# **Bridging ivory towers** Think local, act global?

Master of Science graduation thesis Industrial Engineering and Management

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\*\*\* PUBLIC VERSION \*\*\*

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### Preface

This thesis presents the research findings after nine months of working at the university, studying universities. One might expect a lengthy preface after such a long period of studies; however, I decided to keep it concise.

I would like to thank Dr. Peter van der Sijde for inviting me to commence this graduation project, introducing me to the 'knowledge transfer' field and for the unremitting support and commitment. I would like to thank Dr. Cees Terlouw for his critical though ever useful thoughts. Thanks to all my colleagues and friends for the inspiring conversations and the (unsolicited) advice and many thanks to the anonymous reviewer for the helpful comments. It has been a tremendous learning experience.

Sjors van der Heide Enschede, June 2007.



### Summary

This graduation thesis is about 'knowledge transfer', the 'third' university task next to research and education. 'Knowledge transfer' is described as the "transfer of know-how, expertise, skills and knowledge from one party to another leading to innovative, profitable or economic improvements for government, organisations and individuals in the private and public sectors and in the wider community" (ProTon, 2006) for mutual benefit (PhilipsKPA, 2006:31).

#### **Research project**

The research project is carried out in the context of the DIFUSE project, a research consortium of seven European universities. Inspired by DIFUSE, transnational cooperation on knowledge transfer activities among universities, further on referred to as 'trans-university knowledge transfer', is a prominent subject throughout this research project. Chapter 2 introduces the conceptual framework underlying the research project (see Figure 0.1). It is both developed to understand the research field, as well as to position the research activities carried out within the scope of this study. In brief, the thesis consists roughly of two parts: (1) the development and evaluation of the conceptual framework and (2) the exploration of possibilities for trans-university knowledge transfer.

Research data is gathered through exploratory cases at four European universities and a questionnaire.



Figure 0.1 Conceptual framework and content focus Chapter 3 and Chapter 4

#### Exploring trans-university knowledge transfer

Chapter 3 focuses on the various knowledge transfer (KT) activities carried out by universities (see Figure 0.1). In order to study what kind of KT activities this KT task encompasses, the ten most mentioned KT activities and mechanisms, based on a literature study, are selected. The

first section of Chapter 3 explores which of these KT activities are carried out by universities. Therefore, the following research question is formulated:

#### 1. What kind of knowledge transfer activities do universities carry out?

Questionnaire results indicate that the universities do not carry out each KT activity provided and universities choose different approaches to executing the various KT activities. The three most important KT activities are 'patents and licensing' (protection of intellectual property), 'spin-off and enterprise creation' (commercializing public research knowledge through the establishment of new ventures) and 'university-industry networks' (two-way interaction between university and industry in collaborative networks).

The second section of Chapter 3 addresses the (possibilities for) university cooperation on KT activities. In Chapter 2, cooperation on KT activities has been translated into a scale of 'increasing cooperation and integration'. This scale consists of 7 points, starting with 'no cooperation with other universities to transfer knowledge and/or technology' on the left, up to 'structural cooperation on more than one project with more than one university in another region' on the right side of the scale. With the scale the following research question is addressed:

# 2. Do universities want to establish cooperation on knowledge transfer activities with universities in other European regions?

Questionnaire respondents have been asked to assess the extent of cooperation and integration on their KT activities for the current situation and the desired extent of integration they wish to be at in the future (the year 2020). Results show that more than half of the respondents do pursue cooperation with other universities on KT activities and that they do want to increase cooperation on KT activities. However, on average cooperation on project basis is preferred; structural cooperation on KT activities appears not to be the ambition of universities.

# The institutional organization of knowledge transfer and its implications

Chapter 4 addresses the institutional organisation of the knowledge transfer task and the university strategy towards KT (see Figure 0.1). The institutional organisation of KT encompasses (1) the focus towards the KT task (or leading motive to perform the KT activities), which is directly linked to the university strategy towards KT; (2) the structure of the knowledge transfer office (KTO), i.e. the way universities have embedded and organize their KT activities; and (3) the KT activities itself.

Subsequently, three different organisation types or KTO structures are distinguished: (1) a centralized office, inside the university; (2) KT activities decentralized, inside the university; and (3) a centralized office, outside the university. Four exploratory cases of European

universities with distinctly organised KTOs form the basis for analysing the institutional organisation of knowledge transfer. Two of these universities have a centralized office inside the university, one university has a centralized office outside the university and the fourth university has its KT activities dispersed throughout the organisation. Hereupon, the first section of this chapter advances the following central research question:

#### 1. How do universities organise the knowledge transfer task?

Next to the different KTO structures, the four universities appear to have different strategies towards knowledge transfer and as a result they have diverse motives to perform the KT activities. Furthermore they carry out different KT activities and bring out various interpretations of these KT activities.

The second section addresses the influence of the KTO structure on the kind of cooperation that universities want to establish on KT activities with other universities in another region. Accordingly, the second research question reads:

# 2. Does the way universities have embedded the knowledge transfer activities influence the kind of cooperation that universities want to establish on KT activities with other universities in other European regions?

Again, the scale of 'increasing cooperation and integration' is used. Questionnaire results suggest that the current extent of integration varies among the three organisation types, whereas the desired future extent of integration shows no remarkable differences. Nevertheless, additional data is necessary to draw reliable conclusions.

#### **Finishing conclusions and recommendations**

Chapter 3 and 4 demonstrate that universities carry out various kinds of KT activities and that they evince diverse interpretations of these KT activities. Moreover, the institutional organisation of KT has several characteristics; in addition to the variation in KT activities, universities choose different KTO structures, depending on the university's leading motive to carry out KT activities and its relation to the strategy towards KT.

Trans-university knowledge transfer is approached from two perspectives. Chapter 3 describes the possibilities for cooperation on the provided KT activities. It shows that the current and desired extent of cooperation vary among the KT activities. Furthermore, it demonstrates that structural cooperation on KT activities is not pursued by many respondents. Chapter 4 introduces different KTO structures and within the current sample group no significant influence of the KTO structure on trans-university knowledge transfer can be observed.

Although several possibilities for further research are indicated, the present study reveals two major directions: (1) given the variation among the KT activities, it is, from cooperation

perspective, argued that focusing on individual KT activities offers the best research opportunities; and (2) in order to explain the different approaches among universities to the KT task, it is advised to study and compare university strategies towards knowledge transfer, keeping (local) contextual factors in mind.

