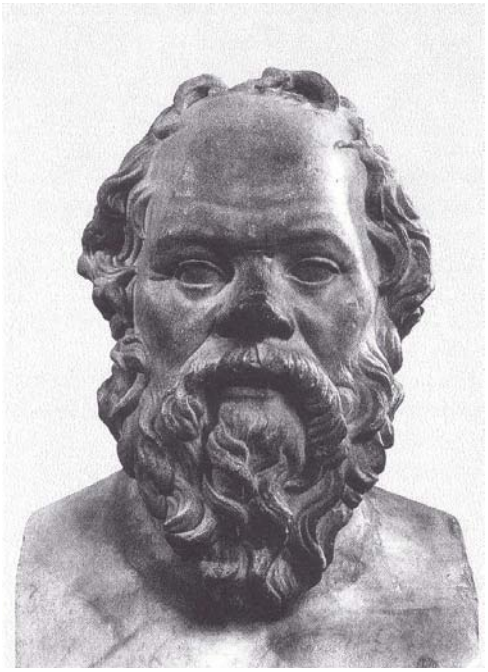

INTERNATIONAL KNOWLEDGE TRANSFER

Investigations of European Practices

Table of contents

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Executive Summary

Introduction

Innovation strategy in Europe anticipates greater growth and competitiveness through enhanced innovative activity.[1]

The Innovation Union Scoreboard (IUS)[2] measures innovative capacity and activity in the 27 European Union Member States (EU27) as well as Croatia, Iceland, the Former Yugoslav Republic of Macedonia, Norway, Serbia, Switzerland and Turkey. In addition it provides some comparative analysis with the US, Japan and the so-called BRIC countries (Brazil, Russia, India and China).

According to IUS 2010, innovative strength is unevenly distributed throughout Europe. Newer member states Bulgaria, Latvia, Lithuania and Romania are identified as "modest innovators,"[3] with an innovation performance which is significantly below the European average. Nevetheless, the IUS 2010 concludes that most modest innovators are in fact improving more quickly than the European Union (EU) average (EU27), with the exception of Lithuania which is experiencing below-average growth.[4]

Those innovating below the average (but not significantly below) are termed "moderate innovators" and include the Czech Republic, Greece, Hungary, Italy, Malta, Poland, Portugal, Slovakia and Spain. Notably, innovation leaders are to be found almost entirely in Scandinavia (Sweden, Denmark and Finland) with the exception of Germany. Innovation followers (where performance is close to the EU average) include the Benelux countries (Belgium, Luxembourg and the Netherlands), the British Isles (the United Kingdom (UK) and Ireland), as well as Austria, Cyprus, Estonia, France and Slovenia.

Due to the great diversity of innovation in Europe, from modest to leading, the average performance is consequently far below that of the more homogeneous industrialized economies like the US and Japan,[5] but nevertheless still above that of the BRIC economies.[6] The EU27 lead over Russia and India is relatively small but stable, but the lead over China and Brazil is rapidly decreasing.[7]

Innovation and Internationalization

There is a pervasive assumption of a positive link between the internationalization of research and development (R&D) and innovation, meaning the ability to innovate in an international trade environment will be beneficial for

[1] Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions, Putting knowledge into practice: A broad-based innovation strategy for the EU, Brussels, 13 September 2006, COM (2006) 502 final.

[2] Innovation Union Scoreboard (IUS) 2010 available at http://ec.europa.eu/enterprise/policies/innovation/files/ius/ius-2010_en.pdf.

[3] IUS 2010, Executive Summary, page 6.

[4] IUS 2010, page 13.

[5] IUS 2010, page 19.

[6] IUS 2010, page 19.

[7] IUS 2010, page 7.

all states, including those below the EU27. A 2009 study by Filippetti et al[8] has found a correlation between innovation and internationalization of research, but notes that further research would be required to demonstrate a clear causality between a higher degree of internationalization and enhanced innovation rates.[9]

This lack of firm data on the internationalization/innovation nexus makes it possible to consider the alternative relationship, where in fact greater innovation facilitates internationalization, as lead innovators have the advantage of globally competitive product portfolios. This suggests a possible conundrum in that innovation is both required for and enhanced by increased internationalization. In other words, industries from innovative countries show a propensity and proficiency for internationalized commercialization and trade. At the same time, that internationalization enhances circumstances for additional innovation in that it provides the opportunity to gather further knowledge and resources regarding country-specific manufacturing styles, management cultures and so on. Such knowledge enhances competitiveness and innovative output through the ability to adapt and apply locally-relevant knowledge. This transfer of knowledge to the human resources of the firm is particularly relevant in building research capacity and adaptability in an international trading context.[10]

Third Country Partnering

It is therefore important to consider, on the one hand, the rationale or benefit for entities located in modest innovator states, like Romania, to cooperate with partners from third countries, like India, and on the other hand, the incentive and benefit for third country companies or Public Research Organizations (PROs) to seek such collaboration. In particular, it would appear to be in the best interests of third country partners to seek collaboration with lead innovators, like Finland in Sweden, in order to maximize their opportunities for transfer of knowledge resources and high technology.

The available country-related statistics and figures demonstrate that knowledge exchange between the new member states and other transforming or developing economies outside the EU is indeed scarce.[11]

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[8] Filippetti A et al, Is the innovation performance of countries related to their internationalization? Pro Inno Europe Inno Metrics, November 2009. Available at

http://proinno.tuxe.es/node/admin/uploaded_documents/EIS_2009_Innovation_performance_and_internationalizational.pdf

[9] Filippetti et al (2009), pages 7 and 10.

[10] For instance, see Hocking JB et al, A knowledge transfer perspective of strategic assignment purposes and their path-dependent outcomes, *International Journal of Human Resource Management*, vol 15 (2004), no 3, pp 565-586.

[11] The Lithuanian Ministry of Education and Science, for instance, lists a number of cooperation agreements on its website, but the major part research cooperation seems to be carried out within the framework of EU and Nordic cooperation programmes (see „International Cooperation" section at http://www.smm.lt/en/); the same is true for Estonia, (see Ministry of Education and Research report „Research and Development in Estonia: Overview and Statistics" at http://www.hm.ee/index.php?148558, according to which research within the EU framework programmes seems to occupy the major part of international cooperation programmes, in spite of the existence of treaties with third countries); a similar message is delivered by Latvia's Ministry of Education and Science in its Fact Sheet on Science (http://izm.izm.gov.lv/upload_file/en/science.pdf); also Poland's external cooperation seems to be predominantly focused on the EU (Website of the Ministry of Science and Higher Education, at http://www.nauka.gov.pl/ministry/international-cooperation/bi-and-multilateral-cooperation-in-higher-education-and-research/), as well as external cooperation carried out by Czech and Slovakian institutes (the only reference to research cooperation made by the website of the Czech Ministry of Education, Youth and Sports (English version) refers to a Government Commissioner for European research, at http://www.msmt.cz/research-and-development-1/plenipotentiary-of-the-government-of-the-czech-republic; according to Slovakia's "Long-term Plan of the State Science and

Facilitating International Knowledge Transfer

Nevertheless, this report will demonstrate that an international environment and culture of innovation and knowledge transfer is desirable in facilitating the conditions for a more innovative Europe. Fostering KT between all EU member states and developed as well as developing third countries is advantageous for the European research landscape in a number of areas, in particular with respect to emerging technologies (including biotechnology and nanotechnology), which provide specific challenges for intellectual property (IP) and regulatory frameworks.

Highlight: Nanotechnology

Several emerging economies have initiated ambitious programmes related to nanotechnology.[12] While many of these programmes may be overly ambitious, there is a strong likelihood that emerging markets with moderate growth rates may soon attain a leading position in a new sector, even if they remain weak in other areas. In such cases, there is an opportunity for growth from the position of mere follower of innovation, and indeed mere recipient of knowledge, to active leader in innovation and R&D in this sector.

In various emerging markets, new technologies present particular opportunities as well as challenges.

Highlight: India and the Technology Sector

At the dawn of the 1990s, India demonstrated that even a developing country may easily catch up with industrialized countries in emerging industries and technologies, despite an otherwise underdeveloped innovation infrastructure. In 1990 India abolished the bureaucratic "License Raj" which, as part of a planned economy, required registration of all kinds of economic activity, including severe restrictions on foreign investment. This led to India concentrating its scarce innovative potential on information technology and software, a still young technology sector for the region. At the same time, the US was already leading in the sector, but not to such an extent that would have rendered it impossible for other economies to enter the market and close the innovation gap. Thus, during the 1990s, India developed a vibrant software sector and western high-tech industries soon outsourced a part of their sophisticated software engineering to new technology centres such as Bangalore.

Highlight: China and Environmental Technology.

Largely unnoticed by the international press, China has emerged as a globally-competitive leader in the railway technology sector[13] and strives for leadership in

Technology Policy by the Year 2015" which can be downloaded at http://www.minedu.sk/index.php?lang=en&rootId=20, research cooperation under the European Framework Programmes seems to occupy the biggest part of outward-oriented research activities); the same is true with regard to Hungary (see "International Activity Site" of the Ministry of National Resources at http://www.nih.gov.hu/english/international-activity, which, however, also lists a number of bilateral agreements with third countries (for third-country related research activity, see explanations below at B. II. 3); the Romanian and Bulgarian ministry sites do not provide information in English.

[12] Salamanca-Buentello F et al, Nanotechnology and the Developing World, *PLoS Medicine*, 2(5), May 2005.

[13] Fairley P, China's High-Speed Rail Revolution, *Technology Review*, 11 January 2010.

environmental technology.[14] Innovation in the environmental sector is considered to be essential to achieving sustainable growth overall.[15]

In certain areas of R&D, in particular in the areas of pharmaceutical and biotechnological research, specific geographical or climatic conditions may give rise to technology leadership in certain areas. Brazil, for instance, has developed a capable biotechnological research sector, in part related to its vast biological diversity.[16] Chile, a country which is rather insignificant in other innovative sectors, claims technology leadership in aquaculture research.[17] India has launched a number of programmes which aim at professionalizing the exploitation of traditional knowledge accumulated over millennia of agrarian culture.[18] Such traditional knowledge has already contributed and is anticipated to contribute further to new medicines and breeding technologies.[19]

Public research

This Report concludes that in order to maximize innovative activity and realize research potential in new technologies in an international environment, partnering and IKT will play an increasingly significant role. The Commission has identified knowledge transfer between PROs and industry, as well as with other third parties, as one of ten key areas for action.[20]

Further, while partnering between public and private institutions is of increasing importance and relevance, it remains one of the more difficult cooperation arrangements for reasons that are not only structural but also cultural.

The present Report thus focuses on publicly funded research cooperation arrangements in view of their particular importance to Europe's research capacity and growth.

The Aims of this Report

The aims of this report are:

- to analyze the mechanisms of IKT;
- to categorize the kinds of and methods for IKT cooperation; and
- to provide recommendations for effective tools for IKT.

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[14] OECD (2009), "Eco-Innovation Policies in The People's Republic of China", Environment Directorate, OECD.

[15] Y Sun et al, Pattern of patent-based environmental technology innovation in China, *Technological Forecasting and Social Change*, 75, 2008: 1032-1042.

[16] Brazil's Biotech Boom, *Nature*, 466(7304), 15 July 2010.

[17] For instance, see the Food and Agriculture Organization (FAO) National Aquaculture Sector Overview for Chile available at http://www.fao.org/fishery/countrysector/naso_chile/en

[18] Lal R & Sorte WF, Where biodiversity, traditional knowledge, health and livelihoods meet. Working Paper 81, International Policy Centre for Inclusive Growth / United Nations Development Program (UNDP), April 2011.

[19] The World Health Organization (WHO), Fact Sheet No 134, December 2008, available at http://www.who.int/mediacentre/factsheets/fs134/en/

[20] Commission Communication, Putting knowledge into practice: A broad-based innovation strategy for the EU, 13 September 2006, COM (2006) 502 final. See further, Commission Communication, Improving knowledge transfer between research institutions and industry across Europe: embracing open innovation, 4 April 2007, COM(2007) 182 final

The Structure of this Report

This Report is structured in four parts.

Part A introduces the research methodology and scope of the Report, as well as basic terms and definitions (assisted by the Annex 1: Glossary). It considers in detail the research and innovation practices of public research organizations (PROs) and industry, including a consideration of the various examples of sector-specific activities and collaboration arrangements. This includes an examination and determination of the fundamental prerequisites for effective IKT as well as the potential obstacles.

Part B examines IKT agreements towards an identification of the patterns of KT, the potential cultural and historical convergences between member states and third countries, and provides interim conclusions as to improving conditions for innovation and internationalization.

Part C reviews in detail the various interactive tools, support measures and guidance towards identifying optimal elements to be included in such mechanisms.

Part D provides a final summary of the conclusions and an outline of the implications for KT and the necessary tools to be observed.

General Conclusions

Effective IKT requires attention to a number of key prerequisites for successful partnership:

1. Context (including research infrastructure and institutional differences);
2. Language (researcher communication and mobility, drafting language);
3. Intellectual property;
4. Bilateralism and the possible impact on flexibilities for IKT;
5. Administrative efficiency;
6. Commercialization; and
7. Funding and exploitation.

Interactive tools, support measures and guidance should include flexibilities and appropriate adaptability in order to account for the varying realities in partner countries. Rigid approaches to partnership models will ultimately undermine possibilities with third countries.

Model agreements and other similar tools have significant value for application in the area of IKT. However, in that application such tools should be equipped with appropriate flexibility so as to adapt to different conditions in different partner countries as well as differences between academia and industry.

PART A International Knowledge Transfer – Practice, Obstacles, Prerequisites

I Basics of international knowledge transfer (IKT)

International knowledge transfer (IKT) occurs in various identifiable and specific forms. As such, IKT activities might be grouped according to:

- the forms of cooperation;
- the transfer partners;
- the levels on which knowledge transfer occurs; and
- the types of funding and infrastructure supporting knowledge transfer practices.

IKT is particularly influenced by the identity of the partners. Thus, cooperation between member states and European partners may be quite different from cooperation between member states and third countries. Similarly cross-sectoral cooperation raises specific issues, particularly for cooperation between academia and industry. It is this latter relationship that is of particular interest to this report as the academia-industry partnership promises great economic and scientific potential.

Forms of Cooperation

IKT is provided within different cooperation forms. They are

- cooperative research
- contract research
- licensing
- spin offs
- subsidiaries

The Transfer Partners

Partners in knowledge transfer arrangements usually include academic, industry and at times also government partners. Such diversity in partners brings with it also greater complications and varying business cultures that must be reconciled for effective transfer agreements and collaboration activity.

The Levels of Knowledge Transfer

Knowledge transfer proceeds on the intra-EU level in interaction between member states as well as on an extra-EU level through partnerships between European PROs and partners from third countries.

Funding

Cooperative research is usually financed by external funding. This may be public, private, or mixed, via basic funding or via project funding. Despite the very few differences in the organizational and legal forms of IKT arrangements between national and international arrangements the specific handling of the arrangements will likely differ.

II Practices of Public Research Organizations (PROs)

The involvement of Public Research Organizations (PROs) in international research activities still remains small in comparison with their overall engagement in R&D activities at national level. Nevertheless, collaboration with

PROs is important, being higher than average in all innovation leaders[21] and in non-European leaders, including the US. Thus, public-private partnerships are growing in relevance and potential for European innovation.[22] The following section tries to provide the basics with several instructive examples of each of the cooperation forms that active PROs currently undertake.

1. Cooperation and Collaboration

IKT via horizontal collaborative arrangements is performed utilising various cooperation models. The significance of horizontal cooperation is the more balanced arrangement for all partners on the same level. Knowledge is created commonly through contributions of all partners, even if the individual parts may differ significantly. Such knowledge transfer on an international level is characterised and differentiated by the broader range of knowledge dissemination that is possible. Further IKT commonly raises 4 notable features:

- cooperative research
- alliances
- virtual institutes and
- researcher mobility

1.1 Cooperative basic and applied research

Depending on the kind of research and the objectives of the research cooperation in question, risk management of cooperation projects varies tremendously from case to case. The global dimension of open innovation[23] and open access publication[24] procedures are examples of dissemination strategies for available knowledge, commonly applied in technology and software fields,[25] but also utilised in other fields of knowledge development and transfer.

Case Study

Development of social web-platforms for data collection via GWAP[26]

Innovative endeavours like this German research project show new structural formations, specifically towards facilitating knowledge transfer and sharing.

[21] IUS 2010, page 6-7.

[22] See further the special theme, Public Sector Innovation, in IUS 2010, page 9. A pilot European Public Sector Innovation Scoreboard is forthcoming pursuant to Commission Communication, 6 October 20101, Europe 2020 Flagship Innovatiative: Innovative Union, COM(2010) 546 final

[23] Open innovation refers in particular to inter-firm cooperation in R&D, of particular relevance to IKT partnerships. See further Chesbrough HW, *Open Innovation*, Harvard Business School P, 2003.

[24] Open access publishing is the practice of unrestricted online access to research output. See further the examples of the Public Library of Science (PLoS) and the discussion in Laakso M, Welling P, Bukvova H, Nyman L, Björk B-C, et al, The development of open access journal publishing from 1993 to 2009. PLoS ONE 6(6) 2011.

[25] See further Chesbrough, H., Vanhaverbeke, W., West, J. (2006), *Open Innovation: Researching a New Paradigm*, Oxford University Press.

[26] Kohle H, Ludwigs-Maximilians-Universität München, see http://www.artigo.org and http://www.kunstgeschichte.unimuenchen.de/forschung/digitalekg/artigo/index.html. See further Kohle H, *Kunstgeschichte goes Social Media. Laien optimieren eine Bilddatenbank-mit einem digitalen Spiel,* in: http://www.stmwfk.bayern.de/mediathek/pdf/aviso_3_11.pdf, pages 38-43. GWAP is used as an acronym for "games with a purpose".

The project is attached to the idea of the *wisdom of the crowds*[27] and motivates *social tagging* to build up databases in the humanities.

Case Study

The Belgian Interuniversity MicroElectronics Centre (IMEC) is an example of a successful collaboration model of basic and applied research in the field of microelectronics. The initiative is international in scope, where PROs and industries from within Europe and abroad cooperate to conduct joint research, profiting from a knowledge platform commonly shared by all collaborators. The platform works as a base for distributing and creating knowledge. The members of the platform are research centres and industrial partners from different specializations, all contributing research capacity and competence to the knowledge pool.

The IMEC collaboration model achieves a flexible balance between own and shared know-how in a complex research field. The IP model, accepted by all partners as a condition of collaboration, is significant in that it combines access to basic knowledge with the opportunity to protect individual knowledge for each of the single partners are far as their business activities are concerned. Further, this model is sustainable in an international consortium, as demonstrated in this case.[28]

1.2 Alliances

Strategic alliances in R&D are usually performed within one of the following structures:

- joint use of research infrastructure
- spin-in
- joint venture

Joint Use of Research Infrastructure

The joint installation and use of research laboratories is a common process, especially in research fields with expensive laboratory facilities such as microelectronics. The European Organization for Nuclear Research (CERN) runs a laboratory in Geneva where particle physicists from all over the world conduct basic research on special facilities as advanced particle accelerators.[29] Researchers from 580 universities worldwide share the laboratories. Among 85 nationalities worldwide are represented in the body of scientific researchers benefiting from the facilities.[30] This means that very expensive facilities, such as the Large Hadron Collidor, can be built whereas they would be difficult or impossible for individual research units to build alone.

[27] Surowiecki J., *The wisdom of the crowds. Why the Many are smarter than the Few and How Collective Wisdom Shapes Business, Economies, Societies and Nations*, New York 2004.

[28] See further http://www2.imec.be/

[29] See further research at CERN at http://public.web.cern.ch/public/en/Research/Research-en.html and details of the Large Hadron Collider at http://public.web.cern.ch/public/en/LHC/LHC-en.html

[30] The acronym CERN derives from the former organization´s name *Conseil Européen pour la Recherche Nucléaire.* See further http://public.web.cern.ch/public/

Applied research within shared laboratories is performed by the Fraunhofer-Chalmers Research Centre for Industrial Mathematics (FCC) in Göteborg, the alliance of Fraunhofer Institute for Industrial Mathematics ITWM in Kaiserslautern and the Institute of Applied Mathematics of Chalmers-University in Göteborg. In the alliance, core research capabilities of the German team, such as process simulation, financial mathematics and diagnostic systems, are combined with Swedish expertise in the analysis of sensor and measuring systems. Industry partners, including Volvo and Eriksson have been attracted by the PRO's corporate research outputs. In this sense, access to research is facilitated for both parties through an improved technical knowledge and capacity, thus enabling knowledge transfer on both the intra- and extra-European levels.[31]

Spin-Ins

So-called *spin-ins* are utilised to facilitate intervention between the actual production cycle and research on the particular product. A company may rent capacity and infrastructure within a research lab and profit from insights into the research activities and the shared infrastructure. The research institution profits from the improvements of production and real progress in production methods and gains in research knowledge. The production of microchips at Fraunhofer ISIT in Itzehoe, Germany, an Institute for microelectronics and microsystems, is a noted example of the application of spin-ins in IKT partnerships, in this case with a US company.[32]

Joint Venture

The *joint venture* is the third form of alliance to be introduced. The joint venture is the establishment of an independent, common subsidiary by at least two partners. The alliance might be temporally limited. Strategic objectives of the relationship build the core of alliance.

