding** | Financed by the European Commission (DG Enterprise) FP6 Innovation Programme, with a total budget of €2 050 000 (2005-2007) |

| **Achievements** | 16 regions supported in 10 EU new member states
- 58 technical assistance projects delivered
- 36 positive feedback letters received from beneficiaries
- + 160 international experts involved |

| **Success factors** | Engagement of international practitioners
Best practice exchange and experience sharing
Learning by doing approach |
Report on Tech Transfer Opportunities and Bottlenecks in the EPC

CASE STUDY OF AN ENTREPRENEURIAL UNIVERSITY: KATHOLIEKE UNIVERSITEIT LEUVEN

An inspiring model for EPC RDIs

The entrepreneurial university model

Why?

Research and education actors are undergoing a great transformation that affects their purpose, role, organization and scope in society and the economy. The ICT revolution, the rise of the knowledge-based economy and reduced funding due to the global crisis, have all posed new rights and demands on research and education systems across the world. A new model of the Entrepreneurial University epitomized by innovation throughout its research, knowledge exchange, teaching and learning, governance and external relations is in the making.

What is it?

The entrepreneurial university is an institution that creates an environment, within which the development of entrepreneurial mind-sets and behaviours are embedded, encouraged, supported, incentivized and rewarded”. (Hannon, 2013)

How does it operate?

The entrepreneurial university thinks and acts entrepreneurially: it proactively generates and transfers knowledge to create value (economic, social, cultural, and technological). It operates according to an interactive rather than a linear model of innovation, where it develops and exploits pieces of intellectual property in collaboration with industry. It has an enhanced capacity to provide students with new ideas, skills and entrepreneurial talent. It educates not only individuals but also organizations, through entrepreneurship and incubation programmes and training modules. Moreover, rather than only serving as a source of new ideas for existing firms, it combines its research and teaching capabilities in new formats to become a source of new firm formation, especially in advanced areas of science and technology (through spin offs and start-ups).

KATHOLIEKE UNIVERSITEIT LEUVEN

The Katholieke Universiteit Leuven is one of the oldest European University (founded in Leuven in 1425).

With 55,484 students in 2014–2015, the KU Leuven is the largest university in Belgium, with recognized excellence and strong international presence in the field of ICT, life sciences and the textile industries.

KU is considered one of the most innovative universities in the world and maintains one of the largest independent research and development organizations on the planet in fiscal 2014, research spending exceeded 426 million euro.

Reuters ranks KU Leuven as Europe's nr 1 in its first-ever ranking of Europe's top 100 innovative universities. This is due to the impressive high volume of influential inventions developed by KU Leuven researchers, who submit more patents than almost any other university in Europe.
# Leuven Research & Development: a successful Technology Transfer Office

## Short description
Leuven Research and Development (LRD) was founded over 40 years ago in 1972, and was among the first technology transfer offices (TTO) in Europe. Since it began its activities, LRD has been dedicated to **building bridges between science and industry, and to transferring knowledge and technologies to society and the marketplace.**

## Main activities
LRD supports researchers throughout the entire technology and knowledge transfer process and helps them to best leverage the commercial potential of their research. The service offer includes:

- **Collaborating with industry:** When researchers collaborate with industry, LRD sets up well-balanced collaboration agreements. Specifically for European consortium projects, LRD's EU advisors guide researchers in administrative, financial and legal matters during the entire project life cycle;

- **Managing intellectual property:** LRD helps researchers to protect their intellectual property and devise appropriate strategies for transferring the intellectual property from the university to industry;

- **Creating spin-off companies:** LRD assists researchers during the start-up phase and guides them through the process of translating a business idea into a real company (also including hosting space and seed fund);

- **Promoting entrepreneurship and innovation** by stimulating networking initiatives and clustering;

- **Stimulating and cultivating knowledge-driven regional development:** in close collaboration with local stakeholders.

