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Knowledge And Technology Transfer Between Science And Businesses: ***Academic KTT Offices' Experience And Good Practice***

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Executive Summary

The first part of the report presents descriptive information on the featured offices and their KTT services as well as quantitative comparisons. The three most comprehensive fields of KTT activities are “assisting R&D collaboration, contract research projects and scientific/technological services”, “Commercialization of R&D results by patenting, licensing” and “Student projects with businesses”. The university budget is the most important budget source for these offices but there is a wide range of services which generate third party income.

The second part provides an assessment of different aspects of KTT in practice so new or recently established offices in the WBC countries may consider these.

A comparison between workload and an assessment of the effectiveness of different modes of KTT illustrates that assisting R&D collaboration or contract research projects does not only occupy most of the workload but is also top-ranked when it comes to effectiveness of KTT measures. However the commercialization of R&D results by patenting/licensing, even if it is second in terms of workload, ranks at the bottom in terms of effectiveness.

A set of incentives is presented which may be suitable to motivate researchers to participate in KTT activities, dealing with financial incentives, awareness/appreciativeness, practical hands-on services, communication and training courses.

Metrics for assessing KTT offices´ performance depend very much on the business processes at the institution and the role of the offices (mandatory vs. voluntary services), moreover they are specific for the individual mode of KTT, so a quantitative KTT benchmarking approach has some limitations.

The assessment of factors promoting and hampering KTT with all three strands of the “triple helix” (SMEs (businesses) / university / government) gives some evidence, that it is primarily up to universities and their KTT offices to positively or negatively influence KTT as the widest range of KTT drivers and barriers is in their hands, at least in the EU which has generally standardized set of government framework conditions.

In the annex 10 case studies of good practice activities in KTT are presented in detail.

List of Abbrevations

KTT: Knowledge and Technology Transfer

R&D: Research & Development

IPR: Intellectual Property Rights

SME: Small and Medium Sized Enterprise

FTE: Full Time Equivalent (referring to no. of staff)

HEI: Higher Education Institution

RTO: Research and Technology Organisation (non-university)

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1 Introduction

The objective for the creation of the presented case studies was to highlight good practice of academic institutions` offices responsible for assisting and promoting KTT between the university and businesses. The offices selected cover a range of KTT modes and have had many years of experience, in particular in dealing with SMEs.

The following "modes" of KTT were surveyed:

- R&D collaboration, contract research projects, scientific or technological services;
- Commercialization of R&D results by patenting, licensing
- Entrepreneurship (spin-outs from university, start-ups)
- Student mobility, career services
- Student projects with businesses
- Mobility of academics between science and businesses
- Involvement of businesses in curricula development
- Lifelong learning, training courses

To achieve well-structured responses a questionnaire (Annex B) was compiled and sent to the 5 EU based WBC-INNO partners. They were asked to identify and involve other offices which meet the following criteria:

1. EU based offices at or in close cooperation with a university,
2. At least 10 years of existence (track record),
3. Experience with all or most "modes" of KTT mentioned above.

The following Section gives descriptive information on the featured offices and their services as well as quantitative comparisons. This is followed by an assessment of KTT in practice and includes a review of issues which similar offices in the WBC countries may benefit from: Effectiveness of different modes of KTT, ways to motivate university staff to get involved in KTT, key elements for KTT performance (metrics), involving SMEs in KTT, collaboration with partners and infrastructure for promoting KTT.

2 KTT offices presented

Table 1: *Overview KTT offices*

Acronym	University	KTT offices	Country	Web	Contact
DUT	Delft University of Technology	Valorisation Centre	NL	*www.tudelft.nl*	Dr Stephan van Dijk
TUG	Graz University of Technology	R&T House	AT	*www.fth.tugraz.at*	Christoph Adametz
PM	POLIMI Politecnico di Milano	Servizio Valorizzazione Ricerca	IT	*www.polimi.it/tto*	Ciro Franco
FZLC	ZLC Fundación Zaragoza Logistics Center		ES	*www.zlc.edu.es*	Carolina Ciprés
UA	University of Alicante	Oficina de Transferencia de Resultados de Investigación	ES	*www.ua.es*	Alexandra Mayr
UB	University of Brighton	Centre for Collaboration and Partnership	UK	*www.brighton.ac.uk/ccp*	Dr Mark Jones
VUT	Vienna University of Technology	Research and Transfer Support	AT	*http://www.tuwien.ac.at/dle/transfer/*	Dr Eva Bartlmä
UV	University of Vienna	DLE Research Services and Career Development	AT	*https://forschung.univie.ac.at/en/home/*	Ingrid Kelly
TUHH	Hamburg University of Technology	TuTech Innovation GmbH	DE	*www.tutech.de*	Monica Schofield PhD
UWE	University of the West of England, Bristol	Faculty of Environment & Technology	UK	*http://uwe.ac.uk*	Dr John Lanhan
UW	University of Wales	Global Academy	UK	*http://www.wales.ac.uk/en/globalacademy*	Dr John Lanhan

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Table 2: *Public online information*

University	*KTT online information (as provided by the offices surveyed)*
Delft University of Technology	**Patent portfolio:** *http://www.tudelft.nl/cooperation/patent-showcase/tu-delft-patent-portfolio/*
Graz University of Technology	**Research:** *https://online.tugraz.at/tug_online/wbSuche.durchfuehren?pSuchTyp=4* **Technology Offers:** *http://portal.tugraz.at/portal/page/portal/TU_Graz/Forschung/FTH/Patent-%20und%20Erfindungsservice* **Theses/Final Papers:** *https://online.tugraz.at/tug_online/wbSuche.durchfuehren?pSuchTyp=16* **Subject Areas of Staff:** *https://online.tugraz.at/tug_online/wbsuche.durchfuehren?pSuchTyp=12&pOrgNr=* **Staff:** *https://online.tugraz.at/tug_online/wbsuche.durchfuehren?pSuchTyp=21&pOrgNr=*
University of Alicante	**Technology profiles and offers:** *http://sgitt-otri.ua.es/en/empresa/offers-techonology.html* **Research Capacities:** *http://sgitt-otri.ua.es/en/empresa/research-activities-and-capabilities.html* **Search Engine:** *http://cv1.cpd.ua.es/consplanesestudio/ConsGrpInv/portal/buscaGrp.asp*
Vienna University of Technology	**Research:** *https://tiss.tuwien.ac.at/research/main.xhtml* *and http://publik.tuwien.ac.at/start.php?lang=2*

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3 Characteristics of the KTT offices

This section gives an overview of the characteristics of the different offices which were involved in the survey. It shows the different modes of KTT which the offices deal with and the respective workload in everyday business, figures on staff and staff qualifications, the sources of funding and the timeline of establishing the different services for promoting KTT.

