

## **KNOWLEDGE TRANSFER IN SELECTED EUROPEAN UNIVERSITIES**

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### **Abstract**

To exploit the research results commercially or otherwise has become increasingly important for universities. When pursuing this, universities have established Technology Transfer Offices and developing links to industries and businesses. This paper focuses on the ways selected European universities have established and organised their Technology Transfer (TT) activities. The study was made using the model developed by professor Allan Gibb as a framework. The data collection work was done in a series of interviews in four European universities. The background material and data was collected from public sources, mainly from the universities' web pages. The study recognised certain elements, which affect the success of the TT activities. Technology Transfer operation requires top management support and a link to university's strategy. The size of the economic area and the amount of cumulative research results are important factors in TT. Successful Technology Transfer can be organised centralised or decentralised way as long as the operating model is known to all involved parties. Creating an entrepreneurial atmosphere and showing that the university values the exploitation of the research results appears to be highly important in order get results from TT activities.

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**Keywords:** Knowledge transfer, university third mission, innovation process

### **Introduction**

Technology has been valued as a premier production factor driving economic growth and development since 1950s, based on Robert Solow's seminal article, which emphasised the role of technology in the aggregate production function. The corporate sector has remained the main engine transforming technology progress into business and the corporate R&D function has increased steadily and even in an accelerating pace in the 20<sup>th</sup> century. More and more often the R&D functions are now done in networks and in cooperation between large and small companies.

Universities have also entered in the cooperation and networks with corporations. This kind of joint research activity has been going on in many universities, but quite obviously it has gained more and more attention lately and the amount of such cooperation has increased. In the course of this development universities have organised services to support the industry cooperation. One outcome of this development has been that the universities are aiming to get their research utilised more efficiently. In particular this is achieved through technology transfer activities in order to boost the science- or knowledge-based entrepreneurship in the regionally and nationally (Debaeckre, 2012, 3; Rasmussen et al, 6).

Industry-science links have become a key dimension in both innovation management and innovation policy. The industry cooperation can take many forms, including joint research, contract research, research-based consulting, in-house development project or targeted training (Charpentron et al, 2014, 83-84). In order to support and develop the links between the worlds of science and industry, professional technology transfer organisations (TTO's) have been frequently established in universities around the world. TTO's have different names in different parts of the world in universities but their function is quite similar worldwide.

### **Technology-, Knowledge Transfer and Third Mission**

In this paper, we focus on the ways selected European universities have established and organised their Technology Transfer (TT) activities. TT is typically included to university's Third Mission Activities, which in addition include Continuing Education (or Life-long Learning) and Social Interaction activities. Our main attention lies on the broad definition of Technology Transfer, which can also be referred as Knowledge Transfer, which extends the Concept covering some of other Third Mission activities.

The Technology Transfer Organisation (The TTO) can ideally be positioned at the interface of academia and industry in order to manage the latter's access to academic output, including inventions. One might advocate the use of the concept of "Knowledge Transfer Organisation" (The KTO) rather than "Technology Transfer Organisation".

The continuous role of the TTO, encompassing a variety of knowledge transfer activities that move beyond the strict realm of "technology", supports and advocates such a view. However, as the concept of a TTO is by now well recognised in the professional innovation community, the acronym TTO is used together with KTO in this paper. The "technology" needs to be interpreted in its broadest, fully knowledge-based, sense when using the term. (Pertuzé, 2010, 84; Debaeckre, 2012, 14)

Technology transfer has been named as challenging for universities. Additionally, technology transfer calls for new skills and knowledge for

university personnel. Especially this is the case if the goal is to start up company development and activity. This is due to the fact that skills and knowledge for start up activity has not been among the qualifications for university research, teaching, and support staff. Additionally, there are cultural differences between academia and industry. (Slaughter & Leslie, 1997)