## Governance and organization
LRD is an entity separate from the rest of the university and it operates as a separate business unit with its own budget and human resources and autonomy. LRD has significantly evolved over the years to adapt to the university’s complex structure. It has shifted from a specialised division towards a matrix structure and has transformed into a cross-university TTO that offers its services to the entire KUL Association. The main departments include:

- Legal department (legal support)
- Flemish government funding
- European government funding
- Intellectual property
- Spin-off companies
- Financial monitoring

## Resources
**a) Personnel**
LRD started with 2.5 full-time staff and now employs 85 people (qualified TT professionals with experience of both the academy and business world. The main units are IP (10 people), spin outs (7 people), the legal department (5 people); all the rest deal with finance, structuring and managing collaborations and other issues, such as
Report on Tech Transfer Opportunities and Bottlenecks in the EPC

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<table>
<thead>
<tr>
<th>b)Facilities</th>
<th>Besides advisory services, LRD provides hosting facilities, networking and financial support via:</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>• KU Leuven Innovation and Incubation Centre</td>
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<td></td>
<td>• Leuven Bio-incubator to support biotech spin-offs from the university</td>
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<td></td>
<td>• Leuven Innovation Networking Circle (1999) a local network between academic research groups,</td>
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<tr>
<td></td>
<td>start-ups, venture capitalists and consultancies in order to promote an entrepreneurship</td>
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<tr>
<td></td>
<td>culture in Leuven</td>
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<tr>
<td></td>
<td>• Technology clusters such as DSP Valley and LSEC (Leuven Security Excellence Consortium)</td>
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<tr>
<td></td>
<td>• Access to three science parks</td>
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<tr>
<td></td>
<td>• KU Leuven Gemma Frisius Fund – seed capital funds</td>
</tr>
</tbody>
</table>

| Achievements | Between 2005-2014 industry contracts, licensing and patents generated nearly €1.4 billion in  |
|--------------| revenue for the university.                                                                      |
|              | The university took a stake in 105 spin outs which have raised €760 million and are actually     |
|              | employing 4,200 people.                                                                          |

<table>
<thead>
<tr>
<th>LRD golden rules</th>
<th>• Ensure a strong commitment by your university leaders</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Dedicate sufficient funding and time for growing the TTO</td>
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<td></td>
<td>• Ensure autonomy and flexibility from the university with the power to make legal contracts</td>
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<td></td>
<td>• Create a clear mission to serve</td>
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<td></td>
<td>• Offer incentives that reward researchers for engaging with industry</td>
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<td></td>
<td>• Hire experts with knowledge of both industry and academia and skilled in TT issues</td>
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<tr>
<td></td>
<td>• Have a long term vision and a step by step approach (focus first on collaborative research)</td>
</tr>
<tr>
<td></td>
<td>• Look for expert partners that will really make a difference</td>
</tr>
<tr>
<td></td>
<td>• Set up a seed fund only after everything else is working (ensure the ecosystem and networking)</td>
</tr>
<tr>
<td></td>
<td>• Promote your success</td>
</tr>
</tbody>
</table>
Annex 1 – EU support measures to foster research to innovation in EPC

Since the collapse of the Soviet Union, Europe has cultivated a strong interest in cooperating with Eastern European Countries, culminating in the implementation of the Eastern Partnership (EaP) initiative (7 May 2009), a joint effort of the EU and 6 Eastern European partner countries (Armenia, Azerbaijan, Belarus, Georgia, Republic of Moldova and Ukraine) aiming to bring Eastern European countries closer to the EU. In recent years, various funding opportunities and support for research and innovation have been made available for EPC counterparts.

Access to this funding can significantly contribute to knowledge transfer processes in EPC (the 2007-2013 EC FP7 Programme saw 535 participations from EaP countries within 427 projects and an overall funding of EUR 45.46 million, with Ukraine involved in over 200 projects), complementing the national resources for research and innovation while raising the EPCs’ internationalization capacity (new partnerships and markets).

However, EU funding programmes are very competitive (high risk, requiring robust proposal development capacities/skills). The European experience with the New Member States (also linked to the Soviet bloc) show that these countries are less effective in accessing EU R&I funds compared with the EU15 (lower participation, lower success rates). This is probably due in part to their inexperience/lack of acquaintance with such mechanisms (lack of skills for proposal development, difficulty of accessing information and understanding the funding rules, etc.). Given their common background and more recent transition, this gap would presumably also affect EPCs.