3.1. Support services for different modes of KTT addressed by the offices

Table 3: *Support services for different modes of KTT addressed by the offices showing relative workload (blank: KTT mode not addressed)*

	DUT	TUG	PM	FZLC	UA	UB	VUT	UV	TUHH	UWE	UW	Arithmetic Mean
R&D collaboration / contract research projects,sc. / tech. services	◑	◑		◕	◕	◑	●	◕	◕	◔	◔	42%
Commercialization of R&D results by patenting, licensing	◔	◑	●		◔	◔	◔	◑	◔	◔	◔	22%
Entrepreneurship: spin-outs from university, start-ups	◔	◔	◔		◔	◔	◔	◔	◔	◔	◔	8%
Student mobility, career services	◔	◔		◔		◔				◔		6%
Student projects with businesses	◔	◔		◔	◔	◔			◔	◔	◕	11%
Mobility of academics between science and businesses	◔				◔	◔			◔	◔		3%
Involvement of businesses in curricula development	◔				◔	◔				◔		2%
Lifelong learning, training courses	◔					◔		◔	◔	◔	◔	5%

About half of these service organisations can be regarded as integrated KTT offices whose services cover most of available KTT modes while others are specialized in a specific KTT mode (eg commercialization of R&D results). Apart from one, all offices deal with services to initiate and administrate R&D collaboration/ contract research and technological service projects. The three most comprehensive fields of activity in the KTT offices surveyed are "assisting R&D collaboration/contract research projects/scientific/technological services" (42% average workload), "Commercialization of R&D results by patenting, licensing" (22% average workload) and "Student projects with businesses" (11% average workload).

3.2. No. of persons in the office dedicated to KTT, staff qualification

Table 4: *No. and qualification of persons in the office dedicated to KTT (arithmetic mean of responses)*

No. of staff	**25***
Qualification of staff in % (total=100%)	
Science / engineering graduates	**58%**
Law / business economic graduates	**22%**
Other graduates	**5%**
Administrative qualification	**13%**
Technical qualification	**2%**
Other qualification	**0%**

** Median: 10 persons*

There is a large variety in terms of human resources devoted to KTT in these organisations. On average (mean) they have 25 dedicated staff, though considering the median value the "typical" office has a staff of 10 persons. It is also noted that in some cases staff are not co-located but are distributed across different offices within the organisation. More than 50% of the staff have got science or engineering degrees, 22% are law or business economic graduates. It is considered that there is a need to employ a majority of science or engineering graduates in a KTT office, preferably with different fields of specialization as they

can communicate with both researchers and businesses in their respective field of research. To support applications for public funding and/or contractual matters (eg IPR) another part of the staff with law or business economic background is very relevant. In general these offices have a low proportion of non-academic staff as most of the processes require an understanding of complex R&D technological and/or legal and financial issues, a high proficiency in communication skills and a good "standing" with scientists, technolgists and business representatives.

3.3. Sources of funding for the offices

Table 5: *Sources of budget for the office `s KTT activities (approximate figures, arithmetic mean, total = 100%)*

University funding	**61%**
Other public funding	**24%**
Private funding	**15%**

The university budget is in most cases by far the most important budget source for these KTT offices with an average share of more than 60% of the officebudget. The university budget is usually planned and granted for a period of at least 3 years which makes planning of services feasible. On top of this most of the offices compete for and successfully attract other public sources which account for another ¼ of the budget (on average). Private income is generated by 4 offices, egby fees for the management of R&D-projects.

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3.4. History of establishing services for different modes of KTT

Table 6: *History of establishing services for different modes of KTT*

	2-6 yrs. ago	> 6 yrs. ago
R&D collaboration / contract research projects, sc./tech. services	10%	90%
Commercialization of R&D results by patenting, licensing	20%	80%
Entrepreneurship: spin-outs from university, start-ups	20%	80%
Student mobility, career services	14%	86%
Student projects with businesses	11%	89%
Mobility of academics between science and businesses	38%	62%
Involvement of businesses in curricula development	40%	60%
Lifelong learning, training courses	11%	89%

Most of the support services of these offices were established more than 6 years ago and have been provided continuously for many years. More recently established support services in some offices include "Mobility of academics between science and businesses" and for "Involvement of businesses in curricula development".

4. Key findings

4.1. Effectiveness of different modes of KTT

Reference: "question B.1.: From your experience, which KTT modes are most / least effective?"

Table 7 below compares the everyday workload dedicated to specific modes of KTT presented before to a qualitative assessment of its individual effectiveness.

Table 7: *Effectiveness for different modes of KTT*

Effectiveness: *1 (very effective) to 5 (very little effect); ranking in this table by workload (average)*	***Effectiveness***	***Workload % of total***
R&D coll. / contract research projects, scientific / tech. services	**1.30**	**42**
Commercialization of R&D results by patenting, licensing	**2.67**	**22**
Student projects with businesses	**2.44**	**11**
Entrepreneurship: spin-outs from university, start-ups	**2.30**	**8**
Student mobility, career services	**2.00**	**6**
Lifelong learning, training courses	**2.22**	**5**
Mobility of academics between science and businesses	**2.00**	**3**
Involvement of businesses in curricula development	**2.60**	**2**

As mentioned in Section 3.1, on average 42% of KTT workload is dedicated to the promotion and administration of R&D collaboration or contract research projects responding to Scientific and technological services. The importance of this mechanism is recognized as it is also top-ranked when it comes to effectiveness of KTT measures. However the commercialization of R&D results by patenting and licensing, even though it is second in terms of workload, ranks lowest in terms of effectiveness. Two studies ("Report of the Knowledge Transfer Study 2011": Arundel, A. et al., 2013[1] and "Financially Sustainable Universities II: European universities diversifying income streams": Estermann, T. et al., European University Association 2011[2]) provide some backing for this assessment:

1 http://www.knowledge-transfer-study.eu
2 http://www.eua.be/Libraries/Publications_homepage_list/Financially_Sustainable_Universities_II_-_European_universities_diversifying_income_streams.sflb.ashx

According to the Knowledge Transfer Study 2011 license income of European universities is highly concentrated with *"... the top 10% of universities and research institutes earning appr. 85% of all license income (the vast majority i.e. 80% of reported license income is from biomedical inventions). Universities earned, on average, €500,000 of license income per 1,000 researchers p.a."*. In comparison Universities with a focus on applied R&D usually generate 25 to 50% of their total budgets from „third-party income", e.g. RWTH Aachen 48%, TU Munich 42%, ETH Zurich 25%. Taking into account that European universities make a total of circa 20% of their budget from "third party income" (according to the "Financially Sustainable Universities II" study defined as *"all income other than direct national/regional public funding and student financial contributions"*) the contribution of IP income to achieving greater financial autonomy in times of decreasing public budgets is somewhat limited, or at least a matter for a handful of very successful universities.