Universities' technology and business research should not be isolated in research but being part of a larger entity, namely innovation system, in which universities are participants and actors. (Edquist & Johnson, 1997; Lundvall, 1992; Carlsson & Stankiewicz, 1995; Bijker, 1995). Innovation system refers to network that consists of people and organisations, in which develops and takes advantage of new ways organising activities, production methods or inventions. It also includes innovation finance and private and public research organisations. Innovation system research produces various different categories (technology and socio-economic systems), which define common requirements for innovation system to perform. These requirements include new knowledge production, incentive system for actors, resource allocation, research resource allocation, information exchange facilitation, and uncertainty reduction. (Lundvall et al., 2002). Similar, although abstract concepts, can be used in evaluating TTO's success. Other indicators have been used, too, These include publications, conferences, collaborative and contract research, academic consultation, staff and student mobility, IPR, spin-off companies, and standards. (OECD, 2013)

### **The development of Third Mission Activities in European Universities**

The success of maintaining and developing Industry-science links in universities can often be seen as a function of the performance of existing Technology Transfer Organisations. According to Debaeckre (2012), the relevant TTO key performance indicators are the size and (financial) volume of: 1) the collaborative research portfolio, 2) the portfolio of discoveries, patents and licences, and 3) the spin-off portfolio. The TTO should also develop the necessary and appropriate processes and IT-systems to facilitate and support those management tasks. In addition, it should build a team capable of dealing with those activities. (Debaeckre 2012, 9)

Table 1: Three Levels of TTO Development (Debaeckre 2012; 6-9)

	Level 1, "The Island"	Level 2, "The Centerpiece"	Level 3, "Inclusive Operation"
When:	Before 1995	1995-2005	From 2005
Organisational status within the university	TTO as a separate "island" at the periphery of the academia	The centerpiece of the university "third mission". Operation becomes university-wide and more	TTO activities now diffuse and interweave alongside the two core missions of education and research. The TTO is

		professional.	fully embedded within the university
Business model:	No actual business model	Integrated business models	The omnipresence of the TTO throughout the full internal value chain of the university turns it into a truly and fully inclusive activity
Main activities	Contract negotiation	Management of intellectual property, contract portfolio, and business development through spinoff creation, including increasing impact on regional development	Technology transfer activities generate a variety of relevant spill overs (cognitive/intellectual as well as financial) towards the education and research activities of the university.
Motivators:	TT activity not used in measuring performance of scientists	TTO achievements are taken into account when measuring academic performance	TTO achievements are taken into account when measuring academic performance
Publicity:	Limited impact and visibility	Impact and visibility have increased rapidly	“Level 3” will further heighten the impact and the visibility of TTO operations in academia.
	Still actual as an entry level concept for 3 <sup>rd</sup> Mission activity.	“Level 2” can still be observed at many EU-universities.	“Level 3” is expected to take full effect in the decade to come

However, the studies about Technology Transfer Organisations focus mainly on the performance of existing TTO:s, which - especially during the second and third “level” - are already recognised as parts of the Universities functions in both strategic and institutional level. Taking into account, that there is a number of universities in Pan-European context almost completely without any Third Mission (Including Technology or Knowledge Transfer) activities. Another group consists of the Universities, who have currently just entered the aforementioned “Level 1”, but who are struggling for making their presence known among the industries, but also inside the University itself. Examples of non-existing 3<sup>rd</sup> mission activities can be found among many former Eastern European universities, which have not changed their curricula and activities towards Bologna agreement.

## **Data collecting and analysis**

For this research project we collected data in order to benchmark our own university's innovation process activities with a few selected European universities. Initially the selected universities were:

- University of Gothenburg, Sweden
- Katholieke Universiteit Leuven (KU Leuven), Belgium
- University of Århus, Denmark
- Oxford university, UK
- University of Konstanz, Germany

The universities were selected so that they would include a) top European universities (KU Leuven and Oxford); b) rising relatively young research universities (Konstanz), and c) Nordic universities outside the capital region (Gothenburg and Århus). Århus was contacted, but no interviews could be agreed (timeframe did not allow that). Therefore, Århus was unfortunately, left out at this stage.

The benchmarking study was made using the model developed by professor Allan Gibb as a framework (for example *Annals of Innovation & Entrepreneurship* 2012, 3). Based on Gibb's framework the data collection work was organised and the interview structure and questions worked up. The background material and data was collected from public sources, mainly from the universities' web pages. Most important source of data for this benchmark study was the interviews carried out in summer/early fall 2012, as well as the written material and document received in connection with the interview.