### **Thesis contents**

Summary	3
1 Introduction	9
2 Research project	. 11
2.1 Overview research context	. 11
2.2 Conceptual framework	. 12
2.3 Cooperation on KT activities – trans-university knowledge transfer	. 15
2.4 Research questions	. 16
2.5 Research design	. 18
3 Exploring trans-university knowledge transfer	. 21
3.1 Introduction	. 21
3.2 New university roles in the knowledge society	. 22
3.3 Method	. 26
3.4 Results	. 27
3.5 Conclusions and discussion	. 30
4 The institutional organisation of knowledge transfer activities and its implications	. 35
4.1 Introduction	. 35
4.2 The institutional organisation of knowledge transfer	. 36
4.3 Exploratory cases at four universities	. 39
4.4 University cooperation on knowledge transfer activities	. 44
4.5 Conclusions and discussion	. 45
5 Finishing conclusions and recommendations	. 49
5.1 Retrospective	. 49
5.2 Conceptual meditations	. 50
5.3 Further research	. 51
References	. 55
List of annexes	. 59
Annex A Knowledge transfer terminology	61
Annex B Online questionnaire (screenshots)	. 65
Annex C Interview protocol exploratory cases	. 73
Annex D.1 Sources of information for exploratory cases	. 74
Annex D.2 Case report University of Twente	. 75



### **1** Introduction

This graduation thesis is about 'knowledge transfer', the 'third' university task next to research and education. 'Knowledge transfer' is described as:

"the transfer of know-how, expertise, skills and knowledge from one party to another leading to innovative, profitable or economic improvements for government, organisations and individuals in the private and public sectors and in the wider community" (ProTon, 2006) for mutual benefit (PhilipsKPA, 2006:31).

A brief overview of the prevalent knowledge transfer terminology and the motivation for choosing this particular definition can be found in Annex A.

The research project is carried out in the context of the European research project DIFUSE. Seven European universities, including the University of Twente, participate in the project that runs from July 2006 until June 2008. The DIFUSE objectives are illuminated below.

#### DIFUSE – Driving innovation From Universities into Scientific Enterprises

DIFUSE aims to develop a model for close (integrated) trans-national cooperation between university knowledge transfer support functions set up to facilitate industrial and commercial exploitation of university research results.

The specific goal of the project is to explore new ways for the joint exploitation of university knowledge in targeted domains using, best practice and individual experiences from members already engaged in an established pan-European university network, the European Consortium of Innovative Universities (ECIU), and to use this to develop models and pilot actions to show how a group of universities might share resources to make exploitation of research results and transfer to the private sector more effective at a European level.

If organisational integration of technology transfer (TT) services by this consortium of universities can be achieved, it will be the first of its kind in Europe and possibly worldwide. In this way DIFUSE could help lay the foundations for actions to be supported at a European level to provide more effective technology transfer from universities.

See for more information: www.difuse-project.org

Inspired by DIFUSE, transnational cooperation on knowledge transfer activities among universities, further on referred to as 'trans-university knowledge transfer', is a prominent subject throughout this research project. The thesis consists roughly of two parts: (1) the development and evaluation of the conceptual framework presented in Chapter 2 and (2) the exploration of possibilities for trans-university knowledge transfer.

The research project and process are described in Chapter 2. An overview of the research context is sketched and thereupon the conceptual framework underlying this study is introduced. Subsequently the research questions are presented. These are discussed in Chapter 3 and Chapter 4. Furthermore, the research design and the various data sources are explained.

Chapter 3 (Exploring trans-university knowledge transfer) discusses the questionnaire results on knowledge transfer activities and possibilities for university cooperation. Chapter 4 (The institutional organisation of KT and its implications) discusses the organisation of the knowledge transfer task within the university system and the influence of the structure of the knowledge transfer office (KTO) on the possibilities for trans-university knowledge transfer. The finishing chapter aims at combining the research findings described in Chapter 3 and Chapter 4 and intends to connect these to the conceptual framework presented earlier. Consequently, a discussion of the conceptual framework follows and opportunities for further research are provided. Each chapter is written in such a way that it can be read independently. However, a slight disadvantage of this choice is the occurrence of some content overlap throughout the various chapters.

In addition, five annexes are enclosed. Annex A provides an overview of prevalent knowledge transfer terminology. The online questionnaire, mainly discussed in Chapter 3, is enclosed as Annex B. Annex C contains the interview protocol for the exploratory cases discussed in Chapter 4. Annex D.1 provides an overview of the sources of information for the exploratory cases. Annex D.2 contains the complete case study report of the University of Twente. This report, written as deliverable for the DIFUSE project, describes the vision of the University of Twente towards knowledge transfer. This report is jointly written with Dr. Peter van der Sijde.

Recapitulating, this thesis can be read in multiple ways. Readers primarily interested in an overview of the research field, the (development of the) conceptual framework, the main research findings and opportunities for further research, are advised to read Chapter 2 (Research project) and Chapter 5 (Finishing conclusions and recommendations). Readers interested in the detailed analysis of the various knowledge transfer activities and mechanisms, including the questionnaire results, are invited to read Chapter 3. The institutional organization of knowledge transfer, including the exploratory cases, is thoroughly addressed in Chapter 4. A complete list of references can be found on page 55.

### 2 Research project

#### 2.1 Overview research context

This study is carried out in the context of DIFUSE (see the Introduction). In order to provide a concise overview of the research context, some relevant literature will be presented below. The triple helix of university, industry and government relations (Etzkowitz and Leydesdorff, 2000) and the Innovation U. model (Tornatzky *et al.*, 2002) in particular are addressed, while these form the foundations for the conceptual framework underlying this research project. Please note that this literature overview can not be considered as a complete anthology, but rather as a brief introduction. Chapter 3, Chapter 4 and the conclusions chapter will provide a broader glance at the research area in general.

#### Triple Helix : University-industry-government relations

The Triple Helix thesis states that the university can play an enhanced role in innovation in increasingly knowledge-based societies Etzkowitz and Leydesdorff (2000). The interaction between university, industry and government can be represented by various models. Etzkowitz and Leydesdorff (2000) illustrate the 'evolution of innovation systems' by three development stages (see Figure 2.1). The Triple Helix I configuration supposes that the national government controls industry and academia and defines their mutual relation. This form of autonomous political steering is known as 'etatism'. The second model represents the situation in which the three entities are separated and do not directly influence each other. Finally, Triple Helix III is generating a knowledge infrastructure in terms of overlapping institutional spheres, with each taking the role of the other and with hybrid organisations emerging at the interfaces; hence, the second characteristic of the Triple Helix, in addition to the enhanced significance of the university, is the recognition that institutions may perform multiple functions. The organizing principle of the Triple Helix is the expectation that the university will play a greater role in society as an entrepreneur. The entrepreneurial university retains the traditional academic roles of social reproduction and extension of certified knowledge, but places them in a broader context as part of its new role in promoting innovation (Etzkowitz and Leydesdorff, 2000).