The rather low ranked effectiveness of the KTT mode "Commercialization of R&D results by patenting, licensing" may be due to:

- the uncertainty of substantial additional income
- the high cost of patenting
- the long duration from an invention to a market success
- an increasing focus on valorising research output for society and not only for companies
- the need for specialized support staff who must accommodate rather uncertain individual career perspectives (e.g no scientific career path, an administrative career may be seen as unattractive).

According to the assessment of the offices surveyed the most effective methods of KTT are "assisting R&D collaboration/contract research projects/scientific/technological services"; "assisting student mobility, providing career services" and "assisting the mobility of academics between science and businesses"

4.2. Ways to motivate university staff / students to get involved in KTT

Reference: "question B.4. Please give us examples how you motivate university staff/researchers or students to get involved in KTT"

In order to increase researchers´ motivation for an extended involvement in R&D collaboration/contract research projects with businesses the following activities are regarded as most relevant:

- Practical hands-on services: individual consulting on funding opportunities for given projects or project requests; help with legal questions and contract-management to minimize administrative effort; support services for the management of projects obtained from R&D grants schemes
- Communication: good preparation of businesses` cooperation requests by e-mail to accelerate decision-making by the scientists/technologists; regular visits of TTO staff to research groups to gather information about recent and planned activities; proactive offering of possibilities to scientists to participate in national and international projects
- Training courses by KTT office for researchers in project management, funding opportunities and collaboration with industry.
- Strategic aspects: appointing professors with industrial experience (academics in the engineering and applied sciences are generally very keen to work with potential users of their knowledge and expertise); involvement of key researchers in thematic R&D and innovation platforms set up between industry and university; inclusion of KTT in annual appraisal and performance discussions; including KTT performance in staff promotion routes.

Researchers will be more inclined to consider commercialization of their R&D results by patenting/ licensing if the following activities or framework conditions are provided:

- Financial incentives: there are different models how academic inventors benefit financially from their inventions
  - monetary premium (lump sum) irrespective of revenues from their IP
  - monetary participation in revenues from their IP: often a 1/3,1/3,1/3 rule applies – university, research group, researcher receive equal parts of net revenue.
- Awareness/appreciativeness/recognition: Inventors` Event (festive presentation of inventors, certificate handed over by the Rector, presentation of good practice cases in technology commercialization)
- Practical hands-on services: individual consulting on IPR questions with respect to inventions, innovation and business contracts
- Communication: Proactive invention and innovation scouting by the KTT office
- Training courses by KTT office for researchers in IPR issues, in particular IP in collaboration with industry.

Studies such as the Global University Entrepreneurial Spirit Students' Survey (http://www.guesssurvey.org) suggest that the proportion of students who would consider starting a business is quite high (approximately 40%, a few years after graduation, in particular in less developed countries), but that the actual rate of company founders is less than 5%.

In addition to ongoing liaison with the regional business incubator, motivation for students´ entrepreneurship is also promoted through the following activities:

- Awareness: "Entrepreneurship Ideas" competitions targeted at students and researchers; "Entrepreneurs-To-Be" days
- Training: entrepreneurship courses (start-up of a company; business planning)
- Financial and infrastructure support for competitive student teams
- Industrial diploma and master theses (students often receive additional remuneration); other formats for company interaction with students

4.3. Key elements for reporting KTT performance

Reference: "question B.6. What are the key elements you use in reporting KTT performance? - qualitative information and/or quantitative key indicators"

It should initially be mentioned that the overall KTT performance of a university cannot be directly attributed only to the KTT offices` activities. Considering the average headcount of these administrative offices they usually act as facilitators and advisors in a subsidiary function. In some cases they are responsible for the enforcement of KTT regulations, central data collection and reporting to the Rectorate. Consequently when it comes to evaluating their performance in input/output/impact categories these limitations should be taken into account. To give an example there is a substantial difference between the indicator "number of projects for which the KTT office provided assistance" and "number of projects for the university in total": in some cases it is mandatory for university staff to report all projects or those above a fixed threshold (eg €5,000 or €20,000) to the KTT office. In other universities this is not the situation and hence these KTT offices do not have ready access to the total number of projects, but only the data on projects assisted by the office.

In the UK KTT offices and also in some others, the impact of a single project on the (commercial) partner and a forecast of the impact post-programme is widely applied as an indicator of performance.

According to University of Vienna "current thinking in TTO circles is that focusing on specific metrics is not very helpful in measuring performance. Instead, one should be looking at "impact" and benefit to the public, for instance: number of start-up jobs created; amount of research funding flowing into the University from industry; success stories e.g. new drug invented at University that saves lives."

Metrics used for R&D collaboration, contract research, scientific and technological services include:

- Number of and income generated by collaborative research projects, contract research projects and scientific/ technological service projects, broken down by funding partners: national and EU subsidies, local, national and international businesses (if possible broken down by line of business and location).

Metrics for commercialization of R&D results by patenting and licensing include:

- Number of invention disclosures for university employees
- Number of patents filed for application (remark: the number of new patent applications filed in a given period (e.g. year) depends both on quantity and quality of inventions disclosures and on patent cost budget available to the university or KTT office).
- Number of patents granted, at national and international level
- Number of license deals, number of patents transferred

• Revenues from licensing / IP royalty income (may include licenses and lump sum payments, but also full cost overhead including IPR transfer share).

Metrics for Entrepreneurship: these are mostly applicable to incubator units (unless specified differently) which are usually not integrated into the KTT offices:

• Number of start-ups accepted
• Number and amount of pre-seed loans granted to start-ups
• Amount of seed and venture capital attracted by start-ups
• Growth of start-ups (FTE, Turnover, Profits)
• Number of spin-out companies, related to IP
• Amount of income and ROI when exit from spin-out companies
• For the university: Number of students and researchers participating in entrepreneurship education
• For the university: R&D projects income from their start-ups.

Indicators for KTT offices` performance:

• Number of consultancy meetings with researchers and/or businesses (pre-project phase, funding opportunities)
• Number of invention disclosures handled
• Number of and expected income from (public funded) projects assisted in the application phase
• Self-financing (if applicable, eg by commercial services, involvement in KTT projects consortia; see section 2.2).

4.4. Geographical scope of the business the KTT offices deal with

Reference: "question D.1. Where is the majority the business target group of KTT offices located?"