To allow the EPC to fully benefit from this opportunity, it would therefore be important that both EC and EPC policy makers introduce dedicated support mechanisms. Grants for accessing expertise, information, support services for bid development, incentives for participating in international calls, reimbursement of costs for participation in partnership building events, rewards for successful proposals, funding of projects which, although of good quality, could not obtain an EU grant, as well as the creation of networks and learning platforms with EU counterparts could feature among the initiatives which contribute to this effort.

Among key programmes available are:

**Horizon 2020**

Ukraine (since 2015), Armenia and Georgia (both since 2016) have recently become associated to Horizon 2020, the European Union’s research and innovation funding programme. This means their researchers, businesses and innovators are now able to fully participate in Horizon 2020 on equal terms with EU Member States and other associated countries.

Association to H2020 opens a wide range of new opportunities to their research institutions, universities and businesses across the whole research and innovation value chain, from fundamental research up to close-to-market activities. In particular, it means they will now be able to apply for financial support to innovative SMEs, support fast track innovation, host European Research Council (ERC) grants, create new research institutes and boost the innovation capacity of existing ones, plus benefit from support for scientific excellence and other research policies.
H2020 SME Instrument

The SME Instrument helps high-potential SMEs to develop ground-breaking innovative ideas for products, services or processes that are ready to face global market competition. The SME Instrument offers small and medium-sized businesses the following:

- Business innovation grants for feasibility assessment purposes (optional phase I): 50k euro (lump sum) per project (70% of total cost of the project).
- Business innovation grants for innovation development & demonstration purposes (possible phase II): an amount in the indicative range of 500k and 2.5m (70% of total cost of the project as a general rule).
- Free-of-charge business coaching (optional) in order to support and enhance the firm’s innovation capacity and help align the project to strategic business needs.
- Access to a wide range of innovation support services and facilitated access to risk finance, to facilitate the commercial exploitation of the innovation.

**SME Instrument Example:**
The Ukrainian firm Institute of Human Ecology (INECO) has developed an innovative technology for processing hazardous waste (e.g. healthcare, oil, pesticides, solid and liquid waste, etc.) in a more cost-effective and environmentally-friendly manner. Thanks to recently winning SME Instrument Phase 1 funding, INECO is implementing a feasibility study in the EUWaste project, which includes market analysis, production scale-up and business model and sales strategy development for their new technology.

H2020 Fast Track to Innovation

The Fast Track to Innovation pilot provides funding for bottom-up proposals for close-to-market innovation activities in any area of technology or application. This thematic openness – combined with the possibility for all kinds of innovation actors to work together and deliver innovation onto the market and/or into society – should nurture trans-disciplinary and cross-sectoral cooperation. The aim is to: reduce time from idea to market; stimulate the participation of first-time applicants to EU research funding; and increase private sector investment in research and innovation.

Proposals for funding must be submitted by consortia comprising between three and five legal entities established in at least three different EU Member States or countries associated to Horizon 2020. Actions funded under the pilot are to be ‘business-driven’ because they are intended to give promising innovation ideas the last push before entering the market. Therefore, substantial industry involvement is mandatory.

**Fast Track to Innovation Example:**
Together with Nesscap Energy (Germany), Envirohemp and CSIC (Spain), the Ukrainian company Apowercap Technologies – specialised in high-power ultracapacitors - has recently embarked on the 2m euro funded CareSTOR project aimed at the market uptake of sustainable and competitive carbons for energy storage.

H2020 Spreading Excellence and Widening Participation

Despite serious efforts deployed at national and European level, the EU sees significant internal disparities in terms of research and innovation performance as also identified in the Innovation...
**Union Scoreboard.** These trends are further exacerbated by the continuing severe financial crisis, and the subsequent adverse effects on public research and innovation budgets. In order to address these challenges, the following specific measures for spreading excellence and widening participation have been introduced which target low-performing Member States and countries associated to Horizon 2020 in terms of research and innovation:

- The Teaming action involves associating advanced research institutions to other institutions, agencies or regions for the creation or upgrade of existing centres of excellence. It provides new opportunities to the parties involved, with real prospects for growth through tapping into new collaboration and development patterns, including the establishment of new scientific networks, links with local clusters and opening up access to new markets. This offers national and local research new possibilities for exploitation and value creation and boosts the innovation potential of the countries involved.
- Twinning helps strengthen a defined field of research in a knowledge institution through linking with at least two internationally-leading counterparts in Europe.
- The ERA Chairs scheme provides support for universities and other research institutions to attract and maintain high quality human resources and implement the structural changes necessary to achieve excellence on a sustainable basis.