A notable example of this type of alliance is the European Satellite Navigation System Galileo. Galileo was planned as a competitor to the US GPS and Russian GLONASS. In 2004 the EU and US agreed to take advantage of the synergistic benefits of the two compatible systems, Galileo and GPS, to reach greater range of coverage, established through an alliance agreement.[33] This is an outstanding example where the risk in an uncertain and competitive path to success was mitigated through international cooperation, allowing all partners to profit from IKT.

1.3 Virtual institutes

To date, cooperative research in the form of virtual institutes has been most common within publicly-funded projects. Within Europe, the European Institute of Technology (EIT), the Networks of Excellence (NoE) and the Joint Technological Institutions (JTI) are all noted examples of cooperative research in virtual institutes. The following comment refers to the EIT. However, examples of R&D cooperation within virtual institutes on an extra-European level are less common. Nevertheless, this type of international cooperation is identified as a priority by many funding councils, particular in areas of research related to development.[34]

[31] See the Fraunhofer-Chalmers Centre, http://www.fcc.chalmers.se/fcc/profile/entrepreneurial-competence/

[32] See further the Fraunhofer site, http://www.isit.fraunhofer.de

[33] For details see http://useu.usmission.gov/072607_galileo.html

[34] For instance, see the work of the UNCTAD Virtual Institute at http://vi.unctad.org/

The institutions engaging in the EIT are organized in Knowledge and Innovation Communities (KICs). KICs are virtual institutes, which allow research in special fields on a cooperative basis. They are established in the three crucial fields of climate change, sustainable energy and future information and communication society.[35] The establishment of KICs aims primarily to develop European networking culture and to advance entrepreneurial awareness, especially within universities.[36]

1.4 Researcher mobility

A significant aspect of IKT is knowledge exchange through mobility of participating researchers. A notable example is that of the Chinese automobile industry, where IKT and technical capacity is enhanced through international training. This is where Chinese nationals are educated abroad, returning to China in a professional capacity as trainers exclusively for Chinese firms to advance and foster a sustainable Chinese automobile tradition and industry.[37] This phenomenon has become known as the return of the "turtles."[38] This strategic practice of educating, training and socialising Chinese students abroad is accompanied by a distinctive tendency to return to China and transfer those new skills, knowledge and research capacity to China.

Lesson

The lesson to be learnt from a review of these various forms of cooperative projects is that **a single general approach is not possible or advisable due to the diversity both in the circumstances and partners themselves**. Key determining factors include the kind of research, the location of the stakeholders, the availability of financial resources and the willingness to create an infrastructure geared towards joint success and not advantages for one partner only.

2. Contract research

Contract research is a classical vertical KT instrument to transfer specified technical solutions or other forms of knowledge against remuneration. R&D activities through contract research are common amongst PROs. The largest European organization devoted to contract research with industry is the German Fraunhofer Gesellschaft (FhG).[39] Many other university organizations are also in operation. In Europe most of the European contract research organizations are members of EARTO[40] sharing their experiences and cooperating as far as it is recommended and useful. Very importantly, contract research organizations in

[35] For further information see the European Institute of Innovation and Technology (EIT) at http://eit.europa.eu/

[36] For further information on entrepreneurial education within KICS see http://eit.europa.eu/kics1/knowledge-and-innovation-communities/overview.html

[37] Zejian Li, *The Role of International Technology Transfer in the Chinese Automotive Industry*, Tokyo 2009.

[38] Shenkar O, *The Chinese Century: The Rising Chinese Economy and Its Impact on the Global Economy, the Balance of Power, and Your Job*, Pearson Education, 2005: 75.

[39] See further http://www.fraunhofer.de/en/about-fraunhofer

[40] EARTO, the European Association of Research and Technology Organizations, is a trade organization representing over 350 RTOs from across Europe, see the press release on http://www.earto.org/.

Europe, in addition to the activities of universities and public research organizations, have been established to bridge the gap between academia and industry. In the US, the universities themselves cooperate directly with industry since the Bayh Dole Act enhanced commercialization of publicly-funded research by universities as the Act returned ownership of the academic IP to universities, where previously this was retained by the federal funding agency.[41] The Act also led to a marked increase in the number of university technology transfer offices (TTOs). In Asia the situation is not comparable in this respect.

IKT via Contract Research

The Danish Technological Institute (DTI) is actively engaged in contract research with European clients, through which it achieves greater turnover from foreign than domestic clients. Its network of experts involves scientists from all over the world.[42] The institute is facilitating a transcontinental collaborating team, with research capacity and innovation being the unifying factors.

The Netherlands Organization for Applied Scientific Research (TNO) has a market income from contractually-conducted research on an international basis that is almost as high as the market income from domestic clients.[43]

In addition to its focus on contract research, **the Technical Research Centre of Finland (VTT)** is engaged in global research communities. VTT cooperates with PROs intensively on the international level. Its model includes strategically established contact points in selected technology centres all over the world,[44] which work to enhance chances of efficient IKT activities through contract research.

Lesson

The international practices of contract research show that the contractor's specialization is the first and most important reason that motivates contacts and orders. All of the abovementioned institutions utilise special and particular business models for international contracting, either for strategic reasons or to expand the research capacity of a PRO beyond its domestic resources. **It is therefore recommended that comprehensive development of model structures be utilised in assisting the entry of new firms and research entities.**

[41] The Bayh Dole Act, enacted in 1980, is concerned with intellectual property arising from federally-funded research. Universities could still contract directly with industry prior to its enactment, however rights in federally-funded research would vest solely with the US Federal Government. This was considered a significant obstacle to research by virtue of its direct impact on exploitation and the 1980 Act went some way to address this. See further the discussion in Gibson J, *Intellectual Property, Medicine and Health: Current Debates*, Ashgate, Aldershot, 2009, page 180.

[42] See further details at http://www.dti.dk/specialists/28520.

[43] In 2009 the total consolidated income, 576 Mio. Euro, is split into funds by Dutch industry (38 %), international industry (35 %) and Dutch government (27 %), see further information at http://www.tno.nl/content.cfm?context=overtno&content=overtnosub&laag1=30&item_id=127&Taal=2

[44] These include contact points in Belgium (Brussels), China (Shanghai), Japan (Tokyo), Russia (St. Petersburg), South Korea (Seoul) and the US (Silicon Valley). See further http://www.vtt.fi/vtt/offices_abroad.jsp?lang=en

3. Licensing

Licensing is a common form of arrangement for KT, utilised to transfer available knowledge protected as patents, copyright or other forms of IP, or to protect and transfer confidential information and know-how.

However, in areas where the particular knowledge or expertise is in high demand, the risk of IP infringement to appears to be extremely high, in that there is both motivation to use the knowledge and also commercial justification for aggressive enforcement. PROs generating basic technologies are subsequently licensing them for further development and commercialization so that they may utilise the resources of the commercial partner. Most of these high-demand, competitive markets are occupied by more than one player, and in this environment, PROs as licensors bear similar risks of IP infringement as any other entity, including commercial companies. PROs engaging in licensing basic or standard solutions are entering a high-risk and extremely competitive field.[45]

Intellectual Property

An important example of the importance of intellectual property (IP) for PROs comes from Australia. A basic invention of Australia´s national research organisation, the Commonwealth Scientific and Industrial Research Organization (CSIRO) led to the wireless local area network (WLAN) standard 802.11[46] for which it obtained a patent in 1996. Subsequently, the CSIRO faced a series of unauthorised use of its patent by several major industry competitors. The technology continued to be adopted as an industry standard on hardware, despite the patent, and consequently with no royalties being paid to the CSIRO. The CSIRO initially prevailed in litigation against the Japanese Buffalo Technologies in June 2007,[47] which motivated it to pursue litigation against other alleged infringers. These cases are ongoing and further defendants were added in 2007, 2009, and 2010.[48] These defendants are alleging invalidity of the patent.[49] Such extensive litigation for enforcement of IP is an extremely costly process, which a PRO usually cannot afford, meaning that it is difficult for PROs to maintain their IP without significant financial resources from some additional source. In the case of CSIRO, the litigation resulted in a number of confidential settlements, not challenging the patent and ensuring ongoing licensing income flowing to the CSIRO. While the terms of these are not available, it is presumed that they are not necessarily as financially rewarding as potential royalties (estimated at potentially billions).[50] On the other hand, the CSIRO,

[45] For more details concerning patent infringement and recent law suits, see Kaiser L, The Threat of Patent Infringement in IT-Business Operations, in *Management of Innovation and Technology* (ICMIT), 2010 IEEE International conference, E-ISBN 978-1-4244-6566-8, pages 226-231.

[46] McBean N, CSIRO settles on wireless patent, ABC News, 23 April 2009. http://www.abc.net.au/science/articles/2009/04/23/2550483.htm

[47] *CSIRO v Buffalo Technology*, 492 F Supp 2d 600 (2007).

[48] The following cases numbers are presently connected to the litigation: 6:06-cv-00324-LED; 6:06-cv-00324-LED; 6:06-cv-00551-LED; 6:06-cv-00549-LED; 6:07-cv-00204-LED; 6:07-cv-00204-LED; 6:09-cv-00399-LED; 6:07-cv-00399-JKG; 6:09-cv-00401-LED; 6:10-cv-00065-LED; 6:10-cv-00067-LED and 6:10-cv-00066-LED.

[49] There is an additional difficulty in that the case was remitted by the Court of Appeals for the Federal Circuit remitted the matter to reconsider obviousness: *CSIRO v Buffalo* Technology, 542 F.3d 1363 (2008).

[50] McBean N, CSIRO settles on wireless patent, ABC News, 23 April 2009. http://www.abc.net.au/science/articles/2009/04/23/2550483.htm

as a government-funded organization, was criticised for blocking the technology market.[51] The CSIRO responded by saying it was necessary to protect that government investment in research, with Chief Executive Megan Clark stating, "CSIRO will continue to defend intellectual property developed from research undertaken on behalf of the Australian taxpayer."

Lesson

The different research and business cultures of PROs and industry, including resources and attending risks, become particularly evident with respect to the management of IP and licensing arrangements. Therefore, **technical assistance with IP strategies and business models to facilitate such partnerships and mitigate risk, especially in standard technologies, would be highly recommended**.

4. Spin-offs

Over the last 10 to 15 years, the use of spin-off entities to facilitate, IKT via spin-offs has become increasingly common in the public-sector research industry. The spin-off is a particularly useful structure when research is close to commercialisation of final products for market, as it allows for concentration of commercial competence as well as providing a mechanism by which to attract private capital.

The utilisation of spin-offs in the transfer process has increased throughout European institutions, but in very different forms and perspectives. In international business relationships, spin-offs seem to remain an exception.

International spin-offs

VSM Solar, located in Bangalore, India, has been generated by Fraunhofer as an international spin-off. The company is active in the field of generating renewable energy supplies from sunlight and water. Therefore, the solar air-conditioning technology itself was developed in the Fraunhofer Institute in Oberhausen, Germany, but is applied on another continent, almost 4000 miles away. The technology requires a maximum rate of annual sun insolation for cooling in applications including food storage, and in environments such as market places, public halls and other high-use areas. In the end commercial, technical and other considerations led to the decision to advance and commercialize the technology in the Indian market.

Lesson

It is often beyond the resources of public research organisations to undertake the activities necessary for commercialisation of new technologies, including the resources necessary for enforcement of IP as well as demonstrating entirely new markets for new and emerging technologies. In such circumstances, the spin-off is a recommended strategic solution. Nevertheless, in IKT spin-offs appear to be exceptions at best. Therefore, **it is recommended that assistance is provided in researching and devising the application of appropriate models for spin-offs in international markets.**

[51] Miller N, CSIRO hinders new wi-fi system, *The Age*, 2 October 2007.

5. Subsidiaries

The incorporation or foundation of a new legal entity separate from the parent organisation (a subsidiary) can be very relevant in IKT. Indeed, it may be that the formation of a so called special purpose vehicle (SPV) is appropriate. SPVs are entities which are set up and run only for a particular purpose and not for general commercial trade. An example of an SPV in IKT would be where an entity is set up to hold and licence IP rights and similar assets. The advantages of this approach are that the commercial risks can be taken by a different entity (another subsidiary or even SPV) and, should it fail, the IP rights are not put at risk. Model strategies to establish such subsidiaries in the pure R&D sector are still uncommon. This is largely due to difficulties in securing sufficient support and funding in foreign countries to maintain a viable subsidiary, but other reasons are also quite relevant.

Subsidiaries and IKT

The German Fraunhofer Gesellschaft provides a useful example of successful IKT via subsidiaries, for example, Fraunhofer USA.[52] The Fraunhofer business model has been applied in various countries outside Europe,[53] which apply the same business methods, financing structures and orientation to applied research as the mother company.

Lesson

In IKT via subsidiaries, the business model and business culture of a mother company must be relevant, applicable and welcomed by the hosting country. The hosting country requires local support both socially as well as financial, usually with funding from the hosting government as well as the mother company. Such commercial partnerships are usually costly in time resources in order to become established, and so patience is required. Nevertheless, where genuine financial and technical benefits flow to the hosting country it is likely that this will assist in motivating a successful partnership. It is recommended that **strategies by which to ensure appropriate support and assistance for host countries should be explored and developed.**

III Obstacles to effective international knowledge transfer

Several identified obstacles to effective IKT exist. The crucial ones may be summarized:

- legal differences;
- funding mechanisms and public tendering;
- administrative burdens; and
- globalization, including socio-cultural and linguistic differences.

In other words, differences build obstacles. They must be considered, tested, and solved or at least given weight according to the problems they cause. Because of the substantial socio-cultural, political and commercial differences in partners participating in IKT, it is therefore recommended that each potential partnership is treated individually, on a case-by-case basis. Each of these crucial areas for potential obstacles requires consideration.

[52] See Fraunhofer-Gesellschaft, http://fraunhofer.org/

[53] See further http://www.fraunhofer.de/en/institutes-research-estabslishments/internatonal/

1. Legal differences

National tax and import/export regulations often hinder IKT activities in some countries. For example, in the US,[54] PROs are permitted to transfer technology abroad via non-exclusive licences. Although exclusivity would be required in most commitments with industry this is not permitted. In other states, almost every transfer of research results in or out must be strictly affirmed by the government, e.g. the state council in China. Import and export regulations often prevent free circulation of knowledge. Similarly, IP rights (IPR) may be used to regulate the transfer of technology and will be relevant both in terms of the creation of rights in technology as well as the commercialisation and licensing of products based on those rights.

Furthermore, different approaches in patent law may be considered burdens in an international protection and dissemination of knowledge, however in practice most of these are differences in emphasis at most. There are, for example, the similar but distinct requirements of *utility* in the United States (35 U.S.C. §101) and *industrial application* under the European Patent Convention (Art. 57 EPC). Similarly, there is the requirement to disclose the *best mode* of putting the invention into effect in India (Patents Act s. 10(4)) and the United States (35 USC § 112). Similarly, the *notable progress* requirement in China (Patent Law, Art. 22) is similar to that for non-obviousness in the United States (35 USC §103) and inventive step under the European Patent Convention (Art 56 EPC).

Two additional divergences relate to the first-to-file principle and the grace period. There are presently very serious political efforts in the US to implement the *first-to-file* principle although, at least at the time of writing, the change has not yet been made. There are also differences in the approach to grace period, ranging from a very generous applicant-friendly approach in the US[55] through to a restricted approach under the EPC which has a grace period only where there has been evident abuse or display at an international fair.[56]

Several countries, including most of the BRIC states, have introduced new rules which could been seen as possible obstacles to the registration of patents. For instance, Brazil[57] and India[58] have adopted new rules which prohibit the grant of a patent relating to certain genetic resources or traditional knowledge where the source and origin of the relevant resources or knowledge is not properly indicated.[59] These additional requirements reflect an important public policy in those countries, notwithstanding the additional burden on patent applicants.

In post-socialist countries like China and Russia, where the State and government are still heavily involved in monitoring and actively steering the flow of knowledge, not only patented (and therefore published) technological

[54] The Bayh-Dole Act, enacted in 1980 by US Congress, assigns ownership of IPR developed by publicly funded research to the institution where the IP was created. See further footnote 41.

[55] 35 U.S.C. §102(b)

[56] EPC, Art 55.

[57] Provisional Measure No. 2.186-16, of 23rd August 2001, art 31.

[58] Patents Act 1970, s. 10(4)(d), 25(1)(j) and (k), 64(1)(p)(q).

[59] There are optional requirements under the Biotechnology Directive 98/44/EC, recital (27) in relation to this issue.

achievements, but also secret know-how is in danger of being appropriated by local authorities.[60]

Part IV of the Civil Code of the Russian Federation[61] deals specifically with IP. The Government Resolution of 22 April 2009, No 342 (in addition to the Resolution of 17 November 2005, No 685, as amended by No 342) provides that in certain cases of government contracts, rights in any IP created must vest in the government. Further, where parties may wish to take the IP out of circulation, then the rights must vest in the government. This raises questions with regard to a number of aspects that would arise in IKT partnerships, including whether the rules would apply to research results which were only co-funded by the Russian Federation. Obviously relevant here would be the levels of contribution provided by each party. Where the substantial funding is from the Russian Federation, in all likelihood the rule should apply. Therefore, future agreements of co-funded research between member states of the EU and Russia, or with European public and private entities, should make direct reference to the rules when drafting agreements, including specific aspects such as distribution of ownership of rights arising as a result of the research collaboration. The success of such partnerships depends upon the enforceability of international contracts, and therefore clauses in choice of law are likely to be significant.[62]

2. Funding mechanisms and public tendering

No financing, no capacities, no research. The investment for R&D in foreign countries usually requires higher investment than at home, primarily due to the additional expenses required to engage in an unknown and uncertain environment. Local funding sometimes is offered, but is governed by the funding conditions and rules in place, which may be obstructive to IKT. These rules are different in different jurisdictions and may build a barrier to effective IKT activities. Further, rules governing funding provided by many European funding systems do not allow for exploitation of funded research in other countries. Additionally many procedures of public tendering for applicants from foreign countries are either not feasible or not wanted and therefore very difficult to fulfil. All of those rules do not take into account the global effects of IKT and the reciprocity of transfer in other countries. This effect should not be underestimated. If future administrative and legal approaches will not depart from these national restraints, a global networking research community remains utopian.

3. Administrative burdens

> *"To receive funding for a year, you have to work for two months. Unfortunately the chance of funding is usually below 20 %. If granted, you keep fulfilling requirements rather than working in actual research."*[63]

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[60] Ranjard P & Misonne B, Study 12. Exploring China's IP Environment, Strategies and Policies: Study on the Future Opportunities and Challenges of EU-China Trade and Investment Relations. Available at http://trade.ec.europa.eu/doclib/docs/2007/february/tradoc_133314.pdf

[61] The Civil Code of the Russian Federation, 1996.

[62] It is important to note that some countries may treat intellectual property ownership rules as a mandatory law and therefore these laws would apply irrespective of any choice of law by the parties. A notable example is the law of moral rights in France (see Huston v. La Cinq Cass. civ. 1re (28 May 1991).

[63] Bader B, LMU Munich, Germany, member of the project *Trust Researchers. A Declaration to the attention of the European Council of Ministers and the Parliament*, see the press release at http://www.trust-researchers.eu/.

The abovementioned quotation refers dramatically to the uncertainties and distresses of the harsh funding environment in which today's researchers are working, both to secure funding and to maintain it. In an international context that administrative uncertainty is aggravated by working in unfamiliar environments, culturally, politically and administratively. Administrative complications are frequently experienced in dealing with public departments, conventions, practices and procedures in partner countries. Different administrative practices regarding creation and implementation of agreements dealing with IKT are among the main obstacles to effective IKT, as well as additional burdens including visa requirements.[64]

4. Cultures, languages, distances

Cultural factors in research cooperation are particularly crucial, in addition to the broader cultural differences experienced by working in partner countries. Academia and industry may bring very different cultural perspectives, notwithstanding the increasingly entrepreneurial nature of university institutions, as well as the additional diversity of cultures in PROs. Furthermore, different cultural perspectives apply for different technologies or even branches of a particular field of technology. As discussed, differences between institutions of different states will also apply. Attitudes toward joint research and sharing knowledge will therefore be complicated by the sometimes vast differences in perspective and practice.

The language barrier should also not be underestimated. Additionally differences of geography, including the practical difficulties of long distances or simply the time differences, cause additional problems. A good example of this at an everyday level is setting up a virtual meeting across numerous time-zones. Finally, these partnerships are driven by commercial objectives and the commercial context in which they are operating, and so additional factors such as currency fluctuation will create further complications.