*Figure 2.1 Triple Helix I – an etatistic model; Triple Helix II – A 'laissez faire' model; Triple Helix III – Tri-lateral organisations (Source: Etzkowitz and Leydesdorff, 2000)* 

#### Innovation U.: New university roles in a knowledge society

Tornatzky et al. (2002) present a conceptual framework to analyze as to how a series of selected American universities developed their participation and contribution to (regional) economic development. This Innovation U. framework (Figure 2.2) encompasses the boundary-spanning structures as pointed out by the Triple Helix relation. These boundary spanners intend to measure the extent that universities participate in e.g. strategy formulation, governance and program development activities of state and local economic development organizations. Concurrently, the boundary spanners measure the extent that universities create industry advisory boards and councils with the business community. This interaction is subsequently expressed in various partnering mechanisms and facilitators. These mechanisms are expected to contribute to economic development by producing 'locally captured (technological) outcomes'. These 'outcomes' can be subcategorized in the three university roles: education (smart people), research (new knowledge) and the transfer of knowledge to society (state-of-the-art knowledge, technology). The outcome 'entrepreneurial' can be considered as a result of the enterprising university-industry-government relationship: Röpke (1998) states that the university itself, as an organisation, can become entrepreneurial, the university members can become entrepreneurs and the university interaction with the region can follow entrepreneurial patterns.



Figure 2.2 Innovation U. – conceptual framework (Source: Tornatzky et al., 2002))

#### 2.2 Conceptual framework

The Triple Helix relationship (Etzkowitz and Leydesdorff, 2000) and Tornatzky's Innovation U. model (2002), form the basis for the development of the conceptual framework underlying this research project. Figure 2.3 illustrates the conceptual framework. Like Innovation U., the university forms the focal point of the university-industry-government interaction (Triple Helix). A minor disadvantage of this representation is that the government-industry interaction can not be included easily. However, within the context of university knowledge transfer, that

relationship is of less importance. The 'university system' itself encompasses three main parts. The first part concerns the university strategy towards knowledge transfer. As appointed by Gunasekara (2006), literature on the engaged university (e.g. Chatterton and Goddard, 2000) appears to downplay differences in the missions of relevant institutions. However, in Chapter 3 and Chapter 4 will be demonstrated that it is essential to include the university strategy in knowledge transfer research. The second part contains the institutional organisation of knowledge transfer. The institutional organisation of KT encompasses (1) the focus towards the KT task (or leading motive to perform the KT activities), which is directly linked to the university strategy towards KT; (2) the structure of the knowledge transfer office (KTO), i.e. the way universities have embedded and organize their KT activities; and (3) the KT activities itself. Thirdly, Tornatzky's 'partnering mechanisms and facilitators' are translated into the ten most mentioned 'KT activities and mechanisms'. These are thoroughly discussed below. The approach towards the KT activities and mechanisms is both influenced by the university strategy and the institutional organisation. The term 'KT activity' is used to describe an activity which results in a certain knowledge transfer outcome, whereas the term 'KT mechanism' is used to describe an activity that facilitates the KT activities.

The 'locally captured (technological) outcomes' are not addressed in Tornatzky's study. However, in this framework these have been replaced by 'knowledge transfer outcome', which encapsulates all possible outcomes of the 'knowledge transfer activities and mechanisms'. More detailed analysis of this 'knowledge transfer outcome' consequently can reveal to what extent the benefits of the KT activities are 'locally captured'. Finally, all KT efforts should contribute to economic development.

This conceptual framework will be used to position the research carried out for this graduation thesis project. The conclusions chapter provides an analysis of the conceptual framework.



*Figure 2.3 Conceptual framework - knowledge transfer in the context of university-industrygovernment interaction* 

#### Knowledge transfer activities and mechanisms

In order to study knowledge transfer, the ten most mentioned activities (see Figure 2.3) have been identified. These activities are depicted from relevant literature (e.g. ProTon, 2003; OECD, 2000) and are briefly described in Table 2.1. The description of activities can be considered arbitrary; e.g. in the ASTP survey report (ASTP, 2006:9) the 'patents and licensing' activity is split out in four sub-activities (i.e. assessing patentability of inventions, applying for patents, negotiating or arranging licenses, managing material transfer/ confidentiality agreements). However, for the purpose of this research project a broader description is chosen in order to get an overview of the *type* of activities that are carried out by a university or its knowledge transfer office (KTO). Therefore, the list includes various 'categories' of activities. 'Patents and licensing', 'spin-off and enterprise creation' and 'university-industry networks' are considered to be the core knowledge transfer activities. 'National subsidies', 'regional subsidies' and 'grants' can be regarded as facilitators or funding for the core activities. 'Continuous professional development (CPD)' and 'alumni affairs' are separate activities which are sometimes assigned to KTOs.

#### Table 2.1 'Shortlist' of the 10 most mentioned knowledge transfer activities

- 1. Patents and licensing concerns the exploitation of intellectual property (IP). Through patents an institute for higher education can protect its intellectual property and if a patent is granted it can be commercialised through sales of the patent or a license (ProTon, 2003).
- Spin-off and enterprise creation A spin-off company is a "new company, whose formation was dependent on the use of intellectual property that was created, and/or developed at a Public Research Organisation" (ProTon, 2003); spin-off is the entrepreneurial route to commercializing knowledge of public research (OECD, 2000), both IP and non-IP based.
- 3. University-industry networks describes the dynamic "two-way interaction between 'the actor' university and 'the actor' industry" in collaborative networks (Groen and Van der Sijde, 2002); cf. the 'partnership principle' (Chatterton and Goddard, 2000).
- 4. International cooperation University cooperation with public and private organisations beyond national borders.
- 5. European affairs Management, acquisition and monitoring of European projects and European funding.
- 6. Continuous professional development (CPD) comprises the post-initial education programmes aiming at improving the capability and realizing the full potential of professionals at work.
- 7. Alumni affairs Management of alumni contacts.
- 8. National subsidies National government programs and policies intended to encourage certain types of research programs and other specified university activities.
- 9. Regional subsidies Regional government programs and policies intended to encourage certain types of research programs and other specified university activities.
- 10. Grants Grants are provided by the government or other non-profit organisations to encourage (individual) development or growth in a particular area.