**H2020 Twinning Example:**
Via the HOLO project, the Institute of Applied Physics of the Academy of Sciences of Moldova is boosting its scientific excellence and innovation capacity in digital holographic microscopy with the help of its Twinning partners: Universität Stuttgart, Tampere University of Technology and Intelligentsia Consultants. They are working together on the design and optimization of diffractive optical elements and the development of advanced image processing algorithms to improve digital holographic microscopy.

**H2020 European Research Council**

The European Research Council (ERC) funding schemes are open to top researchers of any nationality or age who wish to carry out their frontier research in the 28 EU Member States or associated countries. There are 3 core funding schemes and one additional scheme for ERC grant holders.

- ERC Starting Grants: For top researchers with 2-7 years’ experience after PhD. Grants up to 1.5m euro for 5 years.
- ERC Consolidator Grants: For top researchers with 7-12 years’ experience after PhD. Grants up to 2m euro for 5 years.
- ERC Advanced Grants: For established researchers who have a recent track-record which identifies them as leaders in their respective field of research. Grants up to 2.5m euro for 5 years.

**H2020 ERA-NET**

The ERA-NET instrument under Horizon 2020 is designed to support public-public partnerships in their preparation, establishment of networking structures, design, implementation and coordination of joint activities as well as topping up of single joint calls and of actions of a transnational nature. In addition to the joint calls they implement, ERA-NETs have developed over the past years a vast range of networking and other joint activities that contribute significantly to the impact of the ERA-NET scheme and that should be sustained.
H2020 Policy Support Facility (PSF)

The Horizon 2020 Policy Support Facility (H2020 PSF) is a new instrument that gives Member States and countries associated to Horizon 2020 practical support to design, implement and evaluate reforms that enhance the quality of their research and innovation investments, policies and systems. Such reforms concern, for example, the stimulation of stronger and closer links between science and business or the introduction of performance-based funding of public research institutes.

The Policy Support Facility provides Member States and countries associated to Horizon 2020 with access to independent high-level expertise and analyses through the following services:

- Peer Reviews of national R&I systems to detect strengths and weaknesses and recommend concrete paths for reform
- Support to specific reforms, including pre-Peer Review horizon scanning, post-Peer Review evaluations, and other ad-hoc requests
- Mutual learning on specific topics, involving a set of countries around a project targeting the exchange of practices for policy reform

The Horizon 2020 PSF is a demand driven tool that responds to requests made by national authorities on a voluntary basis. To organise this process and the PSF pipeline of projects, the Commission issues an annual Expression of Interest via the European Research Area and Innovation Committee. National authorities are invited to respond to it or to address their requests for specific support to the email address RTD-PSF@ec.europa.eu.

H2020 PSF Example:
A Peer Review of Moldova’s Research and Innovation system took place from November 2015 to April 2016, at the request of the Academy of Sciences of Moldova. It was carried out by a Panel of high-level independent experts (Poland, Greece, Austria, Romania and Netherlands) and senior officials from EU governments (Austria, Estonia). Amongst its seven high-level policy recommendationss were the following:

- Embed Research and Innovation (R&I) policy in the overall economic policy strategy of the country.
- Improve the governance of the national R&I system by strengthening the political responsibility for R&I with a dedicated Ministerial responsibility.
- Create an independent, transparent and accountable R&I implementation Agency.

European Neighbourhood Policy

Through its European Neighbourhood Policy (ENP), the EU works with its eastern and southern neighbours to achieve the closest possible political association and the greatest possible degree of economic integration. This goal builds on common interests and on values — democracy, the rule of law, respect for human rights, and social cohesion. The ENP is a key part of the European Union’s foreign policy.