For KTT offices (1) specialising in commercialisation of IP and/or (2) situated in a large city and/or (3) charging commercial fees, the majority of business partners is beyond 100 km distance while for those in smaller agglomerations a distinctive regional focus is given (up to 100 km distance).

4.5. Involving SMEs in KTT

Reference: "question D.3. Please give us an assessment on working with SMEs in order to promote KTT"

Overcoming the cooperation barriers between academia and SMEs is an explicit objective of virtually any single strategic paper on innovation. KTT offices in their role as an interface to the business world which in sheer numbers is dominated by SMEs have gathered a lot of practical intelligence on this issue.

There are factors promoting and hampering KTT within all three strands of the "triple helix": SMEs (businesses)/university/government.


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KTT drivers	KTT barriers
at SMEs ` level	
• Previous experience in R&D projects • Mid-to-Long term focus; willingness to work together to explore a broad range of company challenges and then work towards a partnership solution. • Dedicated innovation budget • Employees at MSc or PhD educational level • Involvement of students, access to graduates	• Too busy focusing on today's immediate issues and cashflow, requests often very close to commercial deadlines • Availability of dedicated qualified personnel working on project • Unwillingness to involve academic expertise at all ("too theoretical") • Tendency to address too many ideas for innovation projects in parallel • IP concerns
at universities ` level	
• Clear contact point, such as a KTT office; proactive KTT approach • Project & process management and IPR & legal support • Guarantee of freedom to publish granted by SME • Applied research / engineering focus of researchers • Sheer luck: contacting the SME at the right time • "Honest broker": provision of best available R&D expertise by the KTT office • Joint labs: co-location of researchers from academia and industry • Preparing early stage researchers for a career in academia AND private sector with focus on key employment skills • Researchers evaluation criteria that include KTT performance • Flexibility of offer from university with working across traditional subject boundaries. • Sheer desperation – lack of public money for research requires scientists to look elsewhere for funding, even if there are strings attached.	• Limited time resources of researchers to devote to "small" problems; they may not respond quickly once an SME has decided what it wants • Reluctance to risk exposure (e.g. actually having to deliver something that is outside of usual work and to a firm timeline) very diverse SME´s requests hard to provide in-depth expertise in every single case • Different criteria of evaluation of research outputs (Publications versus patents); little chance for scientific publication • Universities may have unrealistic expectations and require even start-up SMEs to commit to paying large future royalties or inventor remuneration • Universities may be too rigid in their requirements on e.g. publishing (worries about restrictions on publications), IP ownership • Too conceptual research focus/not sufficiently applied • Problems of mutual recognition of professional status • Very different wages in public and private sector
at government level	
• Access to and availability of external public funding, non-bureaucratic funding for small („beginners") projects • Technology oriented environment	• Lack of suitable public funding instruments • Funding for universities not cost-covering

4.6. Collaboration with partners

Reference: "question E.6. Do you collaborate with other partners in KTT on a strategic or operative level: other universities and their organisations, other Higher Education Institutions (HEI), other Research and Technology Organisations (RTO), other intermediaries like Chamber of Commerce, incubators, technology parks, service enterprises, manufacturing enterprises, public sector bodies".

Most of the respondents state that they collaborate strongly with local business incubator units of the universities, most of which are organized as separate legal entities (eg YES!Delft, Business Accelerator of Politecnico di Milano, Science Park Graz, inits Vienna). This collaboration is regarded as very effective for KTT because (1) motivation in collaborative R&D projects is normally extremely high as university-created technologies used in these start-ups are most valuable for the founders and (2) the incubators are the key partners in establishing procedures concerning the creation of university spin-off companies. Some KTT offices judge this relationship on the long-term growth of the start-ups and contract research projects outsourced to the university. Furthermore some KTTs collaborate with the regional Science Parks (eg Science Port Holland, hit – Technopark Hamburg).

Valuable partnerships are also established in networks of KTT offices on the regional or national level (eg Netval, Italian association of universities TTOs, Red OTRI – National Network of Technology Transfer Offices in Spain). These networks are usually aimed at promoting the exchange of good practises and training activities concerning technology transfer management.

Experience with organisations which support businesses and should be signposting available support does exist. However some respondents state that these have led to very limited collaboration and the organisations tend to come and go relatively quickly (Chambers of Commerce, business clusters, Regional Development Agencies). In general it can be said that those business-oriented institutions will only be valuable partners for academic KTT offices when the university is a proactive and formal partner with a defined role:

- as a (founding) member or even shareholder of an innovation cluster eg Cleantech (cleantechdelta) in Delft
- as an initiator of a regional or national KTT support scheme eg SCIENCE FIT (Styrian Chamber of Commerce as partner) or the KTP scheme in the UK

In terms of collaboration with other HEIs and RTOs there is always the balance of compete vs. collaborate, even if sometimes complementary capabilities are incorporated into common projects. The SCIENCE FIT network in Austria has tried to overcome this issue as it acts as an "honest broker" on a contractual basis for the benefit of regional SMEs. It is an inter-institutional operative KTT team with professionals from 3 universities and 1 RTO.

In some cases the Municipality is a strong and long-term partner for the KTT office on a strategic level as it creates the conditions for a good business and entrepreneurial climate, supports cluster development and is usually most interested in signposting available KTT support at the universities.

General characteristics of valuable partners for KTT include:

- long term partnerships which go beyond a single project and involve repeat contracts/projects
- well established personal contacts in sizeable organisations who are interested in KTT and can help navigate around complex organisations
- two way exchange of knowledge and ideas
- well established collaboration procedures.

4.7. Infrastructure for promoting KT

Reference: "question G.1. Is there specific (physical) infrastructure available that is crucial in promoting KTT?"

There are two types of infrastructure that are regarded as crucial in promoting KTT: (1) regional business incubators (start-up facilities) and (2) testing facilities, scientific instrumentation, laboratories. Sometimes these functions may be integrated into one building or service.

Regional business incubators usually offer office space, prototyping facilities and some lab space as well as brokering other "soft" services to their clients. In many cases they are owned by the university or by a group of regional universities. In the case of TuTech Hamburg the building itself is host to many small companies.

Testing facilities, scientific instrumentation, labs and working environments enabling creative work: In most cases all testing facilities and available infrastructure (e.g. electron microscope, test rigs, wind tunnel, clean room, robotics lab, hydrogen lab, power lab, measuring and testing lab for materials, prototyping facilities) of the universities have been mapped and can be used for fixed-rate fees. In some cases there is a lower fee for start-ups. In the case of Alicante the SSTTI Scientific Instrumentation Services brings together infrastructure and scientific-technological equipment which, due to the high cost for acquisition

and maintenance, complexity and the use by different research groups, requires centralization and handling by specialized personnel. It is available to researchers from the University and other public universities as well as to private companies to support basic and applied research - there usually is a condition that the services will be made available on a wider basis, though this is usually chargeable.