# 2.3 Cooperation on KT activities – trans-university knowledge transfer

This research project studies possibilities for university cooperation on knowledge transfer activities, further on referred to as 'trans-university knowledge transfer'. After having identified what activities are carried out by universities, the extent of university cooperation on these activities can be measured. The kind of cooperation on knowledge transfer activities is translated into a scale of 'increasing mutual obligations' or 'increasing cooperation and integration'. This is illustrated in Figure 2.4. Two main stages of cooperation are distinguished: the 'traditional knowledge transfer organisation (KTO)' and the 'virtual KTO'. As in-between examples, the stages 'exchange of knowledge and experiences' and 'ad hoc cooperation' are added. In a 'traditional' knowledge transfer organisation, a university makes no attempt to cooperate with other universities on knowledge transfer activities. In this situation the university only focuses on its own region and there is no question of trans-university knowledge transfer. Subsequently, universities start to 'exchange' knowledge and experience on knowledge transfer processes and activities. These exchange processes can e.g. take place in (research) projects (like ProTon or DIFUSE). However, the knowledge transfer activities are carried out by the university itself within its own region and this cooperation can therefore not be considered as trans-university knowledge transfer. The next step can be a knowledge transfer project in which staff and other resources from more than one university team up on an 'ad hoc basis'. Two or more universities cooperate on specific purpose, but do not continue the cooperation afterwards. Though incidental, this is a matter of trans-university knowledge transfer. The ultimate form of trans-university knowledge transfer is a structural cooperation on more than one project with more than one university in other European regions. This 'virtual knowledge transfer organisation' can e.g. cover the exploitation of a collective intellectual property portfolio or joint incubators for specific research areas. Conditions for 'structural cooperation' include, following Axelrod (1984), "the parties' perceiving they will be in contact with each other for a long time, their believing it is to their advantage to cooperate, and their recognizing they must reciprocate for any benefits received, employing a tit for tat strategy". Please note that an important distinction is made between the *exchange* of knowledge and experiences and actual cooperation.



Figure 2.4 Extent of integration and cooperation of KT activities

Hagedoorn (1996, 2002) observes that inter-firm R&D partnering, once dominated by joint ventures, nowadays is of a contractual nature for about 90% of the recently established partnerships. These contractual R&D partnerships enable companies to increase their strategic flexibility through short-term joint R&D projects with a variety of partners (Hagedoorn, 2002). In fact, he concludes that contractual R&D partnerships that regulate relatively small-scale collaboration in a flexible setting of multiple companies are major drivers of inter-firm networks. Besides, research undertaken in partnerships complements, rather than replaces, R&D by collaborating firms (Hanel and St-Pierre, 2006). Macdonald and Piekkari (2005) point out that many studies conclude that success in inter-organisational collaboration is dependent on the relationships between individuals of these organisations. In this perspective, it is interesting to mention the upward trend among European scientists to collaborate with each other, and, to a lesser extent, with American scientists (Archibugi and Coco, 2004). These are interesting remarks when considering cooperation among universities on knowledge transfer activities. Based on the findings mentioned above it might be expected that universities, like commercial firms, prefer short term (or 'ad hoc') cooperation above structural cooperation. In Chapter 3 and 4 the research results for trans-university knowledge transfer are discussed.

#### 2.4 Research questions

Now having set out the research context, the topics to be studied in this research project can be introduced. The research topics are best illustrated by the conceptual framework explained in the previous section. Figure 2.5 shows the focus of both Chapter 3 and Chapter 4 within the conceptual framework. In brief, the rationale for formulating the central research questions (i.e. the problem definition) will be presented here. The actual discussion can be found in Chapter 3 and Chapter 4.



Figure 2.5 Content focus Chapter 3 and Chapter 4

#### Chapter 3. Exploring trans-university knowledge transfer

The conceptual framework contains a selection of the ten most mentioned knowledge transfer activities and mechanisms, based on a literature study. The first section of Chapter 3 explores which of these KT activities are carried out by universities. Therefore, the following research question is formulated:

#### 1. What kind of knowledge transfer activities do universities carry out?

The research question is divided into four sub-questions, first addressing these issues:

1a. What KT activities do universities carry out?

#### 1b. What KT activities are the most important?

Additional information on the characteristics of the KT activities is obtained by raising the following issues:

1c. What is the target group for the KT activities?

# 1d. What is the geographical focus of the KT activities (i.e. regional, national, international)?

The second section of Chapter 3 addresses the (possibilities for) cooperation on KT activities, by raising the following research question:

### 2. Do universities want to establish cooperation on knowledge transfer activities with universities in other European regions?

In the previous paragraph cooperation on KT activities is formulated as a scale of 'increasing cooperation and integration'. By using that scale the first two sub-questions are addressed. These sub-questions both indicate if universities want to establish cooperation on KT activities, as well as to what extent cooperation is aspired. The third sub-question compares the results of question 2a. and 2b.:

2a. To what extent do universities cooperate on KT activities with other universities in other European regions *at this moment*?

2b. What kind of cooperation do universities want to establish on KT activities with universities in other European regions *in the future*?

2c. Do universities wish to increase the extent of cooperation on KT activities with universities in other European regions?

# Chapter 4. The institutional organization of knowledge transfer and its implications

The institutional organisation of KT encompasses (1) the focus towards the KT task (or leading motive to perform the KT activities), which is directly linked to the university strategy towards KT; (2) the structure of the knowledge transfer office (KTO), i.e. the way universities have embedded and organize their KT activities; and (3) the KT activities itself (cf. paragraph 2.2). The first section of Chapter 4 explores the institutional organisation of knowledge transfer and

the university strategy towards knowledge transfer, by advancing the following research question:

#### 1. How do universities organise the knowledge transfer task?

The research question is subsequently divided into the various facets of the institutional organisation. Hence, the sub-questions read:

1a. How are KTOs embedded in the university system?

1b. What is the university strategy towards knowledge transfer?

1c. What is the university's leading motive to perform KT activities?

**1d. What KT activities do universities carry out and what are the most important?** [similar to sub-questions 1a and 1b in Chapter 3]

The second section focuses on the implications of the various organisation types or KTO structures for (transnational) university cooperation on KT activities. The second research question reads:

2. Does the way universities have embedded the knowledge transfer activities influence the kind of cooperation that universities want to establish on KT activities with other universities in other European regions?

Again, the 'increasing cooperation and integration'-scale is used to measure the influence of the KTO structure on cooperation, by addressing the following questions: [these are similar to subquestions 2a and 2b in Chapter 3]

2a. To what extent do universities cooperate on KT activities with other universities in other European regions *at this moment*?

2b. What kind of cooperation do universities want to establish on KT activities with universities in other European regions *in the future*?

#### 2.5 Research design

Figure 2.6 presents an overview of the research process. Please note that the design of the research process is based on the empirical cycle (cf. De Groot, 1961). The process is globally divided into four steps. The first step forms the abstract conceptualization of the subject, resulting in the theoretical frameworks thoroughly discussed in Chapter 3, Chapter 4 and the previous section. The second research step is conducting exploratory cases in order to obtain qualitative information on the university approach towards knowledge transfer. The findings are discussed in Chapter 4. These exploratory cases delivered a lot of relevant information which informed the design of a questionnaire. The third step is the circulation of the online questionnaire. The questionnaire itself is enclosed as Annex B. Its results are mainly discussed in Chapter 3 and to a lesser extent in Chapter 4 and Annex A.