The ENP has many funding instruments to facilitate its broad activities. Amongst these instruments, the Twinning and TAIEX schemes are particularly useful for supporting the introduction and development of innovation and technology-transfer policies in Eastern Partnership Countries.
ENP Twinning

Twinning is a European Union instrument for institutional cooperation between Public Administrations of EU Member States and of beneficiary or partner countries. Twinning projects bring together public sector expertise from EU Member States and beneficiary countries with the aim of achieving concrete mandatory operational results through peer to peer activities.

Since 2004 the Twinning instrument is also available to some of the EU Eastern and Southern Neighbourhood partner countries (e.g. Armenia, Azerbaijan, Georgia, Moldova and Ukraine). In this framework it aims at upgrading the administrative capacities of the public administration of a partner country through the training of its staff and the support to the reorganisation of its structure. It also supports the approximation of national laws, regulations and quality standards to those of EU Member States in the framework of Cooperation or Association agreements signed with the EU.

ENP Twinning Example:
The 18-month Twinning project on support to the implementation and enforcement of intellectual property rights in Moldova was implemented during 2011-2012 by the Danish Patent and Trademark Office, the Romanian State Office for Inventions and Trademarks and the State Agency on Intellectual Property of Moldova.

The project strengthened the administrative capacity of institutions in Moldova to protect and enforce intellectual property rights, enhanced communication between the Government institutions responsible for the protection of intellectual property rights, strengthened and raised awareness about the importance of protecting intellectual property rights and assisted with the development of the national system for the protection of Geographical Indications, Designations of Origin and Traditional Specialties Guaranteed.

ENP TAIEX

TAIEX is the Technical Assistance and Information Exchange instrument of the European Commission. TAIEX supports public administrations with regard to the approximation, application and enforcement of EU legislation as well as facilitating the sharing of EU best practices. It is needs-driven and delivers appropriate tailor-made expertise to address issues at short notice in three ways:

- Workshops: EU Member State experts present specific areas of EU legislation in workshops to a large number of beneficiary officials.
- Expert missions: EU Member States expert(s) are sent to the beneficiary administration to provide in-depth advice on the transposition, implementation or enforcement of a specific part of EU legislation.
- Study visits: a group of three practitioners from a beneficiary administration take part in a study visit to an EU Member State’s administration.

TAIEX assistance is open to:

- Civil servants working in central public administrations.
- Judiciary and law enforcement authorities.
- Parliaments and civil servants working in Parliaments and Legislative Councils.
- Representatives of social partners, trade unions and employers’ associations.

TAIEX does not provide direct support to civil society, private citizens or to individual companies.
European Investment Bank

The European Investment Bank (EIB) can finance investment projects in Armenia, Azerbaijan, Georgia, Moldova and Ukraine to support the European Neighbourhood Policy, in particular the Eastern Partnership launched in 2009.

By the end of 2014, EIB lending in the Eastern Partnership had reached a total of 4.4bn euro, financing some 67 investment projects or providing credit lines to support SMEs in all five Eastern Partnership countries that have signed a Framework Agreement with the Bank.

With Armenia, Georgia and Ukraine having become associated to Horizon 2020, it means they can also benefit from the EIB’s InnovFin scheme to support innovation.

InnovFin

InnovFin is a joint initiative launched by the European Investment Bank Group (EIB and EIF) in cooperation with the European Commission under Horizon 2020. It consists of a series of integrated and complementary financing tools and advisory services offered by the EIB Group, covering the entire value chain of research and innovation in order to support investments from the smallest to the largest enterprise.

InnovFin is available across all eligible sectors under Horizon 2020, in EU Member States and Associated Countries. InnovFin financing tools cover a wide range of loans and guarantees which can be tailored to innovators’ needs. Financing is either provided directly or via a financial intermediary. The financial products are available for:

- Banks and financial intermediaries;
- Mid-sized and large innovative business; and
- Large research and innovation projects emanating from universities and public research organisations, among others.