Working environments enabling creative work are a growing trend coming from USA and Scandinavian countries (eg MIT FabLab, eg Aalto Design Factory). Apart from some pilot activities in Graz and Vienna no other such dedicated infrastructure has been reported.

Integrated facilities: In Hamburg there is a plan to establish the 'Innovation Campus Green Technologies (ICGT)', an exemplary energy efficient building which will offer facilities for research and innovation labs for students and researchers in addition to space for start-ups and other companies. In Delft a pilot production facility for biotech and bio-based processes and products is being developed. It is a multi-million up-scaling facility (shared) that can be used by researchers, industry, start-ups and SMEs and will be realised in 2014.

Apart from these aspects infrastructure in general is regarded as being of minor importance for promoting KTT.

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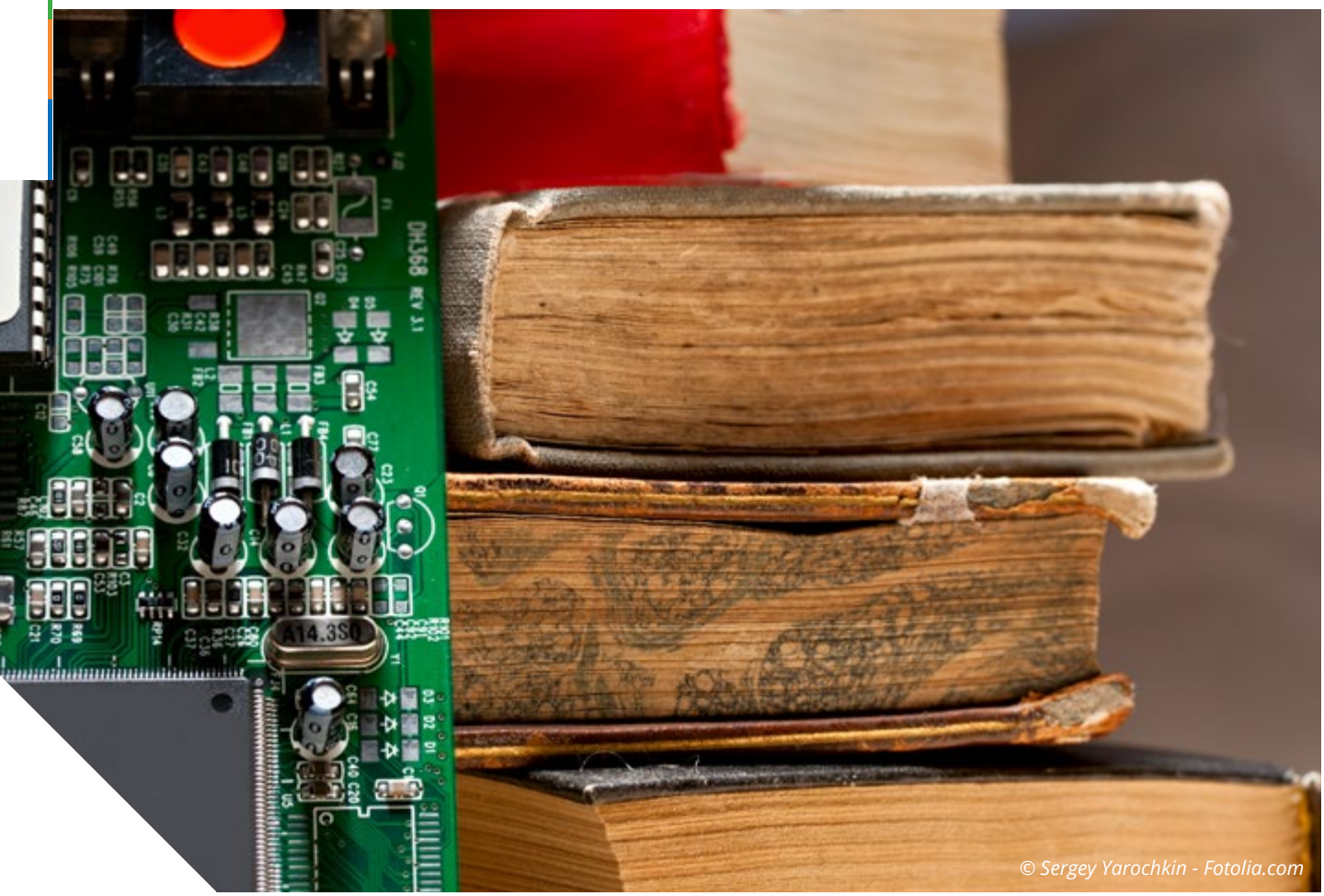

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5 Case studies of good practice activities in KTT

These good practice activities in KTT have been reported by the partners by completing Section C. of the individual questionnaire

1	Delft University of Technology	Valorisation Centre
2	Graz University of Technology	Research & Technology (R&T) House
3	Politecnico di Milano	Servizio Valorizzazione Ricerca
4	University of Alicante	Oficina de Transferencia de Resultados de Investigación
5	University of Brighton	Centre for Collaboration and Partnership
6	Vienna University of Technology	Research and Transfer Support
7	University of Vienna	DLE Research Services and Career Development
8	Hamburg University of Technology	TuTech Innovation GmbH
9	University of the West of England, Bristol	Fac. of Environment & Technology
10	University of Wales	Global Academy

5.1. Delft University of Technology good practice: YES!Delft high-tech academic based incubator

Content

The incubator YES!Delft supports tech-based startups (technology driven, innovative and scalable) emerging from university research and students. The incubator offers coaching, networks, senior entrepreneurs, access to capital, pre/seed investments, office space, and a lively community. It also organizes several business competitions and awareness events. The university (and the TechTransfer Office) supports startups with IPR, legal and research assistance or collaboration. The university is main shareholder of the incubator, together with the city of Delft, and our largest national applied research institute TNO.