IV Prerequisites and conclusions

While examining different examples of successful IKT it was found that some aspects and attitudes are of fundamental importance and are common features that have been followed diligently by successful players (as will be discussed later in this report).

1. Research and development strategies

R&D strategies are a basic requirement for the success of each and every research unit; however, these strategies will vary depending on the kind of research and the objectives of that envisaged research. For example, basic cooperative research bears fewer risks and obstacles than those faced by alliances or spin-offs. Once issues of collaboration, internationalization and applied R&D accumulate, diligent preparation is recommended prior to cooperation in order to avoid as much as possible the potential risks and

[64] Hierarchies and command structures in partner countries may at times be opaque and therefore local assistance and cooperation from the local partner is crucial. Further obstacles include sometimes vast differences in organizational and administrative structures of public departments, including the phenomenon of bifurcation in socialist or post-socialist Asia, where enforcement is the responsibility of both the executive and the judiciary. See further Ganea P, Leitfaden für Forschungseinrichtungen und Unternehmen über den Umgang mit den neuen chinesischen Patentvorschriften, Bonn 2010, p. 11-12

uncertainty involved. The existence of a current, well-analyzed and comprehensive information set is the basis to assess cooperation in an international context. Legal, funding, and administrative aspects of the particular international requirements that might apply are critical considerations. Additional information to be obtained includes knowledge of market structures, country specialities, possible partners and competitors.

The appropriate cooperation model and useful tools for intended IKT firstly need to be selected. There exist a lot of basic recommendations, sets of model contracts, as well as decision tools to facilitate this process. For example, the *CREST Cross-Border Collaboration Decision Guide*[65] is designed in particular for cooperation between PROs and industry partners with recommendations for the most appropriate model contract to be selected.[66]

A particularly important consideration should always be the applicability of such model contracts to the specific conditions of a particular project. Model contracts often do not adjust effectively to the particular nature of the project in question. In any particular case there remains the consideration and weighing of the individual partners' interests and commitments. This becomes very complex in the international context where there are additional legislative, regulatory and administrative differences, as well as cultural ones. Therefore, a useful scheme for IKT in one jurisdiction may not be appropriate in an international partner's jurisdiction. As introduced above, the various contributing factors in international R&D projects are extremely diverse and so cases of collaboration must be assessed individually.

The right partner or partners for IKT will need to be chosen in the first instance, taking into account business models and objectives. Targets and limits of the arrangement, as influenced by the chosen model of cooperation, will need to clearly be defined. Goals of planned activity and outcomes, and milestones and deliverables with appropriate timescales, will need to be agreed. Furthermore, provisions for IPR, including consideration of the regulations in the relevant partner states, should be consistent with the goals of the initiative. In an international cooperation, potential misunderstandings deriving from different languages and communication problems need to be avoided from the beginning.

2. Intellectual property management

IP management is one of the most important issues, if not the most important issue, for KT activities for the purposes of commercialization. Since cooperation on the international level is complex, international research generates an even more obvious demand for effective strategies for IP creation, ownership and management in research. As on the national level, IP issues should be clarified as early as possible in the R&D project. Clear provisions for IP are essential for any agreement governing that research relationship.

2.1 Preparation phase

In IKT, professional IP management in the preparation phase is essential. In particular, in addition to agreeing ownership of any IPR created by the project, agreements should provide for the protection of confidential information and know-how. Further, budgets should include financial reserves for enforcement of contractual obligations (including those of confidentiality) as well as enforcement of IP based on realistic assessments of the risks. Costs of litigation and

[65] See *CREST Cross-Border Collaboration Decision Guide*, in: COM 2008/1329, EC recommendation 2008, Annex II, p. 8, or http://ec.europa.eu/invest-in-research/pdf/download_en/kina20796enc.pdf.

[66] Further regional models include the UK Lambert Agreements, which are discussed in Part C.

enforcement will also vary between jurisdictions and can become particularly complicated and expensive if litigating abroad or in more than one country.

2.2 Rights to the results

In all forms of international research cooperation, the parties must pay special attention to the local IP laws and the consequences for the rights to exploit the results of the research. Indeed, disputes between parties to a research cooperation agreement usually concern IP ownership. In addition to any IP created by the cooperation, it may be the case that some of the research and its results will be confidential information or know-how that is not protected by patents or similar rights. In such cases, obligations of confidentiality may be provided by contract. This characterisation of the assets of the cooperation (that is, both IP as well as confidential information) will be relevant to the calculation of the actual value of investment. Rights to any subsequent IP should be obtained on research outputs as far as possible, independently of the phase in the cycle of the project. This applies in all fields but is especially relevant in cooperation agreements in material technologies, pharmaceuticals and biotechnology. In these fields of technology the differentiation between basic and applied research is far less relevant, leading to mixed research structures and sometimes unexpectedly accelerated opportunities for exploitation.

Consequently, successful parties in IKT will be those aware of the legal and commercial background of IP regulations which also prepare, plan and schedule appropriate strategies for contract negotiations. An important part of this strategic management of IKT is that IP commitments in this respect should be identified and fixed in the starting phase.

2.3 International commercialization and patent management

A crucial element of any effective patent strategy is adequate assessment of the scope of the rights for product development as well as exploitation in the respective market. Opportunities for exploitation need to be planned taking into consideration the following factors:

- IP expertise of possible partners and the most relevant IP protection likely in the circumstances;
- business background of possible commercialization partners and competitors;
- gathering of information about the markets in place; and
- legal differences.

If legal protection is uncertain or not readily enforceable, as in some BRICS states, a strategy for practical management and protection of knowledge is necessary. Furthermore, in some instances classical IP protection will not be as commercially relevant as other forms of protection, such as trade secrets.

Trade Secrets – *Coca-Cola*

A classic example of trade secrets protection is the secret of the Coca-Cola drink. The recipe is not patented, indeed if it had been it would now be in the public domain and available for others to copy. Instead, the economic success of Coca-Cola is secured over the years by strict

confidentiality and trade secret protection.[67] Therefore, crucial to the protection of Coca-Cola's commercial value is the business model underpinning its exploitation, rather than IP commercialisation.

Any licensing strategy depends on the position of the licensor and that licensor's market power. From the view of a licensee it is crucial to make sure that the licence is exclusive and safe enough to prevent competitors entering the market with the same product.

3. Entrepreneurship

More entrepreneurial PROs tend to cooperate more easily with industry partners, including on the international level.[68] Awareness of know-how, IP assets and the importance of KT processes are of high strategic importance in a commercial environment. PROs find themselves confronted with this fact from the beginning of the spin-off process. Enhancing entrepreneurship within PROs includes equipping staff with management skills and delivering a business philosophy which facilitates and supports liaison and cooperation with commercial partners. The knowledge resources of the PRO are an important part of strategic innovation and research management, including the valuation and exploitation of IP, and appropriate skills and expertise for transfer activities. Incentives for researchers to engage in further entrepreneurial contacts and activities are likely to contribute to greater opportunities for spin-offs and other KT arrangements. The creation of spin offs from PROs is sustainable arguably only when training of the relevant staff in strategic management of innovation is in place. IKT via spin offs in the international field requires further additional experience or knowledge in the partner country.

4. International networks

Efficient networks are a basic structural condition for international activities. All of the remarkable contractors and collaborators introduced in Section II are also strong networkers. Opportunities for future cooperative research projects on the international level therefore are reasonably fostered by networks. In the end, personal contact and trust are nevertheless fundamental aspects of successful and sustainable international relationships.

V Summary Part A

Interim findings of Part A

IKT on an extra-EU level is not as significantly organized and systematic as KT between member states. The main channels of IKT run via cooperative projects, contract research, licensing and via the creation of spin-offs or subsidiaries. Cooperative projects may be subdivided into:

- cooperative, basic or applied research (stages in between become evident in specific fields, such as materials technologies or pharmaceuticals); and

[67] There are, however, a number of published claims by third parties for the receipe for Coca-cola most recently by Ira Glass, 11th February 2011 who claimed it could be found in "Everett Beal's Recipe Book," reproduced in the February 28, 1979 issue of the *The Atlanta Journal-Constitution*.

[68] WIPO, SMEs Division, *Research and Innovation Issues in University-Industry Relations*, Geneva 2002.

- strategic alliances (such as the shared use of research infrastructure, spin-ins or joint ventures), virtual institutes and researcher mobility.

Any cooperation according to virtual institutes does not appear to take place on an extra-EU level. Researcher mobility therefore acts as a crucial and pervasive form of IKT in current research activities.

Among the crucial obstacles to efficient IKT there are:

- legal differences;
- funding mechanisms and public tendering;
- administrative burdens; and
- differences in cultures, languages and politics, as well as geographical distances.

This section has therefore elaborated four prerequisites to sustainable IKT manoeuvres:

- R&D strategies which are fitting to the individual case and contribute to the singularity of each project;
- professional IP management, which is crucial especially in cooperative applied research projects;
- entrepreneurship of IKT protagonists; and
- the establishment and maintenance of international networks.

B International knowledge transfer agreements: European and bilateral agreements

Part B presents (1) selected European treaties with Third Parties that address the issue of Intellectual Property (IP); and (2) bilateral agreements on research cooperation between individual Member States and Third Countries. Regarding bilateral agreements, we focus only on the agreements concluded between governmental agencies/departments and the corresponding agency/department of the Third Country government. We do not include university-to-university agreements (although they result from these agreements) but acknowledge that universities figure prominently in any discussion of the production, diffusion, and deployment of knowledge and innovation that supports economic growth.

The bilateral agreements also focus primarily on publicly-funded cooperative/collaborative research and, where information is available, specifically to address the management and use (commercialization/exploitation) of IP generated by projects conducted under these agreements. The exploitation of IP is an important mechanism for KT. Researcher mobility is addressed in this Part as it is also a key route for KT and is embodied in several of the research cooperation agreements that were provided to us.

In conducting this section of the study, we were advised, wherever possible, to focus on the agreements concluded with Brazil, China, Russia and India, collectively referred to as the BRIC countries. We have attempted to obtain as much information on these agreements as is possible within the constraints of time and resources.

The key aspects we address in the bilateral research cooperation agreements are:

1. *Institutional processes that underpin the process of KT agreements*. We argue that an understanding of these processes would contribute to "fruitful" agreements for the purposes of KT. Effective KT results from a confluence of factors, such as the capabilities, skills and/or expertise of the two countries, the organizational and cultural practices, and the research environment and infrastructure of the countries that are signatories to the agreements, among other factors. In other words, the contextual factors are important for effective KT. As in the case of the BRIC countries, effective KT can also result from the intent of the initiating country to harness the capabilities and resources of the target country, or to enhance opportunities for research and development as well as mobility of researchers.
2. *The management of the IP in these cooperation agreements*. This describes how parties to the research cooperation agreements deal with IP issues.
3. *A review of IP language in the treaties/agreements* with an aim to improving their enforcement.

The countries examined in Part B are:

1. the UK
2. Spain

3. Hungary
4. Germany
5. Finland

In consultation with the project officer, it was decided that four EU-12 Member States would be selected. The selection of the UK, Spain, Germany and Finland was based on a general distribution of the "regions" of the EU. Spain represents the Mediterranean region and has strong ties with important emerging markets in Latin America.

The UK has traditionally strong ties to the outer world and it forms an economically important member state with an institutional environment which is quite different from the rest of Europe. Germany forms the biggest economy within Europe and represents the German-speaking countries. Finland is a high performer in terms of KT and will serve as an example of the Nordic region. The new Member States will be represented by Hungary.

Method

We undertook desk-based research. This was complemented with extensive email communication with identified individuals at the various government organizations who we envisaged would be involved with these agreements. Email respondents included relevant ministries/departments, national research councils and embassies who had "science counsellors." We also undertook a limited number of interviews with identified individuals who were actively engaged in the processes for these agreements.

The following sections begin with an overview of (1) European treaties with Third Countries, which will then be followed by (2) descriptions of the research co-operation agreements between selected Member States and Third Party countries, including the BRIC states.

I. Bilateral agreements between the EU and third countries

The analysis of KT-related external relations cannot remain confined to the various agreements on scientific research and technological cooperation initiated by DG Research and Innovation and concluded between the Commission and Third Countries.

Of at least equal importance are the new Economic Partnership Agreements (EPAs) between the EU and third countries because they contain extensive chapters in which the parties to such EPAs commit themselves to protecting IP in a manner which goes far beyond the standards required by the existing multilateral agreements on IP, in particular, the TRIPS Agreement.

EPAs are mainly trade-related and the IP chapters therein aim primarily at protecting European industries and their investments in Third Countries. In spite of their trade-relatedness, such EPAs aim at improving the overall IP landscape in Third Countries, so in this way, they can also be considered to be relevant to collaborative research between European public research institutions and private or public partners abroad.

Furthermore, cross-border research cooperation between public institutions strongly depends on legal certainty and institutions that enforce the terms of the agreements. Therefore, the following explanations will also discuss the suitability of EPAs to foster KT between public institutions.

1. Agreements on scientific and technological cooperation

The agreements concluded between the EU (formerly the EC) and Third Countries on technological cooperation[69] are mainly aimed at facilitating KT in the public sector, even though the participation of firms is welcome. These cooperation agreements normally use standard text which is rather non-committal. Firm mutual obligations are largely confined to the establishment of a joint steering committee comprised of representatives of DG Research and Innovation and of the other party's or parties' ministries in charge of science, technology, R&D, and so on. In addition to a steering committee, cooperation agreements will also include certain specific provisions, such as those regarding financial arrangements. This includes the principle that each party shall bear the costs incurred in its own activities. Many agreements contain an annex on IPR. This annex usually obliges the parties of joint research projects based on the agreement to provide a detailed Technology Management Plan (TMP) which must contain specific clauses, such as on ownership issues, treatment of jointly developed intellectual assets, and so on.

With regard to many other important aspects of KT, the agreements do not require the parties to shoulder firm commitments, for instance, with regard to preferential treatment in terms of reduced bureaucracy or taxation. Regarding "entry of personnel and equipment", for instance, the standard clause is as follows:

> "Each Party shall take all reasonable steps and use its best efforts within existing laws and regulations, to facilitate entry to and exit from its territory of personnel material and equipment of the participant(s) engaged in or used in cooperative activities under this Agreement."

Such a declaration-of-intent-like language will hardly entail any changes to the often disconcerting bureaucracy that may be observed in many emerging markets. Moreover, the agreements remain silent on a phenomenon that can be encountered in post-socialist or transforming economies like Russia or China, where state authorities tend to be involved in science and technology (S&T) or R&D collaboration, and aim to appropriate imported knowledge and make it broadly accessible to domestic parties.

2. IP clauses in Economic Partnership Agreements

In recent years, the European Commission has approached a number of developing countries or regions (like CARIFORUM or ASEAN) wit EPA proposals. An EPA with the CARIFORUM states is already in force,[70] and two further EPA proposals submitted to India and to the ASEAN secretariat are presently under negotiation.

Each EPA or EPA proposal contains a long chapter on IP protection which regulates, for instance, that both parties to the treaty shall provide for a system of supplementary protection certificates, protection of regulatory data, and other subject matter not required by the present multilateral IP treaties, including the TRIPS Agreement. Quite challenging are the enforcement-related clauses. The

[69] Comprehensive list of agreements at http://ec.europa.eu/world/agreements/

[70] *Economic Partnership Agreement between the CARIFORUM States, of the one part, and the European Community and its Member States*, OJ L 289/I/3, 30 October 2008

standard EPA text related to enforcement, for instance, reiterates the text of the Enforcement Directive.[71]

Representatives from developing countries criticize such bilateral agreements as imposing TRIPS-plus requirements on developing countries, and as reintroducing bilateralism on the worldwide stage.[72] Due to the Most Favored Nations (MFN) principle of the WTO, any enhancement of IP protection cannot be a matter granted to certain WTO members only but must be extended to all other WTO members. Such "leverage effect", according to commentators,[73] would entail a worldwide enhancement of IP protection, thus enabling developed countries to circumvent the stalled negotiations about a further development of the TRIPS Agreement.

In fact, however, many developing countries do not have to fear restrictions to their imitation freedom or an obligation to increase their investment in IP protection. Especially in the area of enforcement, IP clauses which are closely modelled according to European IP directives, too often miss the real causes for insufficient IP protection. Many socialist or post-socialist Asian countries, for instance, provide for a so-called "dual" IP enforcement system, which is comprised of both court and administrative enforcement.[74] The problems entailed by this bifurcation (e.g. different outcomes of similar cases, depending on whether they are treated in court or by an administrative agency) are not addressed by the EPA clauses on enforcement. That is, non-EU parties where the domestic institutional environment deviates from the enforcement clauses may struggle in applying the rules of intellectual property in practice, despite implementation into domestic laws.[75]

A more promising approach would be to address single economies with tailor-made proposals which build on the available infrastructures and aim at making best use of the available resources. Nevertheless, the fact that the European Commission has recently split up its "one-size fits all" EPA approach to the extremely heterogeneous ASEAN region as a whole, and replaced it with a process by which single ASEAN states are now individually approached[76], nevertheless does not yet mean that the Commission has started to address country-specific peculiarities and problems. The pending proposals to single ASEAN countries (to date, Singapore and Vietnam, but there are also reports about approaches to the Philippines and to Thailand) are not published but it is very likely that the situation in single ASEAN member states will be considered only insofar as the group of least-developed countries will be confronted with more generous clauses regarding copyright and patent clauses than the more developed ones. Other clauses, especially the enforcement-related ones, will most likely remain standard EPA language. In a similar manner, the EPA already

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[71] Directive 2004/48/EC on the enforcement of intellectual property rights. See for example Articles 151-63 of the *Economic Partnership Agreement between the CARIFORUM States, of the one part, and the European Community and its Member States*, OJ L 289/I/3, 30 October 2008.

[72] Gervais D (ed), *Intellectual Property, Trade and Development: Strategies to Optimize Economic Development in a TRIPS-Plus Era*, OUP, Oxford, 2007.

[73] For example, see Kur A & Grosse Ruse–Khan H, Enough is Enough – The Notion of Binding Ceilings in International Intellectual Property Protection. Max Planck Institute for Intellectual Property, Competition & Tax Law Research Paper Series No. 09-01, 2008. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1326429##

[74] See country reports on Cambodia, China, Laos, Vietnam, in Goldstein P et al (eds.), *Intellectual Property in Asia – Law Economics, History and Politics*, Springer 2009.

[75] See, e.g., the example of Cambodia, where IP laws have been modeled after foreign legislations but remain largely irrelevant in practice – country report on Cambodia in Goldstein et al (2009).

[76] See further http://trade.ec.europa.eu/doclib/press/index.cfm?id=504

concluded with the CARIFORUM requires much less in terms of patent and copyright protection than the EPA proposals submitted to India and the previous proposal to the whole ASEAN region. This may be attributed in part to the fact that the CARIFORUM comprises a group of least-developed countries with hardly any potential to infringe patents (due to limitations in manufacturing capacity), whereas India and most ASEAN members are technologically far more advanced. The text related to enforcement, however, is the same in EPAs respectively and EPA proposals.

Another issue which could be addressed in more detail in such EPAs would be non-IP related obstacles to KT. Each EPA normally contains a single standard provision on enhancement of transfer of technology. In the EPA draft submitted to India, the provision reads as follows:

> "The Parties agree to exchange views and information on their domestic and international practices and policies affecting transfer of technology. This shall in particular include measures to facilitate information flows, business partnerships, licensing and subcontracting deals. Particular attention shall be paid to the conditions necessary to create an adequate enabling environment for technology transfer in the host countries, including issues such as the relevant legal framework and development of human capital.
>
> EC Party shall facilitate and promote the use of incentives granted to institutions and enterprises in its territory for the transfer of technology to institutions and enterprises of the Republic of India.
>
> The Parties shall ensure that the legitimate interests of the intellectual property right holders are protected as per the respective domestic laws."

The text is written in such a soft and non-binding language that an Indian counterproposal suggested the following paragraph:

> "The Parties agree to take measures, as appropriate, to prevent or control licensing practices or conditions pertaining to intellectual property rights which may adversely affect the international transfer of technology and that constitute an abuse of intellectual property rights by right holders or an abuse of obvious information asymmetries in the negotiation of licenses."

The Indian counterproposal aims at diminishing allegedly "abusive" licensing practices. It is very unlikely that the Commission will accept this version, as it would run counter to the interest of European industries. However, there are other non-IP related areas in which KT could be facilitated, such as taxation or administrative requirements regarding commercial knowledge-intensive investment or non-commercial joint public research. A bit more emphasis on the removal of bureaucratic obstacles, on tax holidays and other institutional issues would also signal a serious interest in collaboration and knowledge-sharing and therefore meet less resistance within the target countries than the highly politicized topic of enhanced IP protection.