The EIB Group can provide from 25k - 300m euro, either directly or indirectly through banks or other financial institutions. By 2020, InnovFin is expected to make over 24bn euro of debt and equity financing available to innovative companies to support 48bn euro of final research and innovation investments.

InnovFin Example:

An agreement between The European Investment Fund (EIF) and ProCredit Group under the InnovFin scheme has enabled a 20m euro guarantee to be offered to ProCredit Bank Moldova, which in turn is stimulating lending to innovative SMEs as well as small mid-caps in Moldova. Specifically, it has helped Agro-Panfil GT – a Moldovan agricultural company specialised in cereals cultivation and harvest services - to obtain a loan and guarantee to invest in an advanced GPS guided combine harvester that saves farming time, creates less soil damage, and increases driver security and comfort.
Annex 2 - Audited organizations

GTU, Georgia

Organization Profile - Respondents: Archil Chirakadze and Commercialization Department Personnel

Georgian Technical University is the main and largest technical university of Georgia (around 12,000 students and 1,500 faculty and staff members). It was founded in 1922 as a polytechnic faculty of the Tbilisi State University and then transformed into an independent "Georgian Politechnical Institute" in 1928 and finally achieved University status in 1990.

Since its establishment, Georgian Technical University continues its fine tradition of providing technical specialists to industry and the exact sciences within its faculties of Civil Engineering, Power Engineering and Telecommunication, Mining and Geology, Chemical Technology and Metallurgy, Architecture, Urban Planning and Design, Informatics and Control Systems; Transportation and Machine-Building, Humanitarian and Social Sciences.

Over recent years GTU has further widened its offers also thanks to international partnerships with leading education institutions abroad which have led to the establishment of the "Caucasus Business School" (a joint project of GTU, Tbilisi State University and Georgia State University (Atlanta, Georgia, USA), German Studies faculty, a Franco-Georgian Studies faculty and a "Cisco Networking Academy". GTU is known for its strong ties with Andria Razmadze Institute of Mathematics of Georgia, the leading mathematical research institute in TransCaucasia.

IRPHE, Armenia

Organization profile - Respondent: Prof. Arsen Hakhoumian (Head of the IRPHE)

The Institute of Radiophysics & Electronics was founded in 1960 and comprises a staff of 250 persons from whom 45 are of Doctoral or Professor level. IRPhE is an R&D arm of the Armenian National Academy of Sciences engaged in the fields of radio engineering, automatic control, theoretical physics, solid state physics, semiconductors and superconductivity. Its main areas of research are:

- Development of radio physical methods and microwave units and systems for remote sensing of the Earth and atmosphere, medical diagnostics and analysis of material characteristics.
- Development of new functional elements and metal (dielectric) waveguide structures in the THz frequency band.
- Synthesis and analysis of semiconductor nanometre heterostructures and complex thin-film materials for application in IR optics (electronics).
- Study of crystal lattice defects in solids, affecting mechanical and electric (optical) characteristics of materials.
- Theoretical analysis of electromagnetic waves propagation in plasma, generated by moving charged particles.

The Institute has an area of about 200 acres, within which research laboratories totalling some 13,000m² are located, plus about 10,000m² assigned to design, development and production.
IPR-NAS, Armenia

Organization profile - Respondents: Yuri MALAKYAN (TTO manager), Anahit GOGYAN

The Institute for Physical Research of the National Academy of Sciences of Armenia is a public research organization working in the fields of laser physics, material science and related areas.

With more than 175 employees of which 18 doctors of science, 9 PhDs and funding from the State of around €350 000 per year, IPR-NAS issues yearly 100 publications and is collaborating with over 35 leading scientific centres and has been involved in over 40 international grant programmes within the last 5 years (FP7, ISTC, INTAS, CRDF, NFSAT, Volkswagen, ANSEF and SCOPES).

The institute has collaboration with several countries, such as France, Germany, USA, Italy, UK, Russia, Latvia, Bulgaria, Poland, Japan, Spain, Australia, Switzerland, Croatia, Canada, Taiwan, Greece and others. It also receives over 30 visits from international scientists each year.