Target groups and stakeholders

Target groups of the incubator and startup support are:
- university students and graduates that want to startup a company
- university researchers (PhD's, professors) that want to startup a company or transfer
- inventions/knowledge to a startup

Stakeholders in this activity are many:
- Delft University of Technology
- TNO, Applied Research institute
- City of Delft
- Sciencepark
- External experts and business coaches
- Investors and financial institutions

Quantitative data

YES!Delft incubator capacity:
- 4.5 FTE employees (CEO, Marketing, Incubation Manager, support staff)
- Annual budget of 650 kEuro
- YES!Delft results:
- 120 startup companies since 2005
- 85 MEuro totally invested in YES!Delft startup companies since 2005
- More than 550 FTE new jobs created since 2005 (70 startups interviewed)
- Yearly revenue of 41 MEuro in 2012 (70 startups interviewed)
- 500 kEuro of contract research of startups at the university in 2012 (70 startups)
- On average: 15 startups enter the incubator each year.
- Around 25 % of startups are in Cleantech, 25 % in IT, 25% Industrial Solutions, 15 % in Medtech, 10% in Consumer products.

Awards / recognition

The TU Delft and its incubator YES!Delft was No. 1. on the Dutch Valorisation Rankings for both Most Entrepreneurial and Best Knowledge transfer/Valorisation of all Dutch universities in 2011.

YES!Delft has won the Dutch Enterprise Promotion Awards in 2012, in the category 'business environment promotion'.

5.2. Graz University of Technology good practice: SCIENCE FIT

Content

A team with staff from 3 universities and 1 RTO with KTT experience from different fields of scientific education, mainly engineering:

- approaches local SMEs via mail / phone or handles their inquiries, usually leading to company visits
- surveys the SME`s concrete innovation needs and paths, selects most urgent ones
- identifies specialist(s) for these needs, typically researchers who often involve students (note: experts may also be from outside the SCIENCE FIT team)
- presents "perfect-fit" public innovation funding opportunities to the SME
- sets up of project consortium, assists in contractual matters and public funding application
- monitors progress at least in initial phases
- provides access to students and graduates of Styrian universities, by staging an annual Recruiting Fair „Small can do it all"

Target groups and stakeholders

Target groups:

- SMEs of production sector+business service sector, mostly those less experienced with academic collaboration
- researchers as experts, students of Styrian universities

Stakeholder: funding agencies (regional policy makers), regional intermediaries

Quantitative data

- staff input: appr. 10 TTO persons (= 2 - 3 FTE full time equivalent)
- involvement of 50-70 SMEs p.a.
- 25 additional projects initiated every year in which an SME provides funding or applies for public R&D funding for a project with an academic institute;
- typical project volume: 5-10k€, a few large ones (>100k€)
- 20 SMEs at annual Recruiting Fair
- Total project budget appr. 200.000.- p.a., funded by 3 public / semi-public sources

Awards / recognition

- EU DG REGIO "Regio Stars": Good practice Nominee 2008 (preceding programme TECHNOFIT PRO)
- EU DG REGIO "Investing in our regions": Good practice case 2010 Münster Science-to-Business Marketing Research Centre; November 2011): 1 of 30 good practice examples (http://www.ub-cooperation.eu/pdf/casestudyreport.pdf)
- pilot projects based on SCIENCE FIT experience in other Austrian states: Carinthia, Salzburg, Vienna

5.3. POLIMI Politecnico di Milano good practice: Filing of patents and management of the related procedure

Content

Politecnico di Milano's standard procedure for invention proposals resulting from research requires: the "Research Disclosure Form" to be filled out which has a dual function:
On the one hand it contains the description of the invention (important in order to assess the requirements for patentability) and on the other it is a statement of the inventors' transfer of ownership of the property rights to the University;

In order to assess whether or not Politecnico is interested in assuming ownership of the invention, the following criteria shall apply:

- the technical feasibility of the invention;
- compliance with the requirements of patentability (novelty, industrial application, originality);
- the existence of a fair probability that the invention can be transferred to industry. In this regard it is essential that the Disclosure Form has been filled out properly, in terms of industrial contacts and market analysis.

If the evaluation has a positive outcome the university shall proceed to file a national patent application, the costs of which shall be borne entirely by the university. The inventor will be put into contact with one of the patent law firms the Politecnico works with in order to draft the text to be filed.

In the event that the assessment is negative, the inventors will be left with the decision of whether or not to file the patent application independently.

Target groups and stakeholders

Researchers, post-docs, PhD students, undergraduate students, administrative staff.

Quantitative data

- Three staff units are involved in this process.
- The average duration of the process is two months.
- The number of ideas presented for patent analysis is around 200 per year.
- The number of patents filed and extended is 50 per annum on average.

Awards / recognition

The TTO of Politecnico di Milano is one of the first technology transfer offices established in Italy. It is also among the founding members of the Netval (TTO Network of the Italian universities) and the European Association Proton Europe. During these years it achieved proven results both in terms of intellectual property management, with a portfolio of about 600 patents, half of which are in use at an industrial and commercial level, and in terms of spin-off company establishment.

5.4. University of Alicante good practice: Technology Promotion Action Plan

Content

Technology Promotion Action Plan includes:

I. Technology Map - Technology Offers TOs
II. Technology Promotion Plan
III. Technology Diagnosis
IV. Fundraising for R&D (public funding). Project management.

I. *Technology Map - Technology Offers TOs*
Main steps:

- Interviews / Visits to Research Groups – professionals from the TTO visit research groups
- Matching capacities and/or outcomes with
- Industry Sectors /Science Areas
- Elaboration of Technology Map.

II. *Technology Promotion Plan*
As a second step, a technology map is developed, with 'technology offers' listed in a way easy to find and understand by enterprises.

III. *Technology Diagnosis*

- Visits to Companies. Objective: identify needs/technological demands.
- Carried out by members of the TTO (Enterprise Area)
- Sometimes together with researchers
- In close cooperation with entities like Chamber of Commerce, City Councils, Development Agencies, etc.

TTO: Enterprise Relations Area

- 5 People (Administrative Support + Technicians)
- Specific Education (Technology Transfer, IP, International Projects, Project Management, Contracts, R&D, Innovation, etc.)
- Expertise: Engineers, Scientist, IT, Socio-economy.

Definition of 'Technology Diagnosis':

... a joint reflection carried out by the entrepreneur, the executive team and experts external to the company...
... the team created for this purpose follows an established methodology to analyze the problems/needs and technological potential of the company
... the ultimate aim is to identify potential areas for improvement and thorough joint R&D activities, improve competitiveness, and identify means and funding to undertake R&D projects...

IV. *Fundraising for R&D (public funding). Project management*
Objectives: Detect R&D&I projects which can be financed with public funds and which can help the company improve its competitive position through the innovation. Include in the project, as far as possible, Research Groups of the University of Alicante.