Figure 2.6 Research process

#### Data sources

An important way to strengthen a study design is through triangulation (Patton, 1990). Data triangulation in this study is achieved by using the following four data sources:

#### 1. Literature

Relevant literature on technology transfer, knowledge transfer, Triple Helix, regional development, knowledge transfer activities, knowledge transfer offices and cooperation formed the basis for the theoretical framework. A complete list references can be found on page 55.

#### 2. Document study

The deliverables of DIFUSE partners have been used to broaden the results of the exploratory cases and to compare findings with the other project participants. The DIFUSE deliverables are not publicly available, but will be published as EU book in the near future.

#### 3. Exploratory cases

The exploratory cases consist of interviews with relevant KT stakeholders on different organisational levels. Qualitative methods permit the researcher to study selected issues in depth and detail (Patton, 1990). Exploratory cases are useful where one needs to understand some particular problem or unique situation in great depth, when one can identify cases rich in information, rich in the sense that a great deal can be learned from a few exemplars of the phenomenon in question (Patton, 1990). Hence, while exploring a specific topic, exploratory cases form a good approach for this study.

The exploratory cases took place at four European universities, due to privacy reasons referred to as University # 1, University # 2, University # 3 and University # 4; all participate in the DIFUSE project. Actually, University #4 is the University of Twente. Selection is based upon their different organisational types (see Chapter 4). The results are discussed in Chapter 4. The interview protocol can be found in Annex C and a complete overview of sources for the exploratory cases can be found in Annex D.

#### 4. Online questionnaire

The online questionnaire is designed in order to collect more quantitative data on specific topics. The questionnaire is sent out to relevant KT stakeholders. The questionnaire is enclosed as Annex B. Its results are mainly discussed in Chapter 3 and to a lesser extent in Chapter 4 and Annex A.

### 3 Exploring trans-university knowledge transfer

#### Abstract

Transnational research cooperation is the central aspect of European research funding and dissemination and transfer of knowledge is a important added value of European research activities. Next to education and research, transferring university knowledge to society is seen as a key factor in regional development. This paper addresses the contrast between the European transnational ambition and university's regional role from the perspective of knowledge transfer (KT) activities; it studies the kind of cooperation that universities want to establish on knowledge transfer activities with universities in other European regions. First several KT activities have been distinguished. The most important KT activities are 'patents and licensing', 'spin-off and enterprise creation' and 'university-industry networks'. Subsequently, the current and desired extent of cooperation on KT activities are measured through a questionnaire. Results show that more than half of the respondents pursue project-based or 'ad hoc' cooperation at most. Structural cooperation on KT activities appears not to be the ambition of universities. Hence, the effect of the European funding strategy with respect to knowledge transfer activities can be doubted. However, in view of the conceptual framework presented in Chapter 2, additional research is recommended to study the influence of the university's strategy towards KT and organisation characteristics on possibilities for trans-university knowledge transfer.

Key words: Knowledge transfer, transnational, universities, cooperation, knowledge transfer office, economic development, triple helix

#### 3.1 Introduction

Transnational research cooperation is the key aspect of the seventh European research framework programme. Like the previous framework programmes it relies heavily on the Lisbon Agenda of making Europe "the most competitive knowledge based economy in the world". For the coming six years the European Union will allocate over 30 billion Euros to specific research programmes on 'cooperation'. Transnational cooperation will be supported in a number of thematic areas corresponding to major fields of knowledge and technology, "where the highest quality research must be supported and strengthened to address Europe's social, economic, environmental and industrial challenges" (EU, 2006a).

Cooperation on research and education activities is rather common and well addressed in literature. However, although dissemination and transfer of knowledge is regarded as a key added value of European research actions and "measures will be taken to increase the use of results by industry, policy makers and society" (EU, 2006a), transnational cooperation on knowledge transfer activities is hardly discussed in literature. This paper aims to contribute to this research topic. University knowledge transfer activities are usually described as the process of transferring university knowledge to society (cf. Lambert Review (2003:31); EIM (2003:22);

SHEFC (2003)). This knowledge transfer process is generally referred to as the 'third leg' of university activities, next to research and education. In the present paper 'knowledge transfer' is used to label the "third mission activities, encompassing the transfer of know-how, expertise, skills and knowledge from one party to another leading to innovative, profitable or economic improvements for government, organisations and individuals in the private and public sectors and in the wider community" (ProTon, 2006) for mutual benefit (PhilipsKPA, 2006:31). The first section in this paper addresses what 'university activities' encompass the knowledge transfer task, by advancing the following research question:

#### 1. What kind of knowledge transfer activities do universities carry out?

Transnational cooperation on knowledge transfer activities among universities, further on referred to as 'trans-university knowledge transfer', might realize more effective knowledge exploitation, which should be beneficial for all parties involved. A recent EU survey on transnational research cooperation on knowledge transfer between public research organisations and industry confirms that exploitation of publicly funded research results is deemed to be an important driver for European competitiveness (EU, 2006b). However, more than two-third of the EU survey respondents believed that cooperation between a public research organisation and industrial partner in the same country is difficult; the alignment of interests is considered to be a prominent hurdle. International cooperation seems to be more difficult still, due to the complicated process of finding proper partners and hampering cultural and legal differences (EU, 2006b).

These experienced difficulties might as well hold for trans-university knowledge transfer. Furthermore, knowledge transfer in particular is considered to form the basis for the university's role as key factor in regional development (Tornatzky et al., 2002; Etzkowitz and Klofsten, 2005). Given this regional role, university's knowledge transfer activities are perhaps not appropriate for serving 'the wider community'. Is the European ambition to create structural transnational (research) cooperation among universities in contrast to these meditations? The second section of this paper explores this chasm by advancing the following research question:

2. Do universities want to establish cooperation on knowledge transfer activities with universities in other European regions?

#### 3.2 New university roles in the knowledge society

This section presents a concise overview of the way knowledge transfer is treated in literature. To some extent is drawn on a conceptual framework proposed by Gunasekara (2006). Knowledge transfer can be approached from various perspectives. From a public policy point of view, these industry-science relations are rather well studied (e.g. EU, 2001; OECD, 2000; EU, 2003). 'Best practices' and case studies of successful universities are amply available (e.g. Schutte and Van der Sijde (2000, 2002), Van der Sijde and Ridder (2002), DIFUSE book (forthcoming)). Gunasekara (2006) distinguishes two bodies of literature for analyzing the third role of universities from university perspective and for explaining variation in the roles that universities perform in different regional settings. These bodies of literature point out two types of roles, which Gunasekara labels generative and developmental, respectively. The duality spanning generative literature is captured by the Triple Helix of university-industry-government relations (Etzkowitz and Leydesdorff, 2000) and the developmental categories are based on the literature on the engaged university and its response to regional needs (Chatterton and Goddard, 2000).