Main research topics:

- atomic physics, laser spectroscopy
- quantum and nonlinear optics, photonics
- quantum information
- matter wave physics
- interaction of radiation with matter
- new solid-state lasers, laser materials and schemes
- growth and characterization of laser and scintillation crystals
- thin film structures for microelectronics and laser technologies
- solid state physics, organic ferromagnetism
- high-temperature superconductivity
- synthesis and characterization of nanomaterials
- scientific instrumentation

ISP-NASU, Ukraine

Organization profile - Respondents: Alexander Stronski, Yulia Kiyak (TTO manager)

The V. Ye. Lashkaryov Institute of Semiconductor Physics (ISP), NAS of Ukraine, founded in 1960 on the basis of several departments and laboratories of the Institute of Physics of the Academy of Sciences of UkrRRs, has now more than 700 employees, out of which 400 researchers, 80 DrSc (Doctor) and more than 210 PhDs.

A significant contribution to the foundation and organization of further activity of the Institute was made by the first heads of the research departments and laboratories.

The Institute has also a self-sustained Special Design &Technology Bureau with pilot production and applies new forms for the organization of scientific research and the application of results. ISP NASU has the following organizations and departments:
• Technological Park “Semiconductor Technologies and Materials, Optoelectronics and Sensor Engineering”;
• Centre for collective use of devices of NASU “Diagnostics of semiconductor materials, structures and device systems;
• Testing laboratory of protective holographic elements (certificate of ISO 9001);
• Central testing laboratory of semiconductor materials science (accreditation certificate of the All-Ukrainian State Research and Production Centre for Standardization, Metrology and Certification from 28 December, 2001);
• Centre for testing photo-conversion devices and photovoltaic arrays (accreditation certificate of the State Committee of Ukraine for Technical Regulation and Consumer Policy);
• Centre for testing and diagnosing semiconductor light sources and lighting systems based on these sources.

G. Tsulukidze Mining Institute, Georgia

Organization profile - Respondents: Nikoloz Chikhradze (director) Davit Homeriki (TT manager) Edgar Mataradze (senior researcher)

G.Tsulukidze Mining Institute (TMI), formerly known as the Institute of Mining Mechanics of the Georgian Academy of Sciences, was founded in 1957. In 2006 the Institute received the status of a legal entity under public law.

The regular staff of the Institute consists of 113 employees, including academic staff of 30 as well as 35 young specialists

The academic staff of the Institute includes one correspondent-member of The Georgian National Academy of Sciences and 30 doctors or research fellows of equivalent academic degree.

Main divisions:

• Underground Structures Construction, Mining and Complex Mechanization Department
• Blasting Technologies Department
• Rock, Construction Material Properties and Quality Control Department
• Analytical Chemistry and Mineral Processing Department
• Research Center of Engineering Developments and Design

The Institute has also a Physical and Chemical Analysis of Water and Technologies Group.

UIIP-NASB, Belarus

Organization profile – Respondent: Victor B. Alyushkevich (deputy director)

The United Institute of Informatics Problems of the National Academy of Sciences of Belarus (UIIP-NASB) is the leading Belarusian governmental institution in the fields of ICT and space research. It has over 400 staff including 264 research fellows, 19 DSc’s and 76 PhD’s. UIIP-NASB is an associate member of GEANT 3 project, represents Belarusian TERENA and participates in the EC-funded Baltic Grid-II project.
It is the Belarusian coordinator and principal executor of three past and present Russian-Belarusian supercomputer programs: SKIF (2000-2004); TRIADA (2005-2008) and SKIF-Grid (2007-2010). The most important results of the SKIF programs are the National Supercomputer and GRID Centres.

UIIP-NASB has set up the Belarusian Grid CA and has obtained full accreditation from EUGridPMA for the CA. It operates the network of the National Academy of Sciences of Belarus (BASNET) which is connected to the pan-European research network GEANT. UIIP-NASB runs central services for gLite sites in Belarus and manages the operations centre for UNICORE national Grid segment. Application results include supercomputer modelling and simulation for Belarusian industries, image processing and developing automated diagnostic screening for Belarusian medical and research institutions, and Earth remote sensing. Last but not least, UIIP-NASB is the FP7 Space NCP for Belarus.
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