## **Summary of the Interviews**

### **Strategy and goals**

All the mentioned universities pay due attention to promotion and fostering innovation-related activities and technology transfer among their researchers and students. Gothenburg and KU Leuven Universities have definite university strategies aimed at the promotion of knowledge, technology transfer and innovation activities. Special units at the universities' structure allow realizing of their strategies by providing researchers and students with innovation support at all levels of their work.

Gothenburg activities are focused on assessments of intellectual assets and their management from strategic point of view. KU Leuven defines its goal as promotion & support of knowledge and technology transfer between University and industry. Oxford and Konstanz don't declare any specific strategies or goals devoted to innovation development but their activities and efforts are also concentrated on awareness rising within innovation-related activities.

Oxford directs its resources to organization of entrepreneurship and innovation matters. Konstanz's activities are directed to creating independent working environment for concentrating its researchers and scientists on their research. At Konstanz strategies are made at departmental level. The university recruits professionals for strengthening innovativeness.

### **Organisation and governance**

The universities have different approaches concerning governance and managing of innovation policy. In order to boost their innovation process and make it productive the universities either have special divisions dealing with support of innovation activities or cooperate with external ones. Gothenburg and KU Leuven universities have more centralized governance; main decisions on innovation-related activities and technology transfer are made by universities' administrations.

At Gothenburg the Vice rector bears overall responsibility on innovation policy, and operational responsibilities are shared between three units operating together: Research & Innovation Office (advisors, business lawyers etc); GU Holding (financial issues) and Institute for Innovation & Entrepreneurship. GU Holding doesn't belong to the University structure, it is owned by the Government.

At KU Leuven main issues related to the implementation of innovation policy are addressed by KU Leuven Research and Development (LRD), namely by its Executive Board consisting of the rectors, researchers and external members.

Oxford representatives emphasize the necessity of decentralization of activities for achieving operational effectiveness in innovation management. Main actors are: Oxford Centre for Entrepreneurship & Innovation (innovative activities consulting, entrepreneurial teaching); ISIS Innovation (managing tool for technology transfer and consulting).

Generally, the organization of innovation activities at Konstanz can be described as decentralized. Substantial role in the innovation policy management plays Patent & invention management unit. It cooperates with Technology License Office (TLB, external body) which also affects the decisions within use of research findings. Konstanz adapts its activities and strategies to national "the Excellence Initiatives", the Committee on Research is responsible for research profile.

### **IP ownership**

Gothenburg University's researchers (exception-PhD research) own the IP results.

Other universities (Oxford, Konstanz, KU Leuven) initially own the IP results but they may be transferred to researchers when the universities' administration or special responsible departments deem it fit.

### **Co-operation partners**

In total all the universities underline the crucial role of collaborative work with different actors within innovation development and technology transfer processes, such kind of cooperation allows exchanging information, contacts on business, technology, research cooperation.

Gothenburg University is an active partner of a number of organizations, contributing together to innovative system in Western Sweden. Main partners are science park and companies providing the University's researchers with business consulting, incubation, evaluation, research financing and transferring research results; organisation-promoters of entrepreneurship & business among students. Research Service and External Relations – subdivision of the Research and Innovation Service deals with research and education networking.

Oxford University has very strong links with professionals dealing with entrepreneurship within Oxford area. The University cooperates closely with local science park, providing all facilities for start-ups. The cooperation with external partners is established mainly through ISIS - the University unit managing TT and academic consulting.

Konstanz 's main cooperation is with TLB (Technology License Office), dealing with evaluation of potential innovative products, consulting, patenting and transfer activities. Innovation development strictly focuses on the field of TT cooperation with enterprises and society. The University maintains relations with its external target groups worldwide via the Executive Support Unit Communication and Marketing. Also, the University Board is connected with many enterprises at regional and national levels, links with industry representatives.

KU Leuven aims at creation of strong innovative networks with technology companies & university colleges both for strengthening innovation activities and improvement of quality of education. KU Leuven is in partnership with ten science parks and business centres. The University cooperates also with banks, local and international investors & business angels through its Research and Development Office.