Etzkowitz (2003) describes the development of increasing mutual interdependence of government, industry and university as a Triple Helix relation. The Triple Helix thesis states that the university can play an enhanced role in innovation in increasingly knowledge-based societies (Etzkowitz and Leydesdorff, 2000). The interaction between university, industry and government is conceptualized in terms of overlapping institutional spheres, with each actor taking the role of the other and with hybrid organisations emerging at the interfaces. A key insight offered by this representation is the mutual interdependence of the actors among the three helices. Therefore, the second characteristic of the Triple Helix model, in addition to the enhanced significance of the university, is the recognition that institutions may perform multiple functions. The organizing principle of the Triple Helix is the expectation that the university will play a greater role in society as an entrepreneur. The entrepreneurial university (see e.g. Davies (1987); Clark (1998); Röpke (1998)) retains the traditional academic roles of social reproduction and extension of certified knowledge, but places them in a broader context as part of its new role in promoting innovation (Etzkowitz and Leydesdorff, 2000).

The third role of universities is differently approached by Chatterton and Goddard (2000) who have a more developmental view and focus on the response of universities to regional needs. They emphasise adaptive responses by universities, which embed a stronger regional focus in their teaching and research mission (Genusekara, 2006). Chatterton and Goddard recognise that perhaps more than the other roles, it is the third role of community service which embeds higher education institutions in the region. They see community service as building social networks that link key actors in the local community and feed intelligence into those networks ('partnership principle'), students as volunteer workers ('education for citizenship') and providing community access to university facilities.

According to Gunasekara (2006:111), the key difference between the two bodies of literature is the relative importance of academic entrepreneurialism, as distinguished from adaptive behaviour in an indirect sense. However, it might be argued that the generative and developmental approach are actually complementary, while the Triple Helix describes the 'input'-side of knowledge transfer and the engaged university highlights the 'output'-side of the same process.

It is in the authors' opinion that the distinctions made between the generative aspects of the Triple Helix and the developmental aspects of the engaged university are reasonably well captured in the Innovation U. model. Tornatzky *et al.* (2002) present a conceptual framework to

analyze as to how a series of selected American universities developed their participation and contribution to (regional) economic development. This framework encompasses the boundary-spanning structures as pointed out by the Triple Helix relation. These boundary spanners intend to measure the extent that universities participate in e.g. strategy formulation, governance and program development activities of state and local economic development organizations. Concurrently, the boundary spanners measure the extent that universities create industry advisory boards and councils with the business community. This interaction is expressed in various partnering mechanisms and facilitators. These mechanisms deliver 'locally captured (technological) outcomes' which consequently are expected to contribute to (regional) economic development.

Gunasekara applied his theoretical framework to three non core-metropolitan universities in Australia. He concludes his article by positing that "it may be argued that the most important insight provided by the study is the array of pathways through which universities are making a difference in their proximate localities. Whether this is driven by self-capitalisation of knowledge or shared capitalisation arrangements or no direct commercial spin off at all, is a second order issue" (Gunasekara, 2006:111). This is indeed an important insight when theorizing university's knowledge transfer activities.

However, the present article studies possibilities for university cooperation on knowledge transfer activities. From cooperation perspective, the specific way universities make a difference in the proximate localities is a first order issue. Darr and Kurtzberg (2000) demonstrate that transfer of knowledge is facilitated by strategic similarity. Hence, the kind of knowledge transfer activities that a university carries out could influence the possibilities for cooperation.

Chapter 2 contains an overview of the ten most mentioned KT activities, briefly described in Table 3.1. In order to test the validity of this categorization, the following sub-questions will be addressed in this chapter:

### 1a. What KT activities do universities carry out?1b. What KT activities are the most important?

In order to obtain some additional information on the characteristics of the most important KT activities, the following issues will be raised:

1c. What is the target group of the KT activities?1d. What is the geographical focus of the KT activities (i.e. regional, national, international)?

#### Table 3.1 'Shortlist' of the 10 most mentioned knowledge transfer activities

- 1. Patents and licensing concerns the exploitation of intellectual property (IP). Through patents an institute for higher education can protect its intellectual property and if a patent is granted it can be commercialised through sales of the patent or a license (ProTon, 2003).
- Spin-off and enterprise creation A spin-off company is a "new company, whose formation was dependent on the use of intellectual property that was created, and/or developed at a Public Research Organisation" (ProTon, 2003); spin-off is the entrepreneurial route to commercializing knowledge of public research (OECD, 2000), both IP and non-IP based.
- 3. University-industry networks describes the dynamic "two-way interaction between 'the actor' university and 'the actor' industry" in collaborative networks (Groen and Van der Sijde, 2002); cf. the 'partnership principle' (Chatterton and Goddard, 2000).
- 4. International cooperation University cooperation with public and private organisations beyond national borders.
- 5. European affairs Management, acquisition and monitoring of European projects and European funding.
- 6. Continuous professional development (CPD) comprises the post-initial education programmes aiming at improving the capability and realizing the full potential of professionals at work.
- 7. Alumni affairs Management of alumni contacts.
- 8. National subsidies National government programs and policies intended to encourage certain types of research programs and other specified university activities.
- 9. Regional subsidies Regional government programs and policies intended to encourage certain types of research programs and other specified university activities.
- 10. Grants Grants are provided by the government or other non-profit organisations to encourage (individual) development or growth in a particular area.

After having identified what activities are carried out by universities, the extent of university cooperation on these activities can be measured through the 'extent of cooperation and integration'-scale. This scale (see Figure 3.1) is explained in Chapter 2.



Figure 3.1 Extent of integration and cooperation of KT activities

Hence, through the 'extent of integration'-scale, the following three sub-questions on transuniversity knowledge transfer will be addressed: 2a. To what extent do universities cooperate on KT activities with other universities in other European regions *at this moment*?

2b. What kind of cooperation do universities want to establish on KT activities with universities in other European regions *in the future*?

**2c.** Do universities wish to increase the extent of cooperation on KT activities with universities in other European regions?

In order to meet the European focus on 'transnational' cooperation, the cooperation should explicitly surpass regional collaboration. This is covered by adding 'with universities in other European regions' to these questions.