II Bilateral research cooperation agreements between single EU member states and third countries

1. The UK

1.1 Institutional processes/practices

There are essentially three ways for identifying "target countries" for research cooperation. They are

1. Undertaken by a group of officers at the London-based Department of **Business Innovation and Skills (BIS)**. According to a senior BIS officer, the process of identification is less "concrete" than it is "organic." In essence, this group of officers is part of the International Science and Innovation Unit at BIS and among other responsibilities; each is tasked with different clusters of countries to seek opportunities for the promotion of research cooperation and collaboration. For example, one officer is charged with exploring opportunities with the Brazil, India and China and other emerging economies. Another looks after Russia and developed countries, while another is charged with overseeing the activities of the very important network called the Science and Innovation Network, (see below). These officers are often in consultation with the Research Councils, the British Council, the Royal Society and the Technology Strategy Board (all based in the UK) and in communication with British embassies to identify where there may be opportunities for establishing cooperative research arrangements. An overarching criterion for selection of potential countries is the scientific capacity and competencies in science and innovation areas which are either complementary to UK interests or which can strengthen UK capabilities; in other words, if there are benefits to be derived from the collaboration/cooperation.
2. Through the **Science and Innovation Network (SIN).** This network, which was established in 2000, is funded by the Foreign and Commonwealth Office (FCO) and BIS and has a wide portfolio of science and innovation-related activities. There is dedicated staff in 39 missions in 24 countries and territories, and they are based in UK embassies and consulates. The staff here works closely with their London-based colleagues and helps to identify opportunities for collaborative arrangements. The obvious advantage from working with these localities is because it is easier and more practical for these SIN participants to identify opportunities in a particular country since they are located there. For instance, the UK Embassy in Russia just set up a "Science Section" to map out the science excellence across the Russian Federation and to start forging new and strengthening existing research collaborations.
3. Through a **Joint Commission.** This is a formal process and cooperation discussions are done at the ministerial level. Every two years, the UK Minister of the relevant department (currently it will be BIS), or the UK Chief Scientific Advisor visits the counterpart country to discuss S&T matters at ministerial or chief scientific advisor level. The Joint Commission is used for agreeing

on themes for enhanced collaborative research. For instance, there are Joint Commissions with China, Russia, Japan and Korea. The Joint Commission with India is called the UK-India Science and Innovation Council, which in 2010 concluded 7 new research agreements with commitments for joint funding of approximately £70 million.

The setting up of these agreements depends generally on the practice or preference of the target country. After negotiations, a Memorandum of Understanding (MoU) or Joint Commission is drawn up or established between the UK and the target country. In most cases, the prevailing mode of setting these agreements is between one of the UK's 7 research councils in Research Councils UK (RCUK)[77] and a corresponding government agency of the target country.

Another example is the arrangement between the Science & Innovation (S&I) team at the UK embassy in Singapore and A*STAR (Singapore's Agency for Science, Technology and Research). A*STAR is an agency of the Singapore Ministry of Trade and Industry. It is the principal source of public R&D funding in Singapore and has a key role in setting the priorities for research. The strategic arrangement between the UK S&I team and A*STAR is aimed at directing the bilateral engagement with Singapore research institutes and universities. Through the Singapore's 5-Year Plan, the UK S&I team identifies the opportunities for mutual benefit from collaboration, such as in neuroscience, green energy technologies and infectious diseases. For instance, in 2009, A*STAR and the UK Medical Research Council signed a MoU to launch a joint research program on infectious diseases.

While the UK has no single Government-operated or funded agency/organization to commercialize publicly-funded research, as this is mainly left to the research councils and universities, it is worth noting that A*STAR has a dedicated arm to exploit the IP generated from Singapore research institutes and universities, and collaborative research. The arrangements for the commercialization of research findings are clearly stipulated and there are procedures for managing this process. For instance, in the case of collaborative research, research results may be further funded by an additional funding scheme within A*STAR to help bridge "the valley of death,"[78] the fate of much research which is left unexploited or not further developed. There are also funds for proof-of-concept and validation of concept. However, some UK research councils are now providing "follow-on" funding to develop prototypes (where applicable) as a result of the increasing awareness that too much of the funded research has languished in the valley of death.

1.2 IP management, dissemination and exploitation

How the IP generated through collaborative research is to be managed and/or exploited is left to the two parties of the collaborative arrangement. In the UK, as a general rule, the IP generated is jointly owned. The kind of IPR is to be agreed upon and the confidentiality of potentially marketable IP is to

[77] Research Councils UK (RCUK) is the strategic partnership of the UK's seven Research Councils. Collectively they invest annually around £3 billion in research.

[78] See the discussion of the concept of the innovation "valley of death" in Ford GS et al, A Valley of Death in the Innovation Sequence: An Economic Investigation. Discussion Paper. Phoenix Centre for Legal and Economic Public Policy Studies, September 2007.

be established between the parties. Details concerning the publication of research results, ownership of research results, and other matters are determined through mutual consultation and agreement by the parties. UK research councils and other funding agencies generally insist on a dissemination strategy, which is geared to make research results publicly known to the scientific community and society at large, primarily through publications, seminars, lectures, and conferences.

It is now obligatory for grant applicants to present an exploitation and dissemination plan in their proposals – "pathways to impact."[79] Essentially these "pathways" include an explanation of: how the research results are to be communicated, particularly to the non-academic/practitioner community; how the project intends to engage with stakeholders; and how the research may be commercialized (exploitation of IP resulting from the research). The importance of the economic and social impacts of publicly-funded research has been a UK Government policy objective since the mid-1990s and has steadily grown in salience and emphasis. Impact has been defined as "the demonstrable contribution that excellent research makes to society and the economy. Impact includes all the extremely diverse ways in which research-related knowledge and skills benefit individuals, organizations and nations by: enhancing quality of life, health and creative output; increasing the effectiveness of public services and policy, and fostering global economic performance, and specifically the economic competitiveness of the UK."[80]

On the issue of commercialization of the research, procedures for disclosing research results are also generally determined through mutual consultation and agreement by the parties. In the event that the IP is to be commercialized, it is also left to the two parties to decide on the conditions for its exploitation, which will be largely determined by the contribution, practices and laws applicable to each party. In the UK, the Lambert "licensing models" are being increasingly used as a guide for the construction of IP agreements (discussed further in Part C). On the whole, however, there is no "one-size-fits-all" IP policy or model for the research agreements as the contextual environment in which the agreements have been concluded differs from one to another.

1.3 UK cooperation agreements

The following sections provide selected but leading examples of agreements with the BRIC countries.

Brazil

The agreement (MoU) between the Brazilian Embrapa and the Rothamsted Research, under the umbrella of the Biotechnology and Biological Sciences Research Council is a leading example of a cooperation research

[79] See further Research Councils UK, at http://www.rcuk.ac.uk/kei/impacts/Pages/home.aspx

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[80] Http://www.nerc.ac.uk/about/work/boards/executive/documents/16teambrief.pdf.

arrangement between these two countries.[81] As part of its international strategy since 1998, Embrapa, which boasts a £400 million agri-business, has extended its activities to the US, Europe and Asia through its Labex ("**lab**oratory **ex**terior") program, placing experienced Brazilian research scientists in elite overseas institutions. In January 2010 Embrapa established its first UK base at Rothamsted Research. The aim is twofold: to carry out state-of-the-art research in a priority science area, for instance, bioenergy crops; and to create new opportunities and links between UK and Brazilian scientists across a spectrum of research institutes. The overall aim of this Embrapa collaboration is to apply the research results to pest control for improving wheat production and yield. As Brazil is a major player in global agriculture the UK sees a distinct opportunity in such cooperation arrangements as a means to share similar concerns, skills and expertise. Researcher exchanges and visits are also provided in these partnerships.

In 2009 Research Councils UK (RCUK) and FAPESP (the State of São Paulo Research Foundation) signed a MoU[82] to strengthen the existing research links between the UK and Brazil and to help encourage and support international collaborative research. The MoU provides for a Lead Agency Agreement whereby UK and Brazilian researchers may apply for funds from both countries through the UK research councils' funding schemes. The UK participant in and funder of this MoU is the National Environment Research Council.

The focus of FAPESP will be on Earth system science and global environmental change research. The collaboration is aimed at (1) facilitating links between scientists in countries, building on existing partnerships, but also widening to other groups of both countries; (2) developing novel techniques for communicating scientific outcomes to stakeholders; and (3) engaging directly with the wider Earth system science community.

Russia

In 2007 in London a Joint Commission on Science and Technology Cooperation took place between the UK Government and Russia's Ministry of Education and Science in which themes for enhanced cooperation such as innovation, alternative energy technologies, and climate change collaboration were discussed. In the light of political exigencies that followed very little happened thereafter.

However in an effort to revitalize the activities of the Joint Commission, the space science research agreement was signed with Russia in 2011 after the visit of the Minister of Universities and Science.[83] Various research activities will be undertaken in what the two countries have tagged “UK-Russia Year of Space 2011.”

Under this broad space science research agreement a tripartite MoU was signed between two British research organizations, the Russian International Science and Technology Centre and the Institute of Physics of the Earth,

[81] A UK-Brazil partnership in sustainable agriculture: Embrapa-LabEx at Rothamsted Research. Press Release. 31 March 2010. http://www.rothamsted.bbsrc.ac.uk/Research/Centres/PressReleases.php?PRID=94

[82] See further http://www.rcuk.ac.uk/media/news/2009news/Pages/090916_2.aspx

[83] Department of Business, Innovation and Skills. UK and Russia commit to collaboration in space science. Press Release. 22 Feb 2011. http://www.bis.gov.uk/ukspaceagency/news-and-events/2011/Feb/uk-and-russia-commit-to-collaboration-in-space-science

which is part of the Russian Academy of Sciences. The aim is to develop future collaboration in the TwinSat Project that combines Russian and UK technologies to build new generation Earth observation satellites to monitor seismic activity such as earthquakes and volcanoes. The International Science and Technology Centre is a Russian inter-governmental organization connecting scientists from Russia, Georgia and other countries of the Commonwealth of Independent States with research organizations in Canada, EU, Japan, Republic of Korea, Norway and the United States.

The UK-Russia space science agreement also covers planned "Space Science Cafes" through to 2012 to bring together senior UK and Russian space experts to discuss future priority areas of research.[84] The first one, which was organized by the British Embassy in Russia, was held in October 2010. Other activities under the auspices of the Joint Commission include "Expert Innovation Roundtables" which will be launched by the British Embassy in cities across Russia, in which UK and Russian innovation experts will showcase their experience in knowledge transfer and good practice in setting up an innovation infrastructure environment that fosters successful research to commercialization.

India

The Science and Innovation Network (SIN), as noted above, helps government, research and innovation-oriented agencies, research institutes, higher education institutions and private sector to engage optimally with Indian science. Staff at the British Embassy in India, assigned to SIN duties, are tasked to respond to emerging science and policy priorities with the aim of facilitating new scientific partnerships and catalyzing the early stages of new collaborations.

India and the UK have a strong track record of collaborating in science and research. In order to set formally the priorities for the research partnership, the two Governments meet every two years at the "UK-India Science and Innovation Council." The latest meeting of the Council in 2010 resulted in the conclusion of seven new agreements, with commitments for joint funding of up to some £60-70 million. [85]

One of the seven agreements concluded in 2010 is an MoU between the UK Medical Research Council and the Indian Council for Medical Research.[86] This agreement is aimed at co-operative research on major global health issues. As part of this new collaboration, both agencies have launched a joint call for research on chronic non-communicable diseases such as Type 2 diabetes, cardiovascular disease and chronic respiratory diseases, which are highly prevalent in both countries.

Turning research into innovation is a key UK Government policy. Accordingly, both countries have agreed to work together to improve the IP management and exploitation of research outputs. This includes developing new methods to maximize the economic, societal and intellectual outcomes of joint research and examining the the barriers to achieving these benefits. For instance, a series of workshops were organized in late 2010 in India

[84] Http://www.theregister.co.uk/2011/02/22/uk_russia_space_innovation/.

[85] See further http://ukinindia.fco.gov.uk/en/news/?view=PressR&id=22344485

[86] See further http://ukinindia.fco.gov.uk/en/news/?view=PressR&id=21776034

identifying effective measures to accelerate the commercialization of co-operative research between India and the UK.[87]

A key facilitator for research cooperation agreements is RCUK, as noted above. RCUK India,[88] which was established in October 2008 to promote closer research relationships between Indian and British researchers, also actively helps with the exploitation of jointly funded research results. For instance, in 2008, RCUK and the Indian Department of Science and Technology jointly funded three "Science Bridges" to facilitate innovation from existing research.[89] The Science Bridges projects are sponsored by RCUK to enhance linkages with China, the U.S. and India to

- accelerate the deployment of research knowledge;
- deepen and strengthen current research links; and
- enable the acquisition of new skills and encourage wealth creation through improving the transfer of research and expertise from the research base to businesses and other users by building science and innovation bridges with world-class universities and high-tech businesses.[90]

The funding for each country can be up to a total value of £4 million over three years. Science Bridge funding is aimed specifically at the commercialization of research.

The flagship UK-India program of collaboration in recent years has been the 2006-11 "UK-India Education and Research Initiative" (UKIERI).[91] UKIERI is a five-year program, managed and funded by the British Council and the Indian Department of Science and Technology (since 2007), which aims to substantially improve educational and research links between India and the UK. It has committed almost £25 million to support almost 500 partnerships, many of which are in research, such as in the financial and creative sectors. A central component of UKIERI is the mobility of undergraduate and graduate students, and research and technical professionals between the two countries. The other strand is for collaborative research projects.

Although UKIERI has clear guidelines[92] advising applicants to consider any IPR implications associated with research projects awarded under the initiative, the ultimate decisions on management and exploitation of the IP resulting from the research are left to the British and Indian research teams, and potential investors/companies. Nevertheless, appropriate acknowledgement of the UKIERI project, British Council and the UKIERI funding partners should be made.[93]

In summary, the ownership of IPRs resulting from joint research in the above agreements is primarily decided by the agencies/parties to the research

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[87] See for instance, *Accelerating UK-India Innovation Partnerships, Reflections from the ACTIV workshops*, 2011.

[88] See further http://www.rcuk.ac.uk/officeinindia/Pages/home.aspx

[89] To know more about Science Bridges and other RCUK-funded programmes, visit http://www.india.rcuk.ac.uk/opps/default.htm.

[90] Http://www.rcuk.ac.uk/media/news/2009news/Pages/090130.aspx.

[91] See further http://www.ukieri.org/

[92] See for instance the award guidelines for the current call at http://www.ukieri.org/Resources/revisedguidelines16june2011.pdf

[93] See further the innovation partnership strands, http://www.ukieri.org/partners.html

agreement directly. However it is worth noting that the UK Intellectual Property Office (IPO) has shown much interest in engaging with the UK-India research projects, particularly regarding the improvement of the impact of collaborative R&D efforts and awareness of IPRs in the innovation process. The IPO is currently working on an "international collaborative R&D framework" (focused on low carbon technologies) with China and Brazil.[94]

China

China now ranks among the highest in the world for number of patentees[95] and has become the fifth leading nation in terms of its share of the world's scientific publications.[96] The citation rate of papers with a Chinese address for the corresponding author also exhibits exponential growth. More specifically, China has become a major player in critical technologies like nanotechnology.[97] China's rapid development and growth have increasingly lured developed economies, in particular, to seek opportunities there, be it for trade, investment or research and development. The UK is no exception.

The two main British organizations in China charged with the identification and facilitation of scientific collaboration with China are the Science and Innovation Network (SIN) based in the British Embassy and the RCUK China office,[98] also based in Beijing. The SIN at the Embassy is actively promoting joint activities with the Chinese Academy of Science, China's premier research agency, including for instance workshops on new materials for solar energy and the development of a joint research program.

RCUK China was formally opened in October 2007 with the aim of being an intermediary to help "broker" strategic links between the UK research funding organizations and Chinese funders and to ensure that future UK initiatives are developed collaboratively with co-funders in China. Since 2006, UK research councils' spending on China has increased significantly. The current portfolio totals in excess of £25m and the annual spend doubled to £6m in 2009.[99] RCUK has also funded several Chinese "Science Bridges" covering applied research in 4G wireless mobile technology, healthcare technologies, such as for cancer and treatment of malaria.[100] These Science Bridges, as explained above, are aimed at further research for commercialization.[101]

The Higher Education Funding Council of England (HEFCE), and the Chinese Ministry of Science and Technology, together with a range of other regional public Chinese funding sources, funded an innovative two-year (2007-2009) program on technology transfer between the two countries –

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[94] Personal communication with RCUK India and China, dated November 11, 2010 and July 7, 2010, respectively. See also http://www.ipo.gov.uk/press-release-20090910.htm

[95] See further http://www.epo.org/searching/asian/china/facts-figures.html

[96] Jha A, China poised to overhaul US as biggest publisher of scientific papers. *The Guardian*, 28 March 2011. http://www.guardian.co.uk/science/2011/mar/28/china-us-publisher-scientific-papers

[97] Zhou, P., & Leydesdorff, L. (2006). The Emergence of China as a Leading Nation in Science. 35, 1.

[98] See further http://www.rcuk.cn/rcuk/fore/index_en.php

[99] Personal communication with RCUK China. July 7, 2010.

[100] Personal communication with RCUK China, July 7, 2010, and BIS officer overseeing collaboration with China on August 8, 2010.

[101] RCUK Press Release. 2 February 2009. http://www.rcuk.ac.uk/media/news/2009news/Pages/090130.aspx

Innovation China-UK (ICUK)[102] – administered by an independent ICUK Management Team, based at Queen Mary University of London. ICUK attempted to bridge gaps in collaborative R&D with China.

The program had five specific aims:

1. Improve cultural understanding;
2. Improve knowledge of possible research collaboration and commercialization opportunities;
3. Increase partnership across Chinese and UK stakeholders;
4. Provide access to Chinese R&D capacities; and
5. Provide access to UK and Chinese markets (commercialization).

As a new initiative to support international proof of concept research, ICUK introduced new approaches to funding and organizing knowledge transfer through a range of different tools, namely in Partnership Grants to support networking and Collaborative Development Funds for "proof of concept" projects.[103] The tools were designed to deal with two main sets of perceived problems hindering China-UK knowledge transfer of collaboration: (1) the lack of financing to support collaborative research at the crucial proof of concept stage; and (2) the challenges posed by cultural, organizational, and geographical distance between both countries.

ICUK had clear rules for dealing with the IP that resulted from its funded joint projects.[104] All project participants had to agree to them as commercialization of the research was a key aim of the program. By the end of the program, 14 patent applications were filed, two income-generating licences have been signed, and a spin-out company has been created. Discussions with a Chinese company to manufacture a product jointly, developed further from an ICUK proof of concept project, have also been undertaken.[105]

An important lesson learnt from this program is the significance of the cultural and institutional contexts in which research is funded in China. The Chinese funding mechanisms differ markedly from those of the UK. For instance, funding of research projects in the UK is for a shorter term than that provided for in the Chinese system. This "asymmetry" led to an investment of unexpected time by the ICUK team to eventually obtain Chinese funding. Consideration of contextual factors needs to be taken into account in concluding KT arrangements for *effective* knowledge transfer, including its commercialization, when regulatory barriers can be a major obstacle.

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[102] http://www.icukonline.org/

[103] See further, http://www.icukonline.org/knowledge/overview.shtml

[104] See further the Partner Exploitation Agreement, which required partners to agree "that any and all intellectual property generated with funding from ICUK and Chinese funding authorities shall belong wholly and exclusively to the Partner Institute where the Intellectual Property is generated" and further „that, if successful, involved institutions are committed to the commercial exploitation of the technology and the sharing of the benefit from such exploitation, and before completion of the Project will jointly agree how the exploitation process will be managed."

[105] For more details, see J. Molas-Gallart, P. Tang and A. Villanueva-Felex (2010) Innovation China-UK: Evaluation Report. A Report prepared for ICUK. London. (Molas-Gallart, Tang, & Villanueva-Felex, 2010). Innovation China-UK: Evaluation Report. A Report prepared for ICUK. London.

2. Spain

2.1 Institutional processes/practices

Ministerio de Ciencia e Innovación (MICINN)

The Ministry of Science and Innovation (Ministerio de Ciencia e Innovación, MICINN)[106] and the Consejo Superior de Investigaciones Cientificas (CSIC, Spanish National Research Council)[107] are the two main Government organizations that deal with international research cooperation agreements.

In the Ministry of Science and Innovation, four "pillars" help to underpin its selection of countries for research cooperation. The first pillar is "science for science's sake." Here the Ministry targets countries that have similar or superior capabilities with the aim of either mutually benefiting from the cooperation or enhancing Spanish scientific capabilities.

Second, as seen with other countries featured in this study, strategic research cooperation with emerging economies, such as those represented by the BRIC countries, are aimed at harnessing the potential research opportunities that these countries offer, as well as tapping into the vast pool of scientific resources that these countries either have or from which they could benefit through cooperation with Spanish scientists. As a corollary to this pillar, such strategic research agreements may also serve as a "diplomatic instrument."