### **Support activities**

The Universities are able to provide their students & researchers with different kinds of support activities necessary for productive innovation development with use of either own or partners' recourses and facilities.

Innovation development is financed at GU with sources of the University special funds, regional programmes, EU, interested business

angels, venture capital companies etc. At Oxford there are three investment funds, working for early-stage development. Financial support at Konstanz is provided with use of money from “Excellence Initiative” and private sponsors; Konstanz sponsors also include private sponsors. KU Leuven cooperates with private banks and has its own seed capital fund, providing capital for innovation development; The Industrial Research Fund supports innovative research, and there is also a network of local and international investors and business angels.

### **Consulting, business support, incubation**

Gothenburg University works with skilled advisers who help researchers to reach market; they offer researchers such services as business development, patent strategies, financing, and assistance in company creation. Gothenburg University is also involved in long-term regional projects supporting research findings with commercial potential. GU has its own well developed innovation system with several units operating on different areas: Business support (innovation advice and commercial law); Research Service and External Relations (together with partners generates the conditions for best research and education environments); Research and Innovation Service (supports commercial application of ideas and research findings, involves advisers, lawyers, project managers, research coordinators).

Oxford Centre for entrepreneurship is an important contributor to the University innovation & TT activities; it provides Oxford’s staff and students with entrepreneurship programmes, advices on start-up creation and project running. ISIS (subsidiary of Oxford) assists the University researchers in technology commercialising and innovation management; incubation facilities are also available at Science Park.

Konstanz’s cooperation with Technology License Office is important for provision of support activities at all levels of innovation development, as well as a link with Technologiezentrum Konstanz association), their services include evaluation of potential innovations, business support, incubation.

At KU Leuven a wide range of innovation support services (fundraising, legal issues, IP management, etc.) are concentrated at Research and Development (LRD), it also involves external advisors & experts when providing these services. KU Leuven has also incubator offering facilities for innovative businesses.

Entrepreneurship education is available for students of all disciplines at Oxford but only as short workshops or training days. It is practically impossible to incorporate entrepreneurship studies to student’s study scheme and get the courses credited, if the student is majoring in some discipline than business studies. University of Konstanz has no educational programs



dedicated to innovation management, but such courses are available for Konstanz students at partner university- The University of applied sciences in Konstanz. KU Leuven pays much attention to teaching modules related to entrepreneurship; such courses are provided to the University students and staff. There are also modules on research valorisation in doctoral schools.

## **Conclusion**

The Knowledge transfer activities in Western European and US universities have typically reached the level 2 or 3 of the Debaeckre (2012; 6-9) model. Of the examined universities KU Leuven can be set to level 3 and Oxford and Gothenburg to either level 2 or 3. Konstanz University was clearly on level 2 (or in some aspect on level 1). Based on the interviews and review of related material, in addition to set the universities on different levels of TT development, one can also recognise certain items or prerequisites for successful Technology Transfer activity.

A necessary prerequisite to run fruitful Technology Transfer operation is top management support and a link to university's strategy. This demonstrates that Technology Transfer is valued activity and is something the staff should pursue. However, just mentioning Technology Transfer in the strategy is not enough but the university must have supporting activities for Technology Transfer as well as mechanisms to develop research finding into inventions and eventually innovations.

One must also keep in mind that to get results requires time. Universities that are now regarded as "good examples" are typically those who started early. For example KU Leuven started the activities in a separate TT office in 1972 (second in Europe) and the output started to accumulate only years thereafter. Tech transfer activities require investments by the university and it must be patience to wait for the results.

Critical mass was a term that came up frequently in this research. In order to get noticeable impacts in Technology Transfer decent amount of cumulative research results, both basic and applied, is required. In addition adequate support and other TT services are needed. Also the size of the economic area in which the university is located matters. Although universities operate internationally and also TT activities have international aspects, many activities are done together with regional companies, incubators and financiers. The interviews showed that successful tech transfer requires good connections with the region's business, industry and financial community as well as public bodies. Therefore, when setting the goals for TT activities, the size of the economic area should be taken into consideration.