- The SGITT-OTRI of the University of Alicante is part of the Red PIDI for the advice to companies regarding the funding of their projects.
- The University of Alicante has recently signed an agreement with the Center for Technology Industry Development (CDTI), which makes her part of the Red PIDI as an information point in R&D&I.
- The aim of the Red PIDI is to give advice services and to be a guidance in the lines of public support

of the R&D&I for the management of technological projects.
• For that purpose, a network of local centres where personalized attention to companies interested in developing projects is provided.
• This is a pioneering service in the University field.

Target groups and stakeholders

I. Technology Map - Technology Offers target: university staff - researchers
II. Technology Promotion Plan target : companies /enterprises
III. Technology Diagnosis target: enterprises
IV. Fundraising for R&D (public funding), Project management target : enterprises and university research groups & faculties

Quantitative data

- 4 persons from the TTO involved
- number of projects initiated: circa. 500/year
- value of projects initiated in €:
  • 2007 » 5,810,930
  • 2008 » 8,495,777
  • 2009 » 4,989,752
  • 2010 » 6,238,360
  • 2011 » 3,841,466

Awards / recognition

The activity has proven successful in a context where the industry and business environment of the University are not highly technology oriented. Through the effort of the TTO, the University is promoting itself as a strategic partner to enterprises. A number of interesting projects have proven to lead to significant benefits for both the companies and the university.

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5.5. University of Brighton good practice: Knowledge Transfer Partnerships (KTP)

Content

Knowledge Transfer Partnerships are considered the gold standard for university/industry collaboration in the UK. KTP, a UK-wide programme helping businesses to improve their competitiveness and productivity through the better use of knowledge, technology and skills that reside within the UK Knowledge Base, utilises a three-way partnership model with a graduate appointed to transfer knowledge from the university to meet a core strategic need within a company, and knowledge transferred from the company to the university enhancing teaching and the relevance of research.

The government provides grants of up to 67% for innovative projects which can demonstrate the need for knowledge transfer, and which can deliver a sound business case.

Target groups and stakeholders

Business: Primarily SMEs in the private sector, although large companies, third sector companies and some public organisations are eligible.
University: Research-active lecturers.
Graduates: bright graduates with the potential to be 'business leaders of tomorrow'.

Quantitative data

There are currently over 600 programmes in the UK (numbers reached 1000 prior to the governments comprehensive spending review in 2010). In theory all universities, research establishments and further education colleges in the UK can offer KTP, in practice around 100 institutions are active.

Projects last between 6 and 36 months with 2 years being the average. The budget for an a typical 2 year programme is c£120k so the current value of the whole national programme is in the region of £7.2 million.

A single KTP programme results in an average increase of over £240k in annual profits before tax for the company partner and the creation of 3 new jobs.

Awards / recognition

The programme itself has not received awards but is recognized both within the UK and further afield as a successful programme. Awards are given annually to the most successful KTP projects.

5.6. Vienna University of Technology good practice: Patent Management and Licensing Service

Content

The Patent Management and Licensing Service receive all inventions from the university's scientific staff. Every invention disclosure is evaluated in the beginning and as a project follows its "own way" (e.g. patent-application; patent-sell; licenses; further R&D projects etc.)

The colleagues of the Patent Management and Licensing Service are in charge of these projects from the very beginning until the end.

Target groups and stakeholders

Target groups within the University:

- All scientific staff
- Rectorate
- Senate
- Universitätsrat

Other target groups:

- Enterprises / Industry
- Ministries

Quantitative data

In 2013 the Patent-Service comprises 4.5 FTE staff who are managingcirca 200 patent projects. The service also engages external experts for the commercialisation process in special cases.

Awards / recognition

Vienna University of Technology gained 14 Austrian Patent Grants in 2011, and 20 Austrian Patent Grants in 2012. In both years it was the leading Austrian University in the official "Patent Ranking" of the Austrian Patent Office1

Vienna University of Technology also gained three out of 10 promoted prizes at "Inventum 2012"2; one of them won the Silver-prize. In the "Inventum 2011" Contest, Vienna University of Technology also gained the Silver-prize.

5.7. University of Vienna good practice: Pilot Project: Invention Scouting at Max Perutz Laboratories

Content

The primary aim is to raise the profile of the Technology Transfer Office and increase the number of invention disclosures coming out of a stand-alone molecular biology institute which is jointly run with the Medical University of Vienna. It is planned to visit 12 research groups in 2013 and discuss their research, evaluate possible inventions, explore potential for future inventions etc.

Target groups and stakeholders

The primary targets are the Principal Investigators (PIs), but they are encouraged to invite the full group (including students) to attend.

Quantitative data

Visits to 12 research groups in 2013, of which 9 are University Vienna-funded groups. Each visit is conducted by the University Technology Transfer Manager, and lasts about 1-2 hours. Follow-up steps from each visit are then defined and carried out.

Awards / recognition

This project is in the pilot phase, and will be extended if results are positive.

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5.8. Hamburg University of Technology good practice: Biokatalyse 2021

Content

BioKatalyse 2021 is an interdisciplinary research cooperation cluster formed out of a pre-existing network Industrielle Biotechnologie Nord (IBN) initiated and supported by TUHHTuTech which won funding for 5 years (2008-2013) under the BMBF's Bio-industry 2021 cluster programme. The goal of BioKatalyse 2021 is to bring together academic and industrial partners to systematically develop the enormous potential of industrially-relevant biocatalysts from micro-organisms to industrial scale application.

The management of this circa. €50 million cluster has been a joint task between TUHH, providing the scientific coordination, and TuTech which has provided the overall cluster management
§ see *http://www.biocatalysis2021.net/*

Target groups and stakeholders

The target groups are:
- Industry large and small
- Academic researchers
- Research institutions

Quantitative data

- Biokatalyse 2021 – Budget circa 50 Mio €
- 22 R&D institutions
- 19 multi-nationals
- 22 SMEs

5.9. University of Bristol good practice: QuickMark market evaluation service

Content

Light touch – 20/25 hours desk-based market opportunity evaluation used to assess business and wider exploitation opportunities for a project/proposal. Service entails web/desk based investigation of potential markets, search for similar/related activities/products to assess depth andbreadth of opportunities. The activity may also include focus groups, discussions and phone interviews with potential end – users/ partners. This process is used as an 'acid test' to validate, or refute, academics view that "there is a market / opportunity / need for my idea …. "

The activity produces a report against a flexible range of headings – market, size, comparator opportunities/ offerings in the market, suitable funding sources etc.

Target groups and stakeholders

Open to all groups – primarily used to evaluate ideas from academics – but has also been used to validate ideas/proposals arising from student projects in relevant areas – Product Design for example.

Quantitative data

UWE undertakes ~ 25/30 per academic session
Cost – 20 – 30 hours staff time / investigation
Managed by Business support team – undertaken by internal staff – occasionally will seek external input for specialist cases.