Third is the "science for development" pillar. These agreements are targeted at developing countries with the aim of economic and social development through research and technology. For historical and cultural reasons, the Latin American countries are a target for Spanish research cooperation arrangements; for strategic reasons, North African countries are also of interest to Spain.

Cooperation research agreements aimed at improving knowledge transfer between companies and research institutions are the fourth pillar. However these arrangements are beyond the remit of this study as our focus is on government-to-government (Third Country) research cooperation agreements.

Selection of target countries may also be driven by strategic interests. Ministerial summits and ministerial travels are also another route from which countries may eventually become target countries. A common selection mechanism resides in historical ties with certain countries. With regard to mapping the scientific capabilities of target countries, staff at MICINN undertake bibliometric analysis in addition to other available indicators.

Consejo Superior de Investigaciones Cientificas (CSIC, Spanish National Research Council)

Agreements could result from a recommendation by a senior researcher who has a track record of collaboration with a certain country. Another way would be decisions made by senior CSIC administrative personnel, such as the President, the Vice President of International Relations, or others in positions of responsibility and authority. Yet another could be invitations from Third Party countries. The President has absolute signing power, which

[106] See further http://www.micinn.es/

[107] http://www.csic.es/web/guest/home;jsessionid=852CE01E2F558B2EC1732AC00ECD7308

has recently been derogated by the Royal Decree of the Creation of Agency, January 2008.

CSIC agreements are primarily for the exchange of research personnel between the parties to the agreement as will be seen below. These are generally in the form of a MoU or a framework agreement. However, upon the conclusion of the MoU or agreement for research cooperation, a new specific agreement (convenio especīfico) will specify the scope of the agreement, including whether the agreement is for exchange of personnel, joint research, or for workshops, meetings, and so on.

2.2 IP management, dissemination and exploitation

The following describes how IP is addressed in the cooperation agreements signed between MCINN, CSIC (where indicated) and the BRIC countries.

Brazil

The *Memorandum of Understanding on Scientific and Technological Co-operation* between MCINN-CNPq (Brazil) was signed in 2010.

Signatories agree that IP generated will be regulated by applicable national regulations and WIPO international practices. A distinction is drawn between patents and other categories of IP (including copyright, trademarks, performer's rights, etc), the former being deemed to belong to the institutions that develop them and to be managed by specific contracts signed by the parties. Commercialization which includes third parties will be decided, and the terms defined, by the patent owners.

Russia

The Agreement for Scientific and Technological Cooperation between the Kingdom of Spain and the Russian Federation was signed in 2001.

Use of information and IPRs generated jointly will be defined by the signatories, except under certain circumstances (although these have not been defined in the Agreement). The Agreement differentiates patents (regarded in Spain as Industrial Property) from other forms of IPR, which include copyright, trademarks, performer's rights, etc. These IPRs will be governed by local law as agreed to by the participants. Copyright also will be governed by the terms of the Berne Convention.

The Agreement, on the whole, is governed by four principles: (1) the parties will mutually notify each other the IP generated and will undertake to protect the IP within a period of time (not specified); (2) the parties will exploit effectively the IP generated; (3) the parties will not exercise any discriminatory treatment; and (4) the parties will protect confidential information.

Participants are obliged to jointly develop a Technology Management Plan (Plan de gestion de la tecnologia, PGT) with reference to the IP, publications and the use of the IP (patents and copyright) created during the joint research. The PGT will be approved by the authority funding the research before the signature of a specific research contract. The information and IP jointly generated that will not be regulated by the PGT will be attributed to the parties. Confidentiality of the information will be established by the PGT. However, in the event of a disagreement concerning the IP generated, then the IP will be jointly owned. The rights established will remain indefinitely after the expiration of the Agreement.

The Framework Agreement on Scientific Co-operation by and between the Spanish National Research Council and the Russian Foundation for Basic Research signed in 2007 obliges both parties to inform the other and to obtain consent if one party wishes to disclose any scientific or technical information obtained during the conduct of any cooperative research. The Agreement also requires that there must be mutual consent for the dissemination and use of the data and results generated during the performance of the joint research projects. It also stipulates that only the participants of the research project may be entitled to the dissemination and use of the research in accordance with the appropriate laws of Spain and Russia. Publications based on the research results and any other form of communication referring to the research results must be attributed to the Agreement.

It is worth noting here that there is no particular reference to the issue of possible or potential commercialization of the research results in these Agreements, although it could be implied in the inclusion of the word "use."

India

For the *Programme of Cooperation in the Fields of Science and Technology between the Government of India and the Government of the Kingdom of Spain for the period 2009-2011*, article 4.3 stipulates that both parties are permitted to disseminate "through customary channels and in accordance with the normal procedures of the Parties" the scientific and technological information arising from the research projects and which is of a non-proprietary nature. This essentially would refer to publications (articles, reports) that must acknowledge the origin of the information/data.

Article 4.4 explicitly refers to the protection of proprietary results and the potential use of these results. It says "In accordance with the laws and regulations of the respective countries and with relevant international agreements to which India and Spain are, or will become, parties, the Parties shall ensure adequate and effective protection and fair distribution of intellectual property rights or other rights of a proprietary nature resulting from the cooperative activities undertaken pursuant to this POC. The Parties shall consult one another for this purpose as necessary." As with the agreements with Russia, this Agreement also does not refer explicitly to commercialization of the research results/outcomes.

China

Article 6 on the confidentiality, dissemination and ownership of results in the *Framework Agreement on Scientific Cooperation between CSIC and the Chinese Academy of Social Sciences,* signed in 2007, reflects a similar treatment of IP as seen in the case of Russia. However, two additional issues addressed in this Article not found in the aforementioned Agreements are that of (1) joint ownership of the research results generated jointly by the two parties, and the costs of filing and maintenance of patents, should the results warrant this form of protection; and (2) surrender of ownership to any patent arising from the jointly generated research results.

On joint ownership, the clause says "Where results jointly generated in the research projects may be patentable, both Parties shall determine the terms and conditions that shall govern joint ownership, including the costs related to the filing of the applications or the maintenance of the patents or any

other relevant property rights. In the said patents all the scientists who participated in the invention should appear as inventors."

On the surrender of ownership, the clause reads: "should one of the Parties not be interested in obtaining registered protection for any of the patentable results, this shall be communicated to the other Party within three months of the achievement of these results. The latter Party will determine whether it desires to protect or use the said results."

In sum, it is worth noting here that specific IP clauses appear only to have been included in the Spanish agreements since 2000. Documentation on scientific cooperation made available to us by MCINN for the 1980s and 1990s reflects a distinct absence of IP clauses. For instance, the Scientific Cooperation Spain-Brazil 1992 and 1994 do not contain IP clauses. One could perhaps infer from this omission that Spanish authorities/policymakers involved in collaborative scientific research have only recently begun to be more "systematically" concerned with the commercialization of research IP, in contrast to the lack of explicit attention seen in previous years.

2.3 Spanish cooperation agreements

Spanish cooperation agreements with Third Parties are generally to establish programs for researcher exchanges and visits. These visits are often for the purposes of conducting joint research but no information was available for examples of the projects undertaken during these visits. For instance, in the Agreement with the Russian Academy of Sciences, 218 visits have been made by CSIC researchers to Russia between the years 1999 and 2009 and a higher unspecified number of Russian scientists to CSIC.[108] Visits to Russia will not exceed more than 80 weeks a year, with Spain financing the Russian visitors and vice versa for travel and subsistence costs.[109] Similarly, the Agreements with China and Brazil, reflect the same cost structure. While no visits have yet been arranged under the 2003 *Agreement with the Chinese Academy of Natural Sciences*, the 1988 *Framework Agreement on Scientific Cooperation between CSIC and the Chinese Academy of Sciences* has funded 25 of its researchers to China.[110]

3. Hungary

3.1 Institutional processes/practices

The *Hungarian Law on Research and Technological Innovation, 2004*, aims to "provide public support for research and development and technology innovation activities; and enhance the protection of intellectual property rights and promote the exploitation of R&D results," among other objectives. The Law's underlying policy objectives are to promote sustainable development of the Hungarian economy and to enhance the competitiveness of its enterprises. To facilitate the realization of these aims and objectives, it has identified several priorities. Those pertinent to this study include developing and supporting the research infrastructure (scientific excellence of universities, public research and technology organizations), encouraging knowledge transfer through research,

[108] MCINN-CSIC Institucion Academia Rusia de Ciencias Pais: Rusia

[109] MCINN-CSIC Institucion Academia Rusia de Ciencias Pais: Rusia

[110] MCINN-CSIC Institucion Academia China de Ciencias PAIS: China

attempting to address the various IPR issues raised by publicly-funded academic and not-for-profit institutes, contract research, and licences; introducing measures to raise awareness of IPR issues (in public/academic/non-profit institutes), and providing consultancy and financial incentives related to the use of IPR.[111] The Law on Higher Education, 2005, also addresses IPR issues. Both Laws stipulate that Higher Education Institutions (HEIs) "should *regulate IPR issues internally*, including the distribution of income stemming from patents, licences, copyright. There is, however, a considerable diversity among HEIs both in terms of their actual IPR rules and their observance (e.g. the room for individual agreements, deviating from the rules)."[112]

The two key organizations that deal with research and innovation activities are the National Office for Research and Technology, which is charged with implementation of the support schemes for science and technology policies, and the Hungarian Academy of Sciences. OTKA (Office of the Hungarian Scientific Research Fund) and the Hungarian Economic Development Centre, which focuses on consortium-building and participation in EU programs, are also key players in developing the Hungarian research infrastructure.[113] For the purposes of the present report, the discussion will concentrate on the collaborative research activities of the National Office for Research and Technology and the Hungarian Academy of Sciences.

The main way that the Hungarian Academy of Science identifies countries for research cooperation is through established personal contacts of researchers, which collectively have resulted in a network of bilateral agreements. Another way is through the continual efforts of researchers to establish new and good relations with other institutions with the aim of conducting joint research or exchange of research personnel.[114] Agreements are often initiated by the researchers. These agreements also result from long standing historical relations, such as those with India and China (see below).

The criteria for selection of target countries are based on: (1) a need or interest for strengthening the research capability of the researcher(s) at the Academy; and (2) complementarity of scientific expertise of the researcher(s).

3.2 IP management, dissemination and exploitation

As noted above, the new laws on research and higher education explicitly address IP-related issues, particularly with respect to exploitation. They also, however, explicitly state that the management of IP is left to the discretion of the particular research institute; including the drafting of any IP clauses or provisions in the relevant and applicable agreements.

Therefore, the agreements that the Hungarian Academy of Sciences and the National Office of Research and Technology have provided largely do not

[111] Http://cordis.europa.eu/erawatch/index.cfm?fuseaction=policy.document&UUID=7D87ACE8-9DE3-0791-875821987E441680&hwd=.

[112] Http://cordis.europa.eu/erawatch/index.cfm?fuseaction=ri.content&topicID=66&parentID=65&countryCode=HU

[113] Http://cordis.europa.eu/erawatch/index.cfm?fuseaction=ri.content&topicID=64&countryCode=HU.

[114] Personal communication with a senior executive at the Hungary Academy of Sciences, December 3 and 12, 2010.

have IP clauses. Instead, we were informed that while IP clauses could be included in research projects that are conducted under the umbrellas of these agreements, this is largely left to the individual Hungarian institution participating in the project(s). However, with respect to the research agreements with China and India with the Hungarian Academy of Sciences, both parties may commercialize the IP generated as they see fit, and probably in consultation with each other, although this condition does not appear to be specified.

Similarly, agreements concluded between the Hungarian Government (administered by the National Office of Science and Technology) and Third Parties do not have IP clauses in the agreements. IP matters will, however, be addressed in specific contracts by the party funding the research.

3.3 Hungarian cooperation agreements

Brazil

The Governments of Hungary and Brazil concluded an intergovernmental framework agreement in 1986, which was renewed in 1992.[115] This Agreement is aimed at supporting individual ties among academic researchers mainly through the exchange of scientists.

Russia

The Agreement between the Hungarian Academy of Sciences and the Russian Academy of Sciences, which was originally signed in 1958, renewed in 1998 and currently under review for extending the Agreement to 2013, is aimed at supporting researcher exchange and visits. The Agreement with Russian Academy of Medical Sciences, also of 1984 and renewed in 1998, will be extended for the period 2011-2013. As with the Agreement with the Russian Academy of Sciences, this Agreement is aimed at researcher visits and exchange.

India

The Cooperation Agreement on Experimental and Theoretical Studies on Soft Condensed Matter is a historical agreement, in place for more than 20 years. The Hungarian partner is the Academy's Research Institute for Solid State Physics and Optics and the Indian partner is the Centre for Liquid Crystal Research. This Agreement was concluded specifically to govern the funding of mobility of participants in any project conducted under this Agreement and as such, does not include any IP clauses. The Academy helps to pay for the expenses incurred by the exchange of researchers.

Another agreement, the Cooperation Agreement on identification, biodiversity, mycotoxin production and antifungal susceptibilities of Fusarium strains isolated from keratomycosis is between the Hungarian University of Szeged, Faculty of Science and Informatics, Department of Microbiology and Aravind Eye Hospital and Postgraduate Institute of Ophthalmology in India. This agreement is also for exchange of research personnel in this particular field. Again, the Academy helps to finance the costs of mobility.

[115] Information provided by a senior officer at the National Office for Research and Technology which concludes and administers national agreements.

Projects under this Agreement typically run for three years. The first project was undertaken in 2007-2008, and the second one will run from 2010-2012.

China

The Agreement on the Relations between China and the Soviet Union and the Eastern European Countries in Transition (1949-1989) is another historical agreement. However the Agreement is still in force and the Hungarian Academy Institute for Philosophy and Historical Studies currently has a project with the Institute of World History, Chinese Academy of Social Sciences (CASS). This project is for the period 2011-12 and is aimed at mobility of Hungarian and Chinese research personnel. The Academy and CASS finance the mobility of the participants of this project.

Under the EU-China Partnership and facilitated by Hungarian Presidency of the European Commission, the Academy's Research Institute for Political Sciences and its Chinese partner, the Institute of European Studies, CASS has recently concluded a project for the period 2011-2012. Both HAS and CASS will finance the visits of the participants of the project.

The Chinese Ministry of Science and Technology and the Chinese Ministry of Economy and Transport and the predecessor (National Office of Science and Technology) to the National Office of Research and Technology signed cooperation agreements in 2002 and 2007, respectively, for exchange of scientists.

4. Germany

4.1 Institutional processes/practices

The German Federal Ministry of Research and Education (Bundesministerium für Bildung und Forschung, hereinafter "BMBF") is in charge of fostering predominantly non-commercial, public research-oriented international relationships with other countries. Its ties with non-EU members are of varying intensity. The Ministry for Economy and Technology (competence for "technology" shifted from the BMBF to the Ministry of Economy in 1998, obviously to emphasize the commercial aspect of innovation in Germany) seems to be predominantly in charge of negotiating clauses on innovation and IP which are related to the industry sector. Under the auspices of this ministry, Germany has recently entered into negotiations on Bilateral Investment Treaties (BITs) with third countries. Such BITs subsume patents and other IPR under "investment" (normally in Art. 1 d) of the standardized BITs. For example, the BIT between Germany and China of 2003[116] provides:

> Article 1: Definitions
>
> For the purpose of this Agreement
>
> 1. the term "investment" means every kind of asset invested directly or indirectly by investors of one Contracting Party in the territory of the other Contracting Party, and in particular, though not exclusively, includes:

[116] See country information on the website of the Minstry for Economy and Technology, https://www.gtai.de/ext/anlagen/PubAnlage_7753.pdf?show=true. See further BGBl. II 2005, 733 et seq

a) movable and immovable property and other property rights such as mortgages and pledges;

b) shares, debentures, stock and any other kind of interest in companies;

c) claims to money or to any other performance having an economic value associated with an investment

d) *intellectual property rights, in particular copyrights, patents and industrial designs, trade-marks, trade-names, technical processes, trade and business secrets, know-how and good-will;*

This practice has been subjected to international criticism, particularly for defining IP as "investment" and treating it in the same way as other forms of investment regulated by non-IP-related rules, resulting in possibly harmful imbalances. Compulsory licences, for instance, which are allowed under certain circumstances according to the TRIPS Agreement and some other rules, may turn out to be "expropriation" under the new investment-related treaty clauses and expose the country which imposed a compulsory licence to unanticipated compensation claims.[117]

Expressly IP-related agreements between Germany and other countries or regions do not seem to exist, possibly due to a number of factors, including: (1) the existence of a tight network of multilateral IP treaties; (2) the rather advanced harmonization of IP within the EU; and (3) the EU emphasis on concluding EPAs with third countries, thus transplanting EU protection standards to jurisdictions outside the EU, leaving little to negotiate between single member states and third countries with respect to purely IP-related subject-matter.

Another institutional characteristic of Germany is its strong federalism. According to Art. 32 of the German Constitution, the competence to establish external relations is with the German Federation. Nevertheless, the states may conclude their own agreements with foreign states in areas in which they enjoy legislative competence, inter alia, in the area of culture and education ("cultural sovereignty of the states"). Agreements on scientific exchange may also be concluded on this constitutional basis, as the legislative competence of the states includes education.

Especially prone to establishing its own diplomatic ties is the Free State of Bavaria.[118] Agreements with clauses on scientific exchange, however, are restricted to ties with regions/states/provinces of other countries. The agreement "Mutual Declarations of Intent on Economic and Technical Cooperation between the Province of Shandong and the Free State of Bavaria" (Gegenseitigen Absichtserklärungen zur wirtschaftlichen und technischen Zusammenarbeit zwischen der Provinz Shandong und dem Freistaat Bayern) dates back to 1987. Two years later it was followed by a similar agreement with the Canadian Quebec province. Subsequently, further regional partnership agreements with West Cape and Gauteng, Sao Paolo, Georgia/USA, Guangdong/China and Karnataka/India followed.

[117] See Liberti L, Intellectual Property Rights in International Investment Agreements, OECD Working Papers on International Investment 2010/1. Available at http://www.oecd.org/dataoecd/37/52/44822901.pdf

[118] Meier-Walser R-C, Die Außenbeziehungen Bayerns (Bavaria's external relations), Politische Studien May/June 1999, 5 et seq

From the scarce information available with respect to the contents of and activities carried out under such agreements, it seems that the respective partner regions are selected according to certain preferences. As reasons for selecting Shandong in China, the Bavarian State Center for Political Education under the Ministry of Culture cites the history of colonialism, remainders of German culture and the proximity to the sea.[119] Meanwhile, Bavarian-Chinese collaboration has started to include R&D, especially in the area of environmental technology. The focus of Bavarian engagement in foreign countries, however, is a clearly economic one, namely in order to secure markets for predominantly Bavarian producers and services. This is also true with regard to the recent partnership agreement with the Indian state of Karnataka where Bavarian firms are engaged in infrastructure related projects.

Other German states have launched similar outward-oriented initiatives. On 18 November 2009, the head of North Rhine Westphalia signed a Joint Declaration with the Chinese province of Jiangsu, addressing, among other things, improved investment conditions for North Rhine Westphalia's enterprises and intensified collaboration in the areas of energy and environmental technologies.[120] Other German states seem to have similar agreements with regions in third countries.

4.2 German cooperation agreements

In terms of bilateral relationships directly related to KT and IP, the closest relationship seems to exist with Russia, in spite of the fact that the Russian-German trade volume of 45 Billion euros amounts to less than half of the trade volume between China and Germany (92 Billion). Contemporary initiatives of knowledge transfer and scientific exchange between Russia and Germany are based on the relatively new Agreement between the Federal Republic of Germany and the Government of the Russian Federation on scientific and technical cooperation of 16 July 2009.[121] The Agreement itself is based on the Joint Declaration on a Strategic Partnership in the Areas of Education, Research and Innovation of 11 April 2005. Joint research activities carried out under the present bilateral framework are strongly focused on public research themes. Under these themes, the core areas of cooperation are: high-temperature superconductivity, laser research and laser technology; water research and environmental technologies; biological research and biotechnology; marine and polar research; and information and communication technologies. With the exception of biotechnology and communication technology research, which, at least to a certain extent, aim at commercializing research results, scientific collaboration under this framework is largely confined to joint research at university and PRO level. The relevant model of cooperation basically corresponds to the Russian research landscape which is traditionally oriented towards state-funded basic research, whereas the enterprise sector confines itself to extracting and processing raw materials.[122]

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[119]. Fischer P, 20 Jahre Beziehungen zwischen Bayern und Shandong – eine Erfolgsgeschichte mit Zukunft, Einsichten und Perspektiven 02/2007, at http://192.68.214.70/blz/eup/02_07_themenheft/1.asp

[120] See further http://www.nrw.de/presse/ministerpraesident-ruettgers-besucht-china-8111/

[121] Information regarding scientific ties with Russia summarized on the BMBF website, at http://www.bmbf.de/en/2513.php.