The scope or definition of TT varied in the examined universities. In Leuven and Konstanz collaborative research was regarded as an essential

part of the technology transfer. While the outcome is not always spin-offs or licensing agreements but technology or knowledge transfer in other ways. In Oxford and Gothenburg the collaborative research more regarded as a basis or source for the technology transfer rather than a part of it. In spite of this difference in thinking, collaborative research was regarded an important asset for TT in all universities. It was also noted funding aspect: it is important to support and promote efficient exploitation of the research funding sources, not only finding ways for spin-off funding.

Based on the findings it appears that the way of organising the TT activities is not a central issue in getting good results. The activities can be centralised or decentralised. Important is that system and organisation is understood and known for the researchers and that TT operations fit and support the general strategy.

Raising awareness of entrepreneurial and innovation development possibilities as well as educating the staff and students in these areas are some of the key tasks of TT operations. Creating an entrepreneurial atmosphere and showing that the university values the exploitation of the research results is important. Examples of good cases and success stories are valuable when promoting tech transfer. The need of educational support, for example entrepreneurship or business creation studies for non-business students and for researchers was recognized in all of the examined universities. All universities viewed that in this aspect they should do better as the current offering of these studies was inadequate.

### **References:**

- Bercovitz, Janet & Feldmann, Maryann (2010) Entrepreneurial Universities and Technology Transfer: A Conceptual Framework for Understanding Knowledge-Based Economic Development. *Journal of Technology Transfer*, 31: 175–188, 2006.
- Bijker, W. E. (1995) *Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change*. The MIT Press. Cambridge, Massachusetts.
- Carlsson, B. and Stankiewicz, R. (1995) “On the nature, function and composition of technological systems”. In: Carlsson, B. (ed.): *Technological Systems and Economic Performance: The Case of Factory Automation*. Kluwer Academic Publishers. Dordrecht, pp. 21-56.
- Charpentron, C. & Alanen, J. & Sinervo, P. (2014) “Good Practices of Third Mission in University of Turku. In Vidal, J. & Vieira, M-J. & Ferreira, C, (eds.) “*Developing Third Mission Activities in Albanian Universities*” pp. 81-104. Universidad de León, Servicio de publicaciones.
- Debackere, Koenraad (2012) The TTO, a University Engine transforming Science into Innovation. *LERU - League of European Research Universities, Advice Paper n:o 10*, Jan. 2012.

Edquist, C. and Johnson, B. (1997) “Institutions and Organizations in Systems of Innovation”. In: Edquist, C. (ed): *Systems of Innovation: Technologies, Institutions and Organizations*. Pinter Publishers. London, pp. 41-63.

Lundvall, B-Å. (ed.) (1992) *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. London: Pinter Publishers..

Lundvall, Bengt-Åke & Johnson, Björn & Andersen, Esben Sloth & Dalum, Bent (2002) National systems of production, innovation and competence building. *Research Policy* 31, 213-231.

OECD (2013) *New Strategies and Policies for the Transfer, Exploitation and Commercialisation of Public Research Results, preliminary version*. OECD 2013. <https://ec.europa.eu/jrc/sites/default/files/events/20130627-tto-circle/jrc-20130627-tto-circle-kupka.pdf>, accessed Feb 11, 2015.

Pertuzé, Julio A & Calder, Edward S. & Greitzer, Edward M. & Lucas, William A. (2010) Best practices for University-Industry Collaboration, *MIT Sloan Management Review*, Vol. 51, No. 4, Summer 2010.

Rasmussen, Einar & Benneworth Paul & Gulbrandsen, Magnus (2013) Developing University Innovation Capacity: How can innovation policy effectively harness universities? capability to promote high-growth technology businesses?, *35th DRUID Celebration Conference 2013*, Barcelona, Spain, June 17-19.

Slaughter, S., & Leslie, L. (1997). *Academic capitalism: Politics, policies, and the entrepreneurial university*. Baltimore, MD: Johns Hopkins University Press.

University of Turku Strategy 2013-2016, University of Turku 2012.