#### 3.3 Method

#### Participants and representativeness

The research questions have been applied in a questionnaire. Potential respondents were selected from our own contacts database and about 110 knowledge transfer professionals were personally asked to participate. The largest part of this group is employed at an (European) academic institution and is responsible for the academic 'third leg' of activities. Most respondents are employed as director of the knowledge transfer office (KTO), professor or business development manager. Figure 3.2 provides both the profession and the country of establishment of the questionnaire respondents. It might be argued that the job description 'knowledge transfer practitioner' covers the activities of a 'technology transfer manager', 'business development manager' or 'project manager'. However, while respondents filled out their profession themselves, the various titles are provided. Northern European countries (notably UK and Finland) are somewhat overrepresented in relation to Southern European countries and new member states. This can be explained by the fact that Northern European universities, as for knowledge transfer activities, are to some extent ahead of the other European countries. Eventually 54 respondents completed the questionnaire, which is a response rate of 49 percent.



Figure 3.2 Function and origin of respondents (N=54)

#### Data gathering instruments

The questionnaire was posted online. This approach has been chosen as it is low cost, very accessible to participants, and quick (Mann and Stewart, 2000). The questionnaire has been accessible for about two months, from 22 November 2006 until 30 January 2007. Respondents were asked to provide some general information, to indicate which of the ten KT activities their institution carries out, the target group of the activities, the geographical focus of the activities and their opinion on both the current and desired extent of integration and cooperation of KT activities. The responses on the 'extent of cooperation and integration'-scale are treated as ordinal data. The questionnaire provides information on the KT activities and offers both an indication of the current kind of cooperation among universities and the desired kind of cooperation. In order to quantify the time horizon for the desired situation, respondents were asked to indicate their situation for the year 2020. The questionnaire contained more questions concerning the institutional organisation of the knowledge transfer office; these issues are addressed in Chapter 4. In addition, respondents were asked to indicate which 'label' they prefer for knowledge transfer. These results are enclosed in Annex A, together with a discussion on the terminology.

#### 3.4 Results

A summary of the questionnaire results is shown in Table 3.2 (subsequent page). The table provides the number of respondents indicating that they carry out a certain KT activity, the percentage of the total number of respondents, the number of valid responses (i.e. the number of respondents that filled out all the questions), the average position on the scale in the current situation ('Now'), the average position on the scale for the future situation ('2020') and the average desired increase (i.e. the current situation ('Now') compared to the desired future situation ('2020')), expressed in numbers of steps on the scale. The table e.g. shows that 85% of the total number of respondents indicate that they manage 'university-industry networks' and only 13% handle 'alumni affairs'. The largest average increase is noted for the KT activity 'patents and licensing'. The respondents provided a ranking of the relative importance of the activities.

#### Type of KT activities and the three most important activities

As Table 3.2 illustrates, the respondents do not carry out all KT activities provided. The core KT activities, 'patents and licensing' (78%), 'spin-off and enterprise creation' (83%) and 'university-industry interaction' (85%), are considered to be the most important KT activities and are carried out by the majority. 'International cooperation' is marked by two-third of the respondents. 'Continuous professional development' is carried out by 59% of the respondents and is thus a common activity for knowledge transfer offices. 'Grants', 'European affairs', 'national subsidies' and 'regional subsidies' activities are carried out by more than 40% of the respondents. Only 13% of the respondents is in charge of 'alumni affairs'. More detailed analysis will focus on the three most important KT activities: 'patents and licensing', 'spin-off and enterprise creation' and 'university-industry networks'.

KT activity	Rank	Number of respondents	% of total	Valid responses	n/a	Average 'Now'	Average '2020'	Average increase in steps (Now → 2020)
Total number of respondents		54	100	-	-	-	-	-
University-industry networks	1	46	85	44	2	4,6	5,6	1,0 *
Spin-off and enterprise creation	2	45	83	44	1	3,8	5,3	1,5 *
Patents and licensing	3	42	78	40	2	3,4	5,3	1,9 *
International cooperation	4	36	67	32	4	4,6	5,6	1,0 *
CPD	5	32	59	28	4	4,3	5,4	1,1 *
Grants	6	25	46	22	3	3,4	4,5	1,1 *
European affairs	6	25	46	24	1	3,9	5,0	1,1 *
National subsidies	6	23	43	21	2	3,2	4,3	1,1 *
Regional subsidies	9	22	41	21	1	3,0	4,3	1,3 *
Alumni affairs	10	7	13	6	1	2,5	4,0	1,5

Table 3.2 Number of respondents and average positions on the scale (Now, 2020 and average increase) for the KT activities

\* The Wilcoxon matched pairs signed ranks test: increase is significant with p < 0.01

#### Target group and geographical focus

Figure 3.3 shows both the geographical focus and target groups for the three KT activities. 'Spin-off and enterprise creation' is mainly a regional activity, whereas 'patents and licensing' and 'university-industry networks' seem to be activities with a more national focus. The target groups for 'spin-off and enterprise creation' are both researchers and students. 'Patents and licensing' is an activity concentrated on researchers and 'university-industry networks' is an activity aiming at all target groups in general and researchers and SMEs in particular. SMEs are generally considered to be a more important target group than multinational companies (MNCs).



Figure 3.3 The focus of the three KT activities

#### Current and desired extent of cooperation and integration

The averages (see Table 3.2) for the desired future situation are fairly equal for all activities. 'Grants', 'national subsidies' and 'regional subsidies' on average give the least occasion to trans-university knowledge transfer. 'University-industry networks', 'international cooperation' and 'CPD' show the highest average in the scale, which makes sense since these activities are relatively better fit for cooperation; however, apparently all activities are generally best suitable for 'ad hoc' cooperation. The average current situations seem to vary more among the KT activities. Again, 'university-industry networks', 'international cooperation' and 'CPD' present the highest extent of integration. 'Patents and licensing', 'spin-off and enterprise creation', 'grants', 'national subsidies' and 'regional subsidies' are slightly lagging behind. However, this again makes sense: the latter three activities are not really activities suitable for cooperation and for the first two activities trans-university cooperation is difficult to establish.

However, the averages shown in Table 3.2 do not give more than an indication of the prevalent opinions on the current and desired future extent of integration. Therefore the individual responses are evaluated; see Figure 3.4. For the current situation, three minor peaks can be distinguished. More than 30% of the respondents for 'patents and licensing' indicate not to cooperate with other universities at all. For 'university-industry networks' the majority points out to exchange knowledge and experiences and a substantial part of the respondents report to be engaged in structural cooperation. 'Spin-off and enterprise creation' is the most apportioned on the scale, with a small peak for 'ad hoc cooperation'. More than 40% of the respondents (for 'patents and licensing' even 50%) indicate to pursue a 'virtual KTO', hence pursue structural cooperation on more than one project with more than one university in another region. However, the results provide no details on how this structural cooperation would look like. There is e.g. no information available if these respondents are in favour of establishing a European patent office. On the other hand, this means that almost 60% of the respondents does not wish to establish a 'virtual KTO' and at most aspire to engage in cooperation on project or 'ad hoc' basis.