[122] See also Ganea, Study 4: A study of the factors which affect knowledge transfer activities between European and non-European partners, focusing on collaboration with partners in "emerging economies", in: 2009 Expert Group on Knowledge Transfer - Final Report, at

The agreement with Russia is supplemented by an extensive annex on "Principles of Dissemination and Utilization of Information and the grant of Intellectual Property Rights" which shall be applicable to all joint projects carried out under the auspices of the Agreement. It obliges the parties to fulfil a collaboration agreement to include clauses which regulate the contractual obligations of each party, specify pre-existing rights, confidential information, and other resources contributed by each party, provide for the possibilities of prosecuting and defending IPR, and specify the modes of sharing in the benefits of joint research by each party.

What at first glance appears to be a sign of initial distrust in Russia's eagerness to protect IP,[123] instead seems to represent a new general trend towards management of IP within knowledge transfer relationships. The Agreement with the US on scientific and technological cooperation of 18 February 2010 contains an even longer annex on IP. In contrast to this, the older Framework Agreement between the Federal Republic of Germany and the Federal Republic of Brazil on the Cooperation in Scientific Research and Technological Development of 20 March 1996[124] does not yet contain such additional IP-related obligations. The IP annexes seem to reflect the growing importance of IP in international knowledge transactions.[125]

Until recently, relevant agreements with Germany's largest non-European trade partner, the People's Republic of China, are largely concluded at the level of trade. In 2002, the Federal Republic of Germany concluded an Agreement with China on "Economy, Industry and Technology". The agreement is clearly industry-oriented. Art. 8 obliges both countries to acknowledge the importance of effective IP protection for economic, industrial and technological cooperation and to inform each other about domestic laws and procedures.[126] The BMBF does not refer to this trade-related agreement on its website but it regards the much older Agreement of 9 October 1978 (which entered into force, 10 November 1978) on Scientific and Technological Cooperation as the sole basis for its China-related activities.[127] That a newer agreement on purely scientific collaboration is not yet in place may also have to do with the Chinese innovation landscape, which, according to the English version of the BMBF's entry on China on its website, is predominantly industry-oriented:

> Increasingly research and development in China are being reformed on the basis of economic criteria. However, institutions which conduct basic research are largely exempted from these type of reforms. The focus continues to be on the industrialization and commercialization of technologies.[128]

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http://www.tii.org/download/2009%20Expert%20group%20on%20knowledge%20transfer%20-%20final%20report.pdf

[123] See Ganea, above.

[124] The Framework Agreement and other related documents can be found at http://www.bmbf.de/de/5316.php.

[125] English version of the Agreement with the US at http://www.kooperation-international.de/brasilien/themes/info/detail/data/46315/.

[126] BGBl. II, S. 1022.

[127] Http://www.bmbf.de/en/818.php.

[128] Footnote above (latest update on 2 February 2009, last visit on 12 July 211) – the translation of the recently amended German version should be in progress, so that the present site may no longer be existent when this study is published.

The recently-updated German entry still contains such a sentiment,[129] but it also mentions five new agreements on education and research between the BMBF and Chinese ministries, which can be understood as a commitment to intensify collaboration in the public sector. The following three new agreements are related to research cooperation:

- Joint Declaration on Establishing a German Chinese Innovation Platform (with Ministry of Science and Technology – MOST)
- Declaration of Intent with regard to a German-Chinese Innovation Program "Clean Water" (with MOST and the Ministry of Housing and Urban-Rural Development)
- German-Chinese Innovation Platform Life Sciences (with MOST)[130]

It should be noted, however, that China's public research sector is changing. The Chinese Academy of Sciences together with a number of leading universities have developed strengths in fundamental research. The State Intellectual Property Office (SIPO) proudly alludes to the fact that since 2009, domestic filings of biotech patents applications and biotech patent grants to Chinese applicants exceed filings by and grants to foreigners. In the same press release, however, SIPO bemoans that nearly all domestic filings of biotechnological patent applications, as well as domestic grants in this area, come from the public research sector and that the domestic enterprise sector remains passive in this area.[131]

The BMBF has concluded a number of agreements with other important non-European countries, but it is beyond the scope of the present report to investigate these in great detail.[132] It should be noted, however, that all these national agreements are held in a similarly non-committal language as the mentioned agreements on scientific and technological exchange concluded between the EC and third countries.

In sum, Germany seems to be quite active in terms of formalized R&D relationships. In the newer agreements, IP is treated in Annexes which regulate subject matter of immediate interest for scientific cooperation projects, such as the allocation of application rights or IP in contributed and jointly developed technology. As mentioned, the fact that IP is not more extensively dealt with in such agreements may be traced back to the quite advanced harmonization of IP within the EU and the EPAs which strive for transplanting the character and standards of European protection to third economies.

The large German research societies have their own arrangements with institutions abroad, e.g. the Max Planck Centres co-founded by the Max Planck Society with numerous partners throughout the world[133], the research cooperation agreements between the Helmholtz Association and various Indian research institutes,[134] or the Agreement between the Leibniz

[129] http://bmbf.de/de/818.php, updated on 29 June 2011.

[130] Unfortunately, the texts of these new agreements could not (yet) be found.

[131] Report in German in GRUR Int. 2009, 788.

[132] A comprehensive overview of the BMBF's external relations can be found here: http://www.bmbf.de/en/707.php

[133] http://www.mpg.de/4282820/Max_Planck_Centers_new_kind_of_cross-border_cooperation

[134] http://www.helmholtz.de/en/research/cooperations/international_projects/helmholtz_as_a_research_partner/research_cooperation_with_india/

Association and the Taiwanese Research Council.[135] The available sources, however, remain silent on the question whether and to what extent these cooperation agreements are based on the existing government-level Agreements on Scientific and Technological Cooperation between Germany and non-EU members.

5. Finland

5.1 Institutional processes/practices

According to the European innovation scoreboard 2009, Finland is a high-tech nation.[136] The basic guidelines with regard to research and innovation policy are determined by the Research and Innovation Council (RIC; until 2009: Science and Technology Policy Council), a central agency headed by the Prime Minister and comprising two subcommittees headed by the Ministry of Education and Culture and by the Ministry of Employment and of the Economy, formerly the Ministry of Trade and Industry. Since 2004, when the RIC adopted a Strategy for the Internationalization of Finnish Science and Technology, Finland's program of R&D and innovation is strongly outward-oriented. In another position paper on "Internationalization of Finnish Education, Research and Innovation" of 2009,[137] the RIC confirms its eagerness to strengthen further the internationalization of Finnish R&D. It outlines, inter alia, why a technology leader like Finland should be interested in such internationalization (such as participation in knowledge available abroad in order to maintain competitiveness, attracting scientists from abroad in the light of an ageing society, and so on). It seems that, as compared with other states, such as Germany, Finland's internationalization of R&D is rather coordinated. There is a notable division of labour, as the Ministry of Science and Education is predominantly in charge of publicly-funded "pure" scientific research and education, whereas the Ministry of Employment and of the Economy deals with enterprise-oriented innovation. Their respective outward-oriented activities, however, seem to be largely carried out under the auspices of the RIC.

The same seems to be true with regard to the institutional infrastructure for translating the central guidelines into practice. The following organizations have joined their forces to establish FinNode, an organization which is dedicated to promoting international research cooperation between Finnish public organizations and enterprises and foreign counterparts.

- The Ministry of Foreign Affairs;
- The Academy of Finland, which provides funding for scientific research and researchers;
- Tekes, the Finnish funding agency for technology and education which provides R&D&I funding and expert services to the public and private research sector;
- SITRA, another organization dedicated to assisting and funding not only innovation and R&D but also new policies, operation methods, and related aspects;

[135] http://www.wgl.de/?nid=euii&nidap=&print=0

[136] http://www.proinno-europe.eu/page/finland-1

[137] Http://www.minedu.fi/export/sites/default/OPM/Tiede/tutkimus-_ja_innovaationeuvosto/erillisraportit/liitteet/KVstrategia_Eng.pdf .

- Finpro, a network composed of enterprise experts which assists Finland's industries in their outward activities; and
- VTT, Technical Research Centre of Finland, Scandinavia's largest organization for commissioned research (comparable to the German Fraunhofer Society).

FinNode has bureaus in China, Japan, Russia and the US. A fifth bureau is planned in India. FinNode's activities are steered by the Ministry of Employment and of the Economy, although the Ministry of Foreign Affairs is also involved. The Ministry of Employment and of the Economy also plays a leading role as co-founder of another research cooperation institution, the Finland China Innovation Center (FinChi),[138] together with TEKES and FINPRO. The FinChi was founded before FinNode China opened in 2009. Today, FinNode and FinChi are located within the same premises in Shanghai.[139]

As far as bilateral treaties are concerned, the Ministry of Employment and of the Economy seems to be the main agency in charge of negotiations.

5.2 Finnish cooperation agreements

Finland has formal agreements on cooperation in science and technology with China (since 1986), Japan (1997), South Korea (1989), the US (1995) and India (2008).[140] Only the agreement with the US and a subsequent Implementing Agreement between the US Department of Energy and the Ministry of Employment and of the Economy contain substantive clauses on IP and security/confidentiality. Furthermore, the Ministry of Employment and of the Economy has concluded memoranda of understanding on scientific and technological cooperation with its counterparts in Israel (2001), Ukraine (1999) and Vietnam (1995).[141] All agreements and MOUs, with the exception of the abovementioned, quite detailed IP and secrecy annex in the agreement with the US, are drafted in a rather non-committal language. They refer, inter alia, to the exchange of data, persons and joint conferences as activities covered by the relevant agreement, as well as meetings between the contracting parties.

Importantly, it seems that most of these agreements have been realised through concrete research cooperation projects. Under the agreement with China, for instance, the Ministry of Employment and of the Economy and the Chinese Ministry of Science and Technology hold meetings on a regular basis. For instance, the minutes of the 12th meeting[142] reveal an impressive number of cooperation projects, mainly between universities, showing that cooperation on the PRO level with China is indeed possible. A few collaborations which are based on such agreements also involve the commercial sector (e.g. Nokia).[143] On the other hand, the existence of formal

[138] Http://www.finchi.cn/.

[139] Http://www.finnode.fi/china.

[140] Finland's S&T cooperation agreements can be found on the website of the Ministry of Employment and the Economy, at http://www.tem.fi/index.phtml?l=en&s=2363

[141] Possible limitations should be noted in this regard, in that these are the agreements that could be traced within this Expert Panel's resources and without knowledge of the Finnish language.

[142] 2006, later information was not available.

[143] Available at the University of Easter Finland website, http://www.uku.fi/ehp/admin/New_Project_list_2006_final_muokattu_between_Finland_and_China_310506.pdf, the project list is from 2006, later information was not available.

bilateral ties does not seem to be a necessary prerequisite for commencing cooperation with partners in third countries. FinNode, for instance, already has an office in Russia, in spite of the absence of a corresponding inter-state agreement or MOU.

In sum, the number of agreements with third countries which involve KT is overseeable but a high number of joint research projects seem to be based on these agreements. The Finnish example also demonstrates that a functioning institutional framework for KT may be more important for successful R&D cooperation with foreign partners than the existence of bilateral treaties. The Finnish institutional framework seems to be comparably well-coordinated and not too hierarchical. The RIC coordinates the activities at the top level but delegates the actual implementation work to agencies like Tekes and the Academy of Finland. These agencies enjoy the flexibility to reach out to third economies and to establish local offices wherever deemed profitable.

III Summary Part B

1. KT-related bilateral agreements can roughly be divided into two types of agreements:

- Agreements on scientific-technological cooperation; and
- Agreements on the protection of IP.

At the EU level, the competence for negotiating and administering agreements on scientific-technological cooperation is with the Directorate-General for Research and Innovation. At the member state level, it rests with the various national ministries for research, education, and related areas.

With regard to IP-related bilateral treaties, the competence to prepare and to negotiate agreements at the EU level is with the Directorate-General for Research and Innovation, whereas at the national member state level, such competence seems to be with the various national ministries of trade, economy or commerce.

The IP-related external ties between the EU and Third Countries/regions, however, do not form isolated bilateral “IP treaties”. They are part of broader trade-related EPAs, with a strong focus on IP as trade-related subject matter. At the individual member state level, especially the technologically-advanced member states, a number of bilateral agreements on scientific and technological exchange have been concluded with non-European states. Bilateral treaties between member states and Third Countries on IP, however, are rare to non-existent. In this area, the European Commission, represented by Directorate-General for Trade, seems to have assumed competence to enter into bilateral negotiations. The reason may be the already high degree of worldwide harmonization of IP by multilateral treaties to which either Europe as a whole (WTO/TRIPS) or single member states are signatories and the even further-reaching harmonization of IP within the EU. Further, the EU has started to “export” the results of European IP harmonization to other countries via the mentioned EPAs, meaning that there are few IP issues remaining on which to agree between single member states and Third Countries.

2. Drafting language

The agreements on scientific and technological cooperation at both the regional and national levels are drafted in a notably non-committal language, whereas the

IP-related provisions of the EPAs contain firm and binding requirements regarding protection level and enforcement, mostly beyond the standards set by the TRIPS Agreement. That said, the IP clauses in the EPAs nevertheless rely upon fairly standard language, mostly modelled on the various EU Directives and Regulations on different aspects of IP. This is done without any regard to specific problems or socio-economic differences in the target countries. For instance, institutional peculiarities or lack of effective infrastructure could result in weak enforcement, undermining the practical implementation of any agreement. There is therefore a high probability that even the rigid European standards, once adopted into national laws of the target countries, will remain law on the books without being thoroughly translated into practice.

3. Bilateral treaties and IKT

The existence of formal bilateral treaties on R&D cooperation, and so, is not necessarily a precondition for IKT. Scientific cooperation or joint R&D in both the private and public sectors does not always have to depend on such treaties. More significantly, relevant (though not necessarily sufficient) preconditions include the existence of an institutional framework, comprised of agencies with establishments in the target countries serving as entry-points for parties engaged in collaborative research. We conclude that contextual factors, such as institutional practices, culture, research infrastructure, competencies, and so on, become necessary conditions for completing research cooperation agreements with other countries to ensure effective enforcement and KT.

4. Varying approaches to IP

Trade-related agreements and agreements related to scientific exchange have different approaches towards IP. Whereas trade-related agreements (basically the EPAs) place significant emphasis on enhancing the level of IP protection in Third Country economies, the science-related agreements between the EU or between single member states and Third Countries are largely confined to prescribing what IP-related matters should be treated in concrete agreements on scientific collaboration (such as ownership issues, treatment of contributed intellectual assets, and so on). The former is clearly dealing with broader policy development, whereas the latter is dealing more specifically with aspects of the scientific collaboration and projects themselves.

5. Non-IP-related obstacles

Binding provisions regarding non-IP-related obstacles, but which will likely have an impact on enforcement of the agreements, are not ordinarily addressed in these instruments. These barriers may be found in bureaucracy or taxation matters.

6. Contextual factors

It should be recognized that contextual factors (institutional, cultural, competencies, research infrastructure, and so on) have a significant impact on effective KT. This should be considered in drafting individual agreements, in that a “one-size-fits-all” template for drafting IP clauses will likely result in poor enforcement of the agreements. However, an effective model or models which may be adapted for specific circumstances where relevant will be likely to prove important for facilitating successful IKT.

7. Enforcement

Where IP issues are addressed or IP clauses are included in the agreements, there remains the question of enforcement. It is not clear how the IP arrangements are to be enforced. Equally importantly, it is not known *if* they are enforced by the signatories to the agreements. In other words, what are the mechanisms or processes to monitor enforcement? Should these mechanisms be included in the agreements?

IV Preliminary recommendations for addressing IP issues in treaties and research cooperation treaties and agreements

1. Context

Bilateral agreements concluded between the EU and third countries, or between single member states and third countries, should account for the target country's local characteristics and conditions (contextual factors, such as institutional practices, research infrastructure, and so on). Further, such agreements should deploy less standard language in order to address these cultural and contextual differences. This is especially true with regard to the enforcement-related IP clauses in EPAs. Future proposals of EPAs with IP clauses should tackle insufficiencies and obstacles which have been observed in practice in the respective target country and not simply reiterate the text from various EU directives and regulations. Also in those agreements which are related to scientific and technological cooperation, tighter drafting should focus on those issues which have emerged as problematic in daily collaborative research (or which have prevented interested PROs from entering into scientific collaboration). Of course, such tailor-made agreements would require more preparation, field work, interviews with business circles, and so on, but the benefits of such additional endeavour would enhance the likelihood that the agreements would be translated into practice and not remain merely theoretical.

The institutional, organizational, competencies and cultural factors of the target country need to be considered target country for effective enforcement and KT. In other words, "think global, act local."

2. Intellectual property and KT

The strong focus on IP as the one and only channel of KT in the various agreements on European and member states level also should be rethought. Lack of patent and know-how protection is by far not the only obstacle encountered by professors who want to engage in international research collaboration or by enterprises who want to invest in third countries. Many emerging markets are notorious for their bureaucracy, which suffocates many promising KT projects long before IP infringements or contractual disputes may arise. Until recently, for instance, Brazil had an insurmountably bureaucratic regime on the access to its vast biological diversity, comprised of several different agencies with overlapping competences which had to be approached for a license to engage in biological on-the-spot research.[144]

[144] Meanwhile, however, it seems that Brazil has merged these agencies to a one-stop-shop, a measure which would greatly facilitate KT – see C. Heath, book review S. Bucher „Der Schutz von genetischen Ressourcen und indigenem Wissen in Lateinamerika" , GRUR Int. 2008, 869.

Protection: The importance of the appropriate IPR for protection of the research results must be recognized. Collaborative research in a specific area and which is aimed at commercialization, must also address the kind of IPR relevant to protection and commercialization of the research results. This includes both statutory (for example, patent protection) and non-statutory (such as confidential information) protection, as well as registered (such as trade marks) and unregistered (such as copyright) rights. Further, informal methods of protection (such as being first-to-market or complexity) will also be relevant in many instances. For instance, patents will be appropriate for the pharmaceutical industry, while design and trade marks may be more appropriate for the creative industries (e.g. video sector, movie sector, fashion sector, the first two of which being generally populated by SMEs). In the service sector, such as the financial sector, being first-to-market may be a more effective informal mechanism for protection than a formal IPR (apart from copyright). In the processing sector, the complexity of the process (informal method) could provide better protection than a formal IPR. Relevant and strategic use of the IP system will largely contribute to more effective exploitation and marketing of the research.

Enforcement: Mechanisms to monitor or ensure enforcement of IP clauses merit consideration as IP clauses may merely remain theoretical frameworks at best if there is no adequate infrastructure to ensure the rule of law. Relevant and effective mechanisms for monitoring and technical assistance warrant further thought and investigation.

Commercialization: Care must be taken to consider whether the management of IP is primarily concerned with commercialization of research results. If commercialization is indeed the primary object, then questions of methods for marketing and commercialization must be addressed. These issues include in particular the need for clarification of the measures for the sharing of IP between parties to the relevant agreement.

3. Administrative efficiency

Future bilateral agreements concluded by the EU or by single member states should place more emphasis on the removal of administrative obstacles. Of course, PROs and enterprises appreciate respect for their intellectual assets and a reliable judiciary which prosecutes the disrespectful, but they would also greatly welcome the absence of bureaucratic requirements regarding alien registration, settling, establishment of offices/laboratories, taxation, and so on. Future bilateral agreements may, in addition to IP-related obligations, contain provisions on preferential treatment of R&D intensive investment and public KT, either by commitment to remove administrative obstacles, or – where obstacles are caused by human behaviour rather than by identifiable and removable provisions – by a commitment to establish institutions or one-stop-shops dedicated to guiding foreign researchers through what may be otherwise insurmountable administrative and bureaucratic obstacles.

4. Exploitation and funding

Funding applications will almost invariably include an obligation to present an exploitation plan for the research results. Relevant considerations will include the means by which researchers intend to commercialize their research outputs and findings. Clarifying such questions at the “agreement” stage establishes the policy as well as contractual framework for any collaboration, and would help facilitate effective KT.

As Part C will now elaborate, good practices that will be helpful in setting up IP management guidelines will take into consideration these key features:

1. Context (including language, cultural, organizational, and institutional factors, sector, size of company, and so on);
2. Intellectual Property;
3. Administrative Efficiency; and
4. Exploitation and Funding.

When Good Models Make Bad Practice

A case in point of "bad practice" may be observed from the Danish adoption of a law modelled on the US Bayh-Dole Act 1980 (Danish Law on University Patenting). A study undertaken on the collaborative research activities between Danish universities and biotech firms shows that such activity has *significantly declined* because of disagreements between the ownership of IP not previously experienced between biotech companies and the universities.[145] A key feature of the new Danish law is to accord ownership of IP to the university, including collaboratively-generated IP. Furthermore, in a review of the effects of Bayh-Dole and the implications for developing countries, it was concluded that the growing aggressiveness of some university (US) technology-transfer offices in asserting their patents is beginning to sour relationships between universities and industry, especially in information technology, and causing a general feeling of mistrust between them.[146]

In developing useful, relevant and applicable interactive tools and guidances, it is essential to draw upon the lessons thus far and consider these key features or prerequisites for effective IKT.