5.10. University of Wales good practice: Prince of Wales Innovation Scholarships

Content

The aim of the project is to place doctoral researchers within participating businesses to help develop their innovation capacity. This will be achieved by having each scholar undertake key research projects, supported by international and national academic supervisors, to support the innovation potential of Welsh business.
Please see http://www.wales.ac.uk/en/globalacademy/powis/powis.aspx for current activity.

Target groups and stakeholders

Small and medium size enterprises in high growth and high technology areas undertaking research and development activity with an aim for short to medium term commercialisation.

Quantitative data

30+ projects with as many as 6 university partners in Wales.

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6 Questionnaire

A) Identification and contact data (University, Organisation)

B) Modes of KTT - knowledge and technology transfer (not to be published)

B.1. modes of KTT addressed by your organisation´s activities	Workload % of total

Which modes of knowledge and technology transfer are addressed and promoted by your activities, and to what extent (approximately, total = 100% workload)?

R&D collaboration / contract research projects, scientific/tech. services	
Commercialization of R&D results by patenting, licensing	
Entrepreneurship: spin-outs from university, start-ups (eg via incubator, eg entrepreneurship training courses)	
Student mobility, career services (eg work placements in businesses, experience abroad)	
Student projects with businesses	
Mobility of academics between science and businesses (eg Teachers from Industry; PhD in enterprises)	
Involvement of businesses in curricula development	
Lifelong learning, training courses	

B.2. Effectiveness of different modes of KTT Ranking (or n.a.):	Ranking (or n.a.): 1: very effective, 5: very little effect

From your experience, which KTT modes are most / least effective?

R&D collaboration / contract research projects, scientific/tech. services	
Commercialization of R&D results by patenting, licensing	
Entrepreneurship: spin-outs from university, start-ups (eg via incubator, eg entrepreneurship training courses)	
Student mobility, career services (eg work placements in businesses, experience abroad)	
Student projects with businesses	
Mobility of academics between science and businesses (eg Teachers from Industry; PhD in enterprises)	
Involvement of businesses in curricula development	
Lifelong learning, training courses	

B.3. Timeline of establishing support for different modes of KTT	< 2 yrs. ago	2-6 yrs. ago	> 6 yrs. ago

When approximately were support activities for different KTT modes established?

R&D collaboration / contract research projects, scientific/tech. services			
Commercialization of R&D results by patenting, licensing			
Entrepreneurship: spin-outs from university, start-ups (eg via incubator, eg entrepreneurship training courses)			
Student mobility, career services (eg work placements in businesses, experience abroad)			
Student projects with businesses			
Mobility of academics between science and businesses (eg Teachers from Industry; PhD in enterprises)			
Involvement of businesses in curricula development			
Lifelong learning, training courses			

B.4. Please give us examples how you motivate university staff/researchers or students to get involved in KTT:

B.5. Is there a service provided for the assessment of the commercial potential of researcher's inventions or research results, in order to select appropriate commercialization means (e.g. license, patent sale, start up, spin off etc.)? How and by whom is it provided?

B.6. What are the key elements you use in reporting KTT performance: qualitative information and/or (if applicable) quantitative key indicators

C) Good practice activity in one or more KTT modes

Please select one field of activity (or one project/service) of your organisation promoting KTT between science and businesses that you regard as good practice, and tell us more about it:

C.1. title of the activity / project / service (if applicable)

C.2. Content of the activity / project / service (overview)

C.3. What are the target groups and stakeholders of this activity / project / service?

Please distinguish (if applicable): target group among university (staff and/or students); target groups among businesses; other stakeholders

C.4. Please give us some quantitative data on the „size" of this activity
e.g. number of people/organisations involved p.a., duration, turnover; other relevant figures

C.5. Has this activity / project / service received awards or gained wider recognition?

D) Businesses involved in KTT activities (not to be published):

D.1. Where is the majority of your business target group located (geographical scope)	
Local (eg city, appr. 20 km distance)	
Regional (appr. 20-100 km distance)	
Beyond 100 km distance	

D.2. What are the main industries or fields of technology of the businesses you work with?

D.3. Please give us an assessment on working with SMEs in order to promote KTT. If applicable, please distinguish between established and young SMEs (start-ups)		
Factors promoting KTT („KTT drivers") / Factors hampering KTT		
at SMEs level	*at university level*	*other*

D.4. What are the 3 most relevant public funding instruments for KTT in your region/country?

E) More about your organisation (to be published only at request)

D.3. Please give us an assessment on working with SMEs in order to promote KTT. If applicable, please distinguish between established and young SMEs (start-ups)	
Persons:	*FTE (full time equivalent):*
No. of persons in the organisation dedicated to KTT (knowledge and technology transfer), approximately:	

E.2. qualification of the persons in your organisation dedicated to KTT (total = 100%)	
Qualification	*in %, appr.*
Science / engineering graduates	
Law / business economic graduates	
Other graduates	
Administrative qualification	
Technical qualification	
Other qualification	

E.3. Please provide a short history of your organisation
eg what was the nucleus of this organisation (and when was it established), has it expanded its services, were there reorganizations...

E.4. Who provides the budget for your organisation´s KTT activities, to which extent (appr.)		
The university: .... %	*Other public sources ... %*	*Private ... %*

E.5 If you raise funds from private sources please tell us a bit more about it
eg: do you charge fees and for which services, are there donators ...

E.6. Do you collaborate with other partners in KTT on a strategic or operative level?

Please think of other universities and their organisations, other Higher Education Institutions (HEI), other Research and Technology Organisations (RTO), other intermediaries like Chamber of Commerce, incubators, technology parks, service enterprises, manufacturing enterprises, public sector bodies and tell us a bit about the context and content of the collaboration

E.7. Thinking about your most valuable partners for KTT, please explain what makes them the most valuable, and the parameters you use to judge this.

F) R&D databases as prerequisites for promoting KTT

F.1. Which organisation within your university collects data from university's faculties and departments on their research and innovation resources (staff, expertise, equipment/software, facilities etc.) and how is this done?

F.2. Does the university have a CRIS (current research information system)?

G) Infrastructure for promoting KTT

G.1. Is there specific (physical) infrastructure available that is crucial in promoting KTT?

eg: incubator park, technology centre, innovation labs for students, … please tell us who this infrastructure is owned / managed by (eg the university)

G.2. Are there infrastructure resources (e.g. specific lab or measuring/testing facilities) at you university that are targeted at regional SMEs? If so, please specify

Modernization of WBC universities through strengthening of structures and services for knowledge transfer, research and innovation

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