Part C now turns to such tools and mechanisms and considers their potential for broader application for EU innovation, particularly in the context of extra-EU collaboration and cooperative IKT partnerships.

[145] F. Valentin and R.L. Jensen (2007). "Effects on academia-industry collaboration of extending university property rights," *Journal of Technology Transfer* 32:251-276.

[146] B.V.Sampat (2010). "Lessons from Bayh-Dole," *Nature* 464:755-756, December 9.

C Interactive Tools, Support Measures and Guidance

The purpose of Part C is to review the various support measures and guidelines currently in place, as well as make recommendations for further developments to facilitate knowledge transfer, all in the context of the minimum requisite conditions as identified in Part A. This section and indeed this report will not be concerned with devising new incentives to engage. Rather, the discussion is concerned with maximising support for those already engaging in knowledge transfer activities, cooperation and collaboration.

The purpose is therefore to identify best practice and successful support where currently available and recommend means of support where these are not already in place in order to maximize and facilitate entities already engaging in cooperation and collaboration. This section is primarily concerned with public/private partnering, particularly industry partnering with PROs.

Parts A and B have established the necessary conditions and environment for maximising knowledge transfer and third country cooperation. This section will therefore not repeat this material, other than in explanation. It is also not necessary to provide further extensive country-based explanation, as this section is largely more issues-based and forward looking. Nevertheless, the following key jurisdictions will be discussed for illustrative purposes, particularly for their value in demonstrating the relevance of industry and sectoral differences:

- United Kingdom
    - Strong pharmaceutical sector
    - Comprehensive creative industries
    - Highly-developed university policy and regulatory environments
    - Strong entrepreneurial culture
- Germany
    - Extensive activities in industry sector
    - Strategic use of model contracts and other precedents
- Bulgaria
    - New member state (2007)
    - Developmental stage of policy and regulatory frameworks
    - Developing university environment for innovation and commercialization
- Norway
    - Third country and also member of the European Patent Convention (EPC)
    - Cultural differences concerning entrepreneurial activity within the university sector

These exemplary jurisdictions are important for demonstrating the following:

- Industry differences
    - it is important to note that knowledge transfer is relevant not only in the form of technology transfer and patentable technology, but is a

key aspect of the burgeoning creative industries and so-called creative economy

  - in particular, knowledge transfer must take account of not only registered rights (e.g., patents and trade marks) but also unregistered rights (trade secrets as well as copyright and unregistered design rights, which are of particular importance in the creative industries such as fashion and design industries)

- Structural differences (funding, investment and taxation rules)
- Linguistic differences
- Cultural differences (entrepreneurialism)

Methodology

In addition to the obvious commercial and resource benefits, cross-sectoral partnerships produce considerable benefits in the following ways:

(1) Direct benefits to industry partner
- Financial savings
- Resolution of possible weaknesses in recruitment and staff training
- Increased profile of business (through research profile), including possible international profile
- Universities challenge in-house staff (through staff exchanges and collaborative relationships)
- Use of university facilities and resources

(2) Direct benefits to university partner
- Increased activity in research and development
- Financial resources
- Commercial and industry/market expertise

(3) Indirect benefits to industry partner
- Increased demand for research by business
- Building an innovative culture within the private sector

(4) Indirect benefits to university partner
- Benefits to education and research environment
- Developments towards a best practice culture
- Diversity of ideas and approaches to research and development

Knowledge transfer takes place according to 4 key areas: (1) Collaborative research **(knowledge exchange)**; (2) knowledge exchange activities **(information exchange)** , (3) information and people exchange **(experiential nature of knowledge transfer)**; (4) commercialization and development **(technology transfer)**. Importantly, knowledge transfer is not simply about

intellectual property management. It is perhaps more appropriately understood as innovation management in the broadest sense of innovation (including innovation in research environments, business models as well as a diverse array of industries and disciplines).

The discussion in Part C is structured according to the key types of cooperation to which the relevant guidances and tools available will be applied. These may be understood as follows:

(1) Research
    - Research may be collaborative (traditional research and potential for university commercialization) or commercial (contracts for research and conventional consultancies, where it is possible that no intellectual property is retained by the university)
    - Subsidiaries
    - Strategic alliances etc
    - Industry-university partnerships

(2) Information exchange and skills transfer
    - Seminars, conferences
    - Networks
    - Training
        - Economic pressures on university sector
        - third stream funding and revenue (e.g., CPD)
        - “Value-added” student experiences
        - Employability

(3) People exchange (human resources)
    - Research and training

(4) Commercialization and development
    - Subsidiaries and spin-outs
    - Role of Technology Transfer Offices (TTOs) - licensing out and possible relevance also of licensing in

For each of these four key areas, the general guidance currently available will be examined and reviewed as well as the cooperation tools (structural and substantial support) applied and in operation.

First, general guidance includes materials provided by funding bodies and research councils, international institutional guidelines and funds, as well as intellectual property and knowledge transfer policy of universities, TTOs and other relevant bodies. Of particular interest to the current report is the relationship between these general guidances and international agreements or norms, as identified in Part B.

Secondly, structural and substantive support includes targeted and specific funding frameworks (e.g., knowledge transfer partnerships, doctoral

programmes), training and exchange programmes, licensing agreements and contract precedents. This will allow for preliminary conclusions and recommendations to be made ahead of the final recommendations provided in Part D of the report.

I Research

1. Interactive Tools

There are three key priorities underpinning negotiating behaviour ahead of resolving any contractual arrangement governing knowledge transfer partnerships and arrangements. These concerns are not only key to the preparation of any intellectual property strategy when entering international and third country partnerships, but also raise important cultural factors when considering successful partnerhips. In particular, the academic incentives for commercialization, the rights to use materials academic, and the role of publication and peer esteem in a broader academic context. These three key priorities therefore are:

(1) Ownership and rights to use

(2) Financial concern

(3) Results and academic use

Case Study: The IPR Helpdesk and the China IPR SME Helpdesk

The EU-funded IPR helpdesk[147] has been established to meet the increased need for support on IPR issues. Assistance is provided for any current or potential beneficiaries of EU-funded projects,[148] especially micro-, small and medium-sized enterprises, as well as European PROs. A particular emphasis of the programme is in R&D and Competitiveness and Innovation Programmes (CIP).

The mechanism for assistance is directed towards maximising direct access to support for users of the IP system. This is achieved through a free helpline system that provides specific and individual support, thus addressing potential issues of both financial and administrative obstacles to support through a single portal to information. Examples of assistance include support during the process of negotiation through to concluding transnational partnership agreements, particularly through the Enterprise Europe Network (EEN), thus addressing one of the key issues identified in this present report, namely that of adequate preparation for partnerships (rather than addressing problems after they have arisen during the course of research).

Although the helpdesk focuses on intro-European projects, the model is of critical value to potential mechanisms for support in IKT partnerships. An important development from this model has been the China IPR SME Helpdesk,[149] which includes a confidential e-mail enquiry service, training, materials and other on-line services, including interactive, virtual tools for risk assessment and

[147] See further http://www.iprhelpdesk.eu
[148] See further http://cordis.europa.eu/eu-ipr-helpdesk
[149] See further http://china-iprhelpdesk.eu

preparation for firms managing their IP in or relating to Chinese markets.[150] This approach is an important example again of preparation through information as a fundamental basis for effective participation in international markets and research environments. The programme emphasises effective access (both in terms of economic and information accessibility) for non-specialists as well as associated activities and outputs related to broadening awareness and capacity in IP. The China IPR SME Helpdesk is funded by the European Commission's Directorate-General for Enterprise and Industry (DG-ENTR) under the CIP with a total budget of €3,000,000 over a 3 year period (until December 2013).

Building upon the findings in this Report, it is recommended to consider the possible application of analogous services for other extra-European IKT projects and activities. Nevertheless, the implementation of such a programme would entail considerable challenges, not least concerning the necessary resources in expertise and technical skills, as identified in Part B.

Case Study: The Lambert Toolkit (UK)

A consideration of the Lambert Toolkit illustrates the importance of a sound structural or interactive tool to assist parties at the outset of negotiations.

First, cooperation is a strategic relationship for both public sector (universities and public research organizations) and private sector (industry and commercialization entities). In order to devise not only effective legal strategy but also commercial strategy there must be adequate support. SMEs in particular suffer from a lack of resources and access to satisfactory legal support and commercial advice.[151] Therefore, the relevance of model agreements and interactive tools for such enterprises is markedly higher.

The Lambert Toolkit contains 5 model research collaborations and 4 consortium (multi-party) agreements. Notably, the emphasis is on intellectual property and the charting of that property through the life of the commercial/research partnerships. In particular, rights to use result are a critical concern.[152]

Secondly, there is also emphasis in the Toolkit on increasing innovation. This is particularly noteworthy given the relationship between innovation and competitiveness. Such research partnerships are not only about producing knowledge but also about improving competitiveness (through effective provisions for knowledge transfer, skills transfer, enhancement of human resources and expertise, and so on).

Importantly, the aim of such agreements reflects the broader concerns with the distinction between innovation for simply commercial return, and innovation as part of a broader policy of collaboration and knowledge transfer. Arguably, the latter is the key priority for the Lambert system and is also necessary to the success of any sustainable policy for facilitating and improving current cooperative and collaborative relationships.[153] This is also borne out in the detail of the Decision Guide (interactive tool) accompanying the agreements.

The key questions for the research agreements can be distilled from the model agreements as those concerning the following 7 main themes:

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[150] These include e-learning modules for trade fairs and risk assessment, as well as

[151] For instance, see the discussion in Chapter 9 of the Independent Hargreaves Review (UK), "Digital Opportunity: A Review of Intellectual Property and Growth," May 2011.

[152] See further http://www.ipo.gov.uk/lambert.

[153] See further the Lambert Review on Business-University Collaboration 2003, available at http://www.hm-treasury.gov.uk/lambert_review_business_university_collab.htm

(1) Project
(2) Finances
(3) Resources
(4) Public
(5) Rights
(6) Liability
(7) Termination

The Project theme concerns questions such as duration, timing, resources (including people, deliverables, payment schedules), the contribution of the university (including scope, funding), and the key people to be involved. The latter is of particular interest as movement of human resources can de-rail partnerships that have been motivated by the desire to work with a particular academic or researcher. The academic industry can experience high staff movement which may prove problematic if commercial entities wish to work with a particular individual.

Considerations concerning Finances are of considerable importance as many commercial arrangements will seek payment schedules that make payment after deliverables. However, start-up costs will often be necessary when dealing with universities as research teams need to be assembled. Similarly, as payment schedules are usually mapped against deliverables, this also raises the question of the interim publication of work and the status of academic outputs.

Considerations concerning Resources include primarily the expertise and identity of team members, as well as facilities and other support within the research environment. The Public concerns for the project will include the confidentiality of information, and the marketing of the project itself. The latter is of particular interest to universities, where publicity attaching to a research project is an important marketing strategy, not only in attracting other research funding but also in its broader demonstration of research impact as a higher education institution. There are conditions in commercial arrangements where identification of the funding partner may not be appropriate, and so managing expectations of universities in this regard is important. Specific questions on confidentiality and academic use will ordinarily arise in any research relationship and should be resolved in the preparation for research, as discussed in Part A.

The rights accrued in a research project are of significant importance. The ownership of intellectual property has a very relevant impact on ordinary academic practice, particularly publication. Therefore, licensing for teaching and publication purposes must be considered.

Liability questions must address considerations of quality, infringement issues, third party claims, as well as any possible caps on damages for negligent disclosure and other breaches.

Finally, termination provisions must be a consideration, as in any commercial contract. This is particularly where staff movements (considered above) may impact negatively upon the progress or sustainability of a project. This is of particular relevance in an academic environment where shifts in the academic market (such as periods of national research assessment and other funding pressures) may motivate major changes in staff.

The interactive tool supporting the consortium agreements identifies similar priorities:

(1) Project (identity of lead party; duration; human and other resources)

(2) Project management (identity or role of project manager; role and membership of a steering committee; governance structure of a steering committee; reporting obligations)

(3) Financial

(4) Resources (background and expertise)

(5) Public (marketing)

(6) Rights (results and exploitation; licensing and assignment of intellectual property; limitations, such as to use in specific fields, academic use only, use limited by time, and so on; patenting and other commercialization strategies)

(7) Confidentiality and Liability

(8) Termination and Withdrawal

Interim Conclusions

The use of interactive tools **simplifies** negotiations by indicating the minimum considerations that must be addressed in negotiations.

Decision trees and other interactive tools should address:

(1) **Project** (structure and administration, including project management)

(2) **Finances** (payment schedules, start-up costs)

(3) **Resources** (particularly expertise as well as facilities)

(4) **Public** (marketing, confidentiality, identification of parties)

(5) **Rights** (the creation and movement of rights within the project lifetime must be charted and accountable; different types of use as well as periods of use)

(6) **Confidentiality and Liability**

(7) **Termination and Withdrawal**

2. Model Agreements

The use of Model Agreements is recommended as an efficient and effective way to manage expectations, identify priorities and resource partners with the minimum level of information and support.[154] As well as the Lambert system in the UK, the use of model agreements or negotiation guides is in evidence throughout Europe. The question of adaptability persists as an issue for several of the national model agreements, which do not appear to show sufficient adaptability to account for the institutional, cultural and legal peculiarities (contextual factors) identified in this report as possible obstacles to effective IKT. As identified in the Lambert Review, flexibility in defining roles and managing IP within research partnerships is essential in order to maximise benefits for diverse

[154] "Overwhelming support for new model IP contracts," *The Times*, Higher Education, 12 February 2009.

partners across sectors.[155] In addition to model agreements, national best practices and guidelines are of some benefit with respect to managing expectations and informing priorities (for example, Ireland produces the National Code of Practice for Managing and Commercialising Intellectual Property from Public-Private Collaborative Research[156]).

In Austria, the Intellectual Property Guide[157] provides fundamental tools in addition to the more substantive support provided through: (1) model material transfer agreements (Vertragsmuster Materialüberlassung); (2) patent licensing agreements (IPAG Muster Lizenzvertrag[158] and the supportive Beschreibung zum Muster Lizenzvertrag[159]). There is also the Muster Vertrag FuE Kooperation (funded research and development cooperation) system which provides a template for a R&D cooperation agreement.[160]

Cyprus similarly provides for a model consortium agreement[161] which is a document required for any organizations participating in a Research Promotion Foundation (RPF)[162] funded project. The RPF is the national research body founded in 1996 to promote scientific and technological research in Cyprus. It funds research activity as well as assessing and monitoring that activity and the overall research environment. The Consortium Agreement required by any RPF project is described as reducing bureaucratic procedures and assisting participating organizations. Modifications are permitted in order to tailor the document to suit the specific needs of the particular consortium.

Denmark makes extensive use of model agreements for commissioned research (contracts for research), co-financed research (partnerships and consortia), co-financed PhD projects, as part of the Johan Schlüter Committee model agreements,[163] as well as providing Guidelines for Innovation Consortiums.[164]

Germany also provides for a variety of sample agreements for research and development cooperation. Most common are the BMWi Model Contracts provided by the German Ministry of Economy.[165] The German model contracts are intended for use by TTOs and focus predominantly on national requirements and peculiarities. They do not approach IKT in wider circumstances; rather, they are confined to the minimum requirements that must be addressed in an IKT contract. The degree to which such model agreements are accepted or utilised as a basis for KT varies among TTOs.

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[155] See Lambert Review of Business-University Collaboration, HM Treasury UK, December 2003.

[156] See http://www.sciencecouncil.ie/media/acsti051125_ip_code_of_practice.pdf.

[157] See further http://www.era.gv.at/space/11442/directory/20288.html

[158] See further http://www.era.gv.at/attach/1IPAG_Template_PATENT_LICENSING_AGREEMENT.doc

[159] Available at http://www.era.gv.at/attach/IPAG_Beschreibung_Patentlizenzvertrag.pdf

[160] See http://www.era.gv.at/attach/IPAG_Muster_gefrderte_FuE_Kooperation.doc and http://www.era.gv.at/attach/IPAG_Beschreibung_Gefoerderte_FuE_Kooperation.pdf

[161] See further http://www.research.org.cy/EN/national_programmes/info_received_funds/consortium_agreement.html

[162] See http://www.research.org.cy/EL/index.html.

[163] See http://en.fi.dk/innovation/model-agreements

[164] See http://en.fi.dk/innovation/innovation-consortioms

[165] Http://www.bmwi.de/Dateien/BMWi/PDF/mustervereinbarungen-fuer-forschungs-und-entwicklungskooperationen,property=pdf,bereich=bmwi,sprache=de,rwb=true.pdf

Case Study: The Lambert Agreements (UK)

The use of the Lambert system

The Association for University Research and Industry Links (AURIL)[166] conducted research into the performance of the Lambert agreements in their first year.[167]

There were 39 returns on the survey (corresponding to approximately 30% of the AURIL membership).

University and public sector research organizations

72% agreed that the agreements had simplified the process of constructing contracts.

Resources

61% agreed that the contracts saved time.

55% agreed that the contracts had saved money.

Of the minority not using the contracts, at least half were relying on precedents already in place. Nevertheless, the Lambert agreements had been relevant in that just over half (58%) were using aspects of the agreements in their precedents.

Industry

Just under 60% of the feedback received from industry was either positive or neutral. The most highly-used agreement was that for contracts for research (that is, pure consultancy), where the sponsor owns any intellectual property generated in the agreement and the university licenses that intellectual property for academic purposes only).

Only 22% of industry suggested actually using the agreements, although most would commence from these if the university suggested it.

Additional observations

It is difficult to ascertain a clear impression of the impact of the Lambert agreements in that most universities have precedents in place for the range of research partnerships and consultancies that might be relevant. However, for smaller and medium-sized enterprises (SME), these agreements are likely to be important in ensuring they are informed going into relationships with universities. The SME is of increasingly importance and relevance in the knowledge economy, particularly in the creative industries. So for some jurisdictions this will be of considerable importance.

Confederation of British Industries (CBI)

[166] http://www.auril.org.uk/pages/knowledge-transfer-training-consortium.php

[167] http://www.qub.ac.uk/auril/pages/posts/lambert-model-agreements-warmly-received-by-academia24.php

The CBI has noted that the Lambert system is of particular relevance in providing toolkits that not only inform business when entering into a research partnership but also assist in creating relevant and appropriate expectations of the partners (including universities). Further, CBI members have tested and applied the Lambert agreements, with positive results, not only within the UK but also internationally.[168]

Interim Conclusions

The use of model agreements **simplifies** negotiations:

(1) **Maximizes** resources (both time and money)

(2) **Informs** parties and manages **expectations**

Nevertheless, **too few model agreements are effective on an international basis**

(1) Many **do not address peculiarities of IKT**

(2) Many **do not take account of contextual factors**

II Information Exchange and Skills Transfer

Technology Transfer Offices (TTOs)

KT is critical to European competitiveness and development,[169] however the resources available for industry across sectors are inconsistent and at times not readily available or accessible. This is an especially critical issue for TTOs in new member states and in regional areas of all members, where access to knowledge and resources is variable, as well as for the wider academic, non-governmental (NGOs) and business community, including smaller enterprises (SMEs).[170]

The role of TTOs in universities is now more critical than ever, not only in terms of the advancement of entrepreneurial activities within the universities, but also at a time where university-industry collaboration is increasingly common and essential. Despite these new pressures on universities, the resources and knowledge available vary considerably to the detriment of efficient, productive and effective industry-university partnering, both within the EU and with third countries.

Further, TTOs are primarily concerned with the business of intellectual property (and to a varying degree, a greater preoccupation with innovative industries and registered rights) as distinct from business that is based on intellectual property (that is, the research and innovation itself). This sometimes compromises the relationships between TTOs and academics to the detriment of greater commercialization and dissemination of research.

[168] See further the CBI Guide for Members, *Business-University Collaboration for Research and Innovation*, August 2010.

[169] See further Commission Press Release IP/07/469, 4 April 2007.

[170] See further Chapter 9, Independent Hargreaves Review of Intellectual Property and Growth, May 2011.

Case Study: Bulgaria - IP Points

The collaboration with the EPA on establishment of “IP Points” throughout Bulgarian institutions has been important to enhancing technology transfer for industry. To date, 13 centres for information and consultancy on patent protection and industrial property have been established in regional centres and 9 centres at the university level. Cooperation with IP Points is not optimal at present and should be promoted and enhanced.

Furthermore, programmes for IP teaching and research in Bulgarian universities are commendable. The universities participating in the workshop demonstrated breadth and depth in programmes both within law schools and towards collaborations between disciplines. Further, there is significant innovation in courses, subject matter and research, in line with the creative potential of greater Bulgarian society. In addition, there are developments of dedicated research and education centres, including the Centre for Intellectual Property Research at the University of National and World Economy. These centres could be developed to attract visiting scholars throughout Europe and internationally.

However, significant obstacles persist in the development of academic activity. These include some difficulties in devising mechanisms for collaborations between universities as well as significant challenges in terms of teaching resources and funding. While innovative programmes may be developed, it is not always clear that there will be adequate teaching expertise available in order to staff those programmes.

The Bulgarian Patent Office (BPO) regards its relationship with the university sector in general and the technical universities in particular as especially important. This relationship between the BPO and IP education is relevant not only in the immediate sense of technical KT but also in terms of the wider development of an informed research and innovation culture in Bulgaria. That is, IP has both a technical significance as well as a broader cultural relevance for Bulgarian development. In this way, IP is itself both the tool for protecting innovative capacity as well as the vehicle for emphasising the importance of the knowledge-based economy.

The BPO is mandated to contribute to the dissemination of IP information to the general public and to promote the legal protection of industrial property. This includes specific cooperation agreements with universities, provision of technical equipment and teaching materials, methodological and technical assistance and training programmes. The mandate extends to educational activity in the area of industrial property protection, including contribution to education and training and the establishment of a network of information services and IP points within universities. Further, the BPO contributes to the development of specific IP curricula in all universities and advocates IP certification programmes.

Interim Conclusions

Technology Transfer Offices (TTOs) should be assisted further by:

National coordination of resources

(1) Access to adequate legal and commercial advice and support

(2) Management of expectations with respect to research underpinning IP

(3) Attention to importance of licensing in as well as licensing out

(4) Greater bilateral cooperation (university and government) is of even more critical importance in new member states

III People Exchange

Case Study: Norway

Although Norway is not a member of the European Union (EU), it is nevertheless substantially bound by European directives on IP law by reason of Annex 17 to the European Economic Area (EEA) Agreement. Norway is also working closely with EU Member States towards the development of the European Research Area (ERA).[171]

The ERA will create a research network and research "common market" in Europe following principles similar to that of the EEA. Key to the ERA will be the facilitation of collaboration and knowledge transfer, managing that exchange of knowledge through the appropriate application of intellectual property frameworks and rules. These principles are set out in the 2020 Vision for the European Research Area,[172] adopted by the Council of the European Union, 2 December 2008. The principles were developed in partnership with all Member States and in consultation with associated countries, including Norway.

Norway continues to cooperate closely on the development of the ERA. The National Research Council (RCN) reports, "Norway takes part as a full-fledged member of the EU Seventh Framework Programme for Research and Technological Development (FP7) through the European Economic Area (EEA) Agreement … For European research to truly gain momentum, it is necessary to promote greater cooperation within the ERA at the national level."[173] Simen Ensby of the RCN states, "EU cooperation will gradually become an integral part of national research policy, also in Norway."[174]

Therefore, it is prudent to recognize and consider the European Commission's emphasis on knowledge transfer and IP education and creation in the university sector. In particular, the Commission of the European Communities Recommendation on the management of intellectual property in knowledge transfer activities and Code of Practice for universities and other PROs,[175] adopted in April 2008, provides specific guidance. In particular, in the context of dissemination of IP and IP knowledge in the university sector, the Recommendation makes important reference to:

(1) Internal IP Policy;

(2) Knowledge Transfer (KT) Policy; and

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[171] See further http://www.forskningsradet.no/en/European_Research_Area_ERA/1138969864047

[172] ERA (2008). 2020 Vision for the European Research Area. Adopted by the Council of the European Union, 2 December 2008.

[173] RCN (2008). Norway, an active partner: EU initiatives give new moment to research cooperation. 20 November 2008.

[174] RCN (2008). Norway, an active partner: EU initiatives give new moment to research cooperation. 20 November 2008.

[175] Commission Recommendation on the Management of Intellectual Property in Knowledge Transfer Activities and Code of Practice for Universities and Other Public Research Organizations. C(2008)1329. 10 April 2008.

(3) Collaborative and Contract Research.

Arguably, this framework informs the principles of the ERA and also informs Norway's emphasis on EU cooperation in developing national research policy. Importantly, the principles of the Recommendation and the efficacy of the ERA depend upon collaboration and knowledge transfer as facilitated and managed through the application of appropriate intellectual property rules. Therefore, knowledge of intellectual property across diverse research disciplines is arguably critical to the successful implementation of European research policy. Universities will thus play a crucial role in establishing and sustaining Norway's competitiveness and indeed its cooperation.

Interim Conclusions

Teaching and research exchanges are recommended:

Consolidation of ERA principles

(1) Cooperation with broader academic principles of dissemination and collaborative work

(2) Greater emphasis on academic collegiality as distinct from relying on entrepreneurialism alone (ineffective in some jurisdictions)

IV Commercialization and Development

Case Study: Norway

The role of academic entrepreneurialism in Norway is problematic in that all research within the university sector automatically vests in the government (White Paper No 7). Therefore, contracts for research (where universities are commissioned to undertake research but for which no intellectual property is retained by the university) are arguably more successful partnership examples.

The Research Council of Norway and Innovation Norway joint programme, FORNY, was established in 2000 (existing as a project since 1995). The programme is concerned with the commercialization of research and development (R&D). The priority for the programme is the support of public research institutions in commercialization of R&D. FORNY works directly with research institutions and technology transfer offices (TTOs) in order to assist the researchers themselves, employed by those institutions. Therefore, for research in the university sector, FORNY is especially relevant for its assistance in establishing the professional and commercial infrastructure necessary to facilitate the commercialization of R&D in universities. This includes funding for the establishment of TTOs, incubators and other infrastructure directly relevant to achieving the transfer of R&D knowledge and technology through commercialization.

In September 2009, Borlaug et al published a report commissioned by the Research Council of Norway evaluating the programme, *Between entrepreneurship and technology transfer: Evaluation of the FORNY programme*. The report notes that "The main target group of FORNY is researchers working in universities, university colleges, research institutes or university hospitals that

have ideas originating from their research which can be developed into commercial activity."[176]

In order to participate in the funding advantages, a TTO must be recognized as such within the FORNY programme. This is achieved by demonstrating the TTO's function in supporting research institutions in conjunction with that institution's potential for R&D commercialization. According to Borlaug et al, "This implies that the TTO must have a formal agreement with one or more research institution which have researchers that generate deal flow for the TTO." At the time of the introduction of the FORNY project in 1995, there were six TTOs participating. Four of these represented the major universities: Oslo, Bergen, Trondheim and Tromsø. The other two represented the research institutes at Kjeller and the specialized university and related research institutes at Aas. Today there are 14 TTOs participating in the FORNY programme.[177]

Major R&D across these institutions include natural sciences (Campus Kjeller and Oslo Innovation Centre, which was phased out of the FORNY programme in 2008), agriculture (Aas), medical and health (Medinnova), information and communication technology (Simula), and general technology R&D (Norinnova in the Northern Norway region and for the mid-Norway region, Sinvent, which provides TTO services for Sintef and works primarily with NTNU Technology Transfer). Some institutions are active across the full range of R&D enterprises, including Birkeland Innovation (Oslo region), all representative institutions in Southern and Western Norway (Coventure, Prekubator, Bergen Technology Transfer), Leiv Eiriksson Innovation and NTNU Technology Transfer (mid-Norway), and TTO Nord (Northern Norway).

According to the Borlaug et al report, the competence of the TTOs varies greatly, however the area of least competence in all the TTOs is that of business or commercial law, including competence in IP. This is further demonstrated by the fact that this is the area in which there is the greatest use of external consultants by the TTOs.

It is important to distinguish between the possible strategic differences between IP in the teaching context and the use of IP strategy in the TTO context. According to Borlaug et al, the TTOs are concerned primarily with R&D commercialization with high market potential. On the other hand, academic activity cannot be generalized within these strategic limits and so potential conflicts as well as differences should be anticipated when addressing IP dissemination through TTOs and research institutions and departments. These strategic limits also create possible conflicts and concerns for the TTOs themselves. As Borlaug et al explain:

> *"Should they pursue a broad strategy stimulating the generation of a large number of ideas, or should they rather pursue a narrow and focused strategy and apply strict selection criteria? Furthermore, how should the ideas be evaluated, and what types of projects should be given priority? A number of issues have to be addressed when the TTOs are developing their strategies for commercialisation."*[178]

Although teaching is nevertheless a marginal priority for TTOs, several are involved in teaching and seminar activity, including support to academics themselves (for instance, Norinnova provides seminars and lectures in IP, and Stavanger Centre for Innovation Research runs a series of workshops).

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[176] Borlaug et al, page 51.

[177] Borlaug et al, page 52.

[178] Borlaug et al, page 61.

D Final conclusions

Knowledge can take various forms. It can appear in form of a patent-protected invention but it may also be published in an academic article and protected by copyright, presenting issues for access to the knowledge in scientific research and publishing. On the other hand, open access publishing in the scientific community is emerging as an important way in which to provide readers with unrestricted access to peer-reviewed research.

As a patent protects an intellectual asset, it may be transferred to another party by way of licensing or assignment against remuneration. As the subject matter of an academic publication, knowledge is transferred either within the framework of proprietary publications (and therefore access may be constrained by subscriptions to copyright material) or through open access publishing. In both cases, the rewards to the author and institution are more likely to be reputational (scientific esteem) rather than monetary.

Knowledge may also be exchanged within frameworks outside formal intellectual property rights, such as confidential information and know-how. In such cases, agreements with employees, scientific and technical staff, are essential to protecting the confidential nature of that knowledge and that particular form of protection in the marketplace. In knowledge transfer partnerships, such knowledge might be part of the collaborative resources shared between partners, and so agreements must be in place to regulate the sharing of that knowledge, as it similarly comprises a valuable asset which can become the subject matter of contracts on technical services.

Transfer of knowledge can take various paths. Traditional licensing of intellectual property is an important but by far not the only form of KT. This study has also identified cooperative research (including exchange of personnel), contract research, spin-offs and subsidiaries as forms of KT which are of critical relevance for PROs. In all of these cases, obstacles to cross-border KT include the legal and administrative infrastructure in place in partner countries for the management and enforcement of IP.

There are also many other obstacles which are not directly related to the protection of intellectual property yet can become significant disincentives to engagement in KT. These include taxation or import/export regulations, local bureaucracy and administrative obstacles, discriminatory public procurement practices, burdensome alien registration or visa procedures which complicate the exchange of scientific personnel and, quite importantly, different perceptions and attitudes which interfere with effective collaboration between scientific personnel.

The EU does not yet provide for a coherent set of instruments to overcome these obstacles. The available instruments can roughly be divided in two categories:

- interactive toolkits, model agreements and active guidance, to which PROs may directly resort if they intend to engage in KT; and
- bilateral agreements on scientific cooperation and on IP protection which aim at aligning the legal and institutional environment for KT within and outside of Europe.

The guidance instruments considered in this report, to which parties interested in KT can directly refer, aim at preparing PROs prior to engagement in KT (on both the intra-EU and extra-EU levels). These instruments include the interactive tools, support measures and guidance instruments, important examples of which were considered in Part C. Part C revealed that quite a number of interactive

toolkits, such as the Lambert agreements and different national model agreements, have proven useful and practical tools in the preparation and management of KT. Nevertheless, they may have to be refined further (or expanded in scope) in order to anticipate the obstacles PROs are likely to face if they want to engage in a non-EU environment. Especially with regard to TTOs, it appears that a lot of work remains to be done, particularly with respect to technical assistance for PROs in the valuation of knowledge assets and the strategic management of innovation and research. Greater emphasis on technical expertise in TTOs as well as more strategic decision-making as to when to patent should be part of the contemporary university research landscape. This is especially important considering the greater commercial activity of universities in contract consultancies, industry collaboration and the like. In such cases, the often vast differences in the institutional environments, attitudes and cultures must be overcome, and mechanisms (such as model agreements) to facilitate the commercial aspects of research agreements will be crucial in this respect.

Bilateral agreements between the EU or single member states and third countries can be divided into roughly two layers. The first includes agreements on scientific collaboration, which aim mainly at obliging the partner institutions in an international research cooperation to consider certain issues in their specific collaboration agreement, such as treatment of pre-existing and newly-emerging knowledge, ownership issues, and the like. Such agreements are concluded between single member states and third countries, as well as between the EU and third countries. The other layer is so-called Economic Partnership Agreements (EPAs). The EU has approached a number of third countries with proposals of such EPAs which contain detailed provisions on IP protection. Many of these IP provisions are closely modelled after the various EU directives and regulations.

Characteristic of both the national and regional agreements on scientific collaboration and the EPA clauses on IP is the standard language in which they are written. That is, they do not pay much consideration to national peculiarities in the partner country, even though such peculiarities can become formidable obstacles to KT. Similarly problematic are the previously mentioned IP clauses in EPAs – most provisions, especially the ones on enforcement, are simply reproduced from the various European directives and regulations in IP, and aim at imposing sometimes unfamiliar protection prerequisites and genuinely European enforcement procedures on countries and regions with completely different legal cultures and institutional frameworks. It is highly doubtful whether such standardized approaches to language and drafting can have a positive effect on KT. In most cases, the bilateral obligations will not be translated into practice but remain merely theoretical in implementation. It is therefore recommended that the use of such standard “one-size-fits-all” approaches to language in future agreements be reconsidered. Instead, member states as well as the Commission should take a closer look at those countries with which they want to conclude such bilateral agreements, identify country-specific shortcomings and obstacles, and approach each target country with customized and relevant proposals that account for the domestic situation, including not only the law but also the institutions.

In sum, with regard to reshaping the available tools and developing new measures, model agreements, bilateral treaties, and related resources, this report recommends greater consideration for cultural acceptability and accessibility when dealing with partner countries: “think global – act local”. This approach should include guidance instruments and bilateral agreements which

focus on scientific cooperation with the important BRIC economies. Such mechanisms would be:

- interactive tools which reveal to PROs how to react to certain country-specific peculiarities, e.g., Chinese requirements to register technology contracts with certain administrations;
- model agreements tackling national peculiarities, e.g., the complicated rules on assignment of ownership in inventions made with help of funds from the Russian Federation;[179]
- scientific cooperation agreements which aim at removing country specific obstacles, especially bureaucracy, taxation, and so on for scientific cooperation projects which are in the mutual interest; and
- IP clauses in future EPAs which directly address obstacles and difficulties of IP protection and enforcement in the target country.

Of course, such a country-specific approach necessitates proper preparation, elaboration of country reports, even field studies to be commissioned by the European Commission and national ministries in charge of KT. Furthermore, once in force, such country-specific instruments would have to be monitored as to their efficiency and, where appropriate, adapted to the ever-changing KT environment in rapidly-developing economies. That is, model agreements, guidance instruments or bilateral treaties alone cannot resolve the environment for functioning KT if they are not backed by capable institutions. The example of Finland has demonstrated that the success of scientific collaboration depends on institutions, helpdesks, and other suitable support mechanisms, and the recruitment of qualified personnel, rather than on the existence of bilateral research cooperation treaties alone. In the future, TTOs may play a crucial role in this area, as consulting agencies with regard to international KT, provided that technical expertise is available and mainstreamed within the modern TTO. Future endeavours and enterprises at the European and member state level should therefore also focus on enhancing country-specific knowledge within European TTOs as well as considering expertise in the partner country.

[179] Some third country model agreements do already exist, such as between Germany and China.

Annex 1: Glossary

Applied research
Research which envisages a certain product; close-to-market research; market and demand driven research, as opposed to “basic” or “fundamental” research (see below)

Background
Short for “background knowledge”: IP and know-how created before the project´s lifetime; as opposed to “foreground” (see below)

Basic research
Also known as fundamental or generic research, basic research is that research carried out to enhance scientific knowledge and not primarily driven by commercial motives. Includes all scientific endeavours on a professional level that do not necessarily operate close to market and are which are not necessarily product-driven.

BRIC / BRICS
BRIC is an acronym for Brazil, Russian Republic, India, the People´s Republic of China, extended to BRICS where including South Africa; states which according to economic experts will be of tremendous importance in future economic times; here the actual growth rate and economic influence, capacities are proportionally higher, the increase is based on facts; formerly the termination addressed to the BRIC states, thereafter South Africa has been added

Economic Partnership Agreement (EPA)
Strategic arrangement in research and development or science and technology undertaken by DG Trade on behalf of the EU (as bilateral trade agreements the EPA functions similarly to a US free trade agreement (FTA)).

External funding
Private or public funding raised on a competitive basis; EU or research council funding won on a competitive basis or funding from industry. This funding is usually awarded in return for clear deliverables (Crest 2006, p. 41)

Foreground
Short for “foreground knowledge, meaning knowledge created jointly during a research cooperation; in contrast to “background” (see above)

Horizontal structure
Research cooperation on equal terms (cooperation models, cooperative research, alliances, joint ventures), as opposed to “vertical structure” (see below). Partners cooperate on equal terms without hierarchical differences.

Intellectual Property (IP)
Exclusive rights in the intangible results of intellectual and entrepreneurial endeavour, including patents, copyright, trade marks and design.

Joint Venture (JV)
Business entity, founded by two or more independent enterprises in order to achieve a specific business result. JVs normally take the forms of contractual JV or equity JV.

Know how

“A package of non-patented practical information, resulting from experience and testing, which is secret, substantial and identified: in this context, "secret" means that the know-how is not generally known or easily accessible; "substantial" means that the know-how includes information which is indispensable for the manufacture of the contract products or the application of the contract processes; "identified" means that the know-how is described in a sufficiently comprehensive manner so as to make it possible to verify that it fulfils the criteria of secrecy and substantiality" (Article 2 (10) of Commission Regulation No 2659/2000 of 29 November 2000 on the application of Article 81(3) of the Treaty to Categories of Research and Development Agreements). Know how is not protected by a specific IP right and its protection varies significantly from country to country, even within the EU (see also Technical Know-how)

Knowledge transfer (KT)
Within the meaning of the study, KT refers to the transfer of knowledge as a fundamental activity and prerequisite of basic and applied research. KT is the process by which the research base of Higher Education Institutions and Public Sector Research Establishments interact with business to enable knowledge and expertise to be utilised. Intellectual property is a key part of the knowledge transfer environment (Lambert agreements, www.ipo.gov.uk/). KT can take various forms, e.g., licensing, assignment, communication through collaborative research, scientific publications, obtainment and further processing of traditional knowledge. KT activities include technology transfer, commercialisation, consultancy, etc. but also those activities that benefit society and community en large (Crest 2006, p. 41). As a new professional area, KT models have emerged to manage the process of turning technology, know-how, expertise and skills into innovative, commercial products and services (Institute of Knowledge Transfer, U.K., press release, www.ikt.org.uk/).

Public research organisation (PRO)
“Universities, public research centres including academies of science and other knowledge producers receiving significant public funding" (CREST 2006, p 41)

Research and development (R&D)
Scientific and/or innovative activity aiming at basic research or at market-oriented applied research, bound to a market idea or product vision.

Technical know-how
Most European countries have developed legislation to protect technological "trade secrets" or "know-how" which are not protected by formal IP mechanisms such as patents or copyright, the legal situation varies significantly from one Member State to the other, the following typical characteristics are found in Member States which recognise some form of protection for know-how, trade secrets or similar concepts:

subject matter
"specific, proper, non-apparent business data" (Austria)
"commercial, manufacturing and technological information" (Czech Republic)
"information relating to a commercial business" (Denmark)
"secret information and non-patented inventions" (Italy)
"information regarding a business" (Sweden)

value
"actual or potential, material or non-material" (Czech Republic)
of a type "which a person is willing to pay money for" (France)
"economic value" (Italy)
"pecuniary value" (Hungary)
"actual, or at least potential, tangible or intangible value" (Slovakia)

secret
"not apparent" (Austria)
"not normally known to the general public" (Denmark)
"secret" (Finland)
"secret" (Sweden)
"not part of the public domain" (Hungary)
"not of general knowledge or easily accessible" (Portugal)

protective measures
"protected in a suitable manner" (Czech Republic)
"that a businessman keeps secret" (Finland)
"that the owner has taken all necessary steps to keep such information confidental" (Hungary)
"adequate measures (exist) aimed at maintaining secrecy" (Italy)
"subject to considerable efforts by the interested party to keep them secret" (Portugal)
"the trader keeps it secret" (Sweden)
(see van Eecke/Kelly/Bolger/Truyens 2008, p. 281-286)

Technology Transfer Office (TTO)
Institution which aims at coordinating and facilitating the commercialization of the results of public and university research

Traditional Knowledge (TK)
Knowledge based on traditions and experiences of indigenous people or local communities, often passed from generation to generation by way of rites and/or oral teaching. TK encompasses a variety of subject matter, including expressions of culture, biodiversity-related and environmental knowledge, agricultural and medicinal knowledge, e.g., the medicinal or therapeutic benefits of certain plants.

USITC
International Trade Commission, a US organ located in Washington, D.C.

Vertical Structure
Knowledge is created or transferred when within an hierarchical structure between contract partners, e.g., commissioned or contract research, licensing (compare Horizontal Structure).

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