*Figure 3.4 Percentage of respondents by position on the scale ('Now' and '2020') for the three activities* 

#### Increase of cooperation and integration of KT activities

The results show that on average all respondents indicate that they want to increase cooperation for all activities provided. Respondents scaled their current situation ('Now') and the desired future situation ('2020') for the various activities; the Wilcoxon signed ranks test shows that these two answer sets differ significantly (p < 0.01) for all activities provided ('alumni affairs' was omitted due to the low number of responses). Hence, it can be concluded that universities

want to increase cooperation and integration of KT activities with other universities in other European regions.

However, a more detailed evaluation of the increase of cooperation shows that the observed significant average increase is relative. More than two-third of the respondents for 'university-industry networks' shift only one step or even maintain their current situation. The same holds for half of the 'spin-off and enterprise creation' respondents. In other words: these respondents are satisfied with their current situation and do not or only slightly wish to increase cooperation. For 'patents and licensing' approximately two-third of the respondents indicate to move up two steps at most. Of course, these numbers include the respondents indicating that they already engage in a 'virtual KTO' and thus cannot move up on the scale. However, this still implies that they are satisfied with their current situation; from cooperation perspective they apparently believe to have achieved the most cooperative situation possible. Figure 3.5 shows the number of steps respondents want to take and the cumulative number of steps. The 'number of steps' is the difference between the results on the scale for the future situation ('2020') and the current situation ('Now'); mathematically: 'number of steps' = '2020' - 'Now'.



Figure 3.5 Percentage of respondents taking x steps from Now to 2020

#### 3.5 Conclusions and discussion

The present paper studies what knowledge transfer activities are carried out by universities and subsequently addresses the kind of cooperation that universities want to establish on KT activities with universities in another European region.

#### Knowledge transfer activities

First, the ten most mentioned KT activities are investigated. The ranking of the activities is in line with the categorization made in the theoretical framework section. The core KT activities,

'patents and licensing', 'spin-off and enterprise creation' and 'university-industry networks', are indeed considered to be the most important KT activities.

Two-third of the respondents indicate to manage 'international cooperation', while only 46% handle 'European affairs'. Perhaps 'international cooperation' is considered as a more common activity than 'European affairs', which might be the label for specific project(management) activities. The noticeable response for 'grants', 'national subsidies' and 'regional subsidies', confirms the substantial share of fundraising activities within the spectrum of KT activities. Only 13% of the respondents is in charge of 'alumni affairs'. 'Continuous professional development (CPD)', which is traditionally regarded as a KT activity, is carried out by 59% of the respondents. The low response rate for 'alumni affairs' suggests that it might not be considered as a KT activity; it can be located in another university department, or perhaps only few universities handle alumni affairs.

The respondents do not carry out all provided KT activities. That is interesting, because it might be expected that all KTOs at least carry out 'patents and licensing', 'spin-off and enterprise creation' and/or 'university-industry networks'. However, Chapter 4 demonstrates that various KTO models exist. Some universities have a joint KTO in which e.g. 'university-industry networks' or 'spin-off and enterprise creation' activities are coordinated. In that case the individual universities e.g. manage their own 'patents and licensing' activities. Other universities have their KT activities decentrally hosted in separate research institutes or faculties, which makes that certain KT activities are absent on central level. Furthermore, it is important to note that, although discussing the same activities, institutions can choose different approaches towards KT activities. This is illustrated by the variation among the target groups and geographical focus for the KT activities. In general, students and researchers have the largest share in the target groups, which implies that knowledge transfer is primarily an internal task. SMEs are considered to be a more important target group than multinational companies (MNCs) for the KT activities provided. This might hint at the regional university role. On the other hand, SMEs outnumber MNCs by far, which naturally makes SMEs a more important target group.

The questionnaire respondents were offered the possibility to add other KT activities which were not included in the list of activities provided. Additional activities mentioned were 'public policy' (once), 'research support' (once), 'strategic consultancy for the University Board' (once), 'teaching and mentoring' (once), 'pre-entrepreneurial training for students' (once) and 'entrepreneurship and innovation training' (once). Given these responses, perhaps an activity like 'entrepreneurship training' or 'entrepreneurship development' (cf. Tornatzky *et al.*, 2002) should be added as a separate KT activity because of the possible contribution to new business development. However, basically it is considered to be an education activity.

#### Cooperation on knowledge transfer activities

The current and desired extent of integration and cooperation is measured through the questionnaire. The averages for both the current situation and the desired future situation vary

somewhat among the different activities. The questionnaire results show that universities *on average* significantly want to increase the extent of integration and cooperation for all the knowledge transfer activities provided. However, analysis of the relative increase on the scale (i.e. the increase from Now to 2020) shows a more modest trend. This modest trend confirms the observation that, on average, universities apparently are not in favour of establishing a 'virtual KTO', or structural cooperation on KT activities.

Hence, the kind of cooperation that universities want to establish on knowledge transfer activities with universities in another region can be characterized as cooperation on project or 'ad hoc' basis. This preference for short-term joint projects resembles the trend in interfirm research partnering (Hagedoorn, 1996, 2000). Given these results, the effectiveness of focusing on transnational cooperation on KT activities can be doubted; trans-university knowledge transfer may not be what should be aimed at. However, a more detailed study of the individual activities is recommended. For 'patents and licensing', this will possibly follow shortly, given the recent proposal to establish a European Charter for the management of intellectual property from public research institutions and universities (EU, 2007). 'University-industry networks', 'international cooperation' and 'CPD' appear to have the best cards, which makes sense given their cooperative nature. 'Spin-off and enterprise creation' seems slightly less promising, which is not very surprising while it particularly is a local activity. Nonetheless, trans-university cooperation on this activity is e.g. addressed in the Global Start research project (cf. Kirwan *et al.*, 2006).

#### Limitations

The extent of cooperation scale urged some arbitrary decisions which will be addressed briefly. One of the disputable issues is the descriptions used for the four stages of cooperation. Respondents currently participating in a 'virtual KTO', can still wish to expand cooperation with more universities or for more activities. These possibilities are not addressed and therefore leave perhaps too much room for individual interpretation. The same holds for the use of the 7point scale; a 4-point scale might have been better. Although the 'in-between values' (i.e. '2', '4' and '6') provide more detailed data, the meaning of these values can be considered as ambiguous. E.g. '6' can mean "more regular cooperation than 'ad hoc', but not structural" or "structural, but only with one university". For further research is tended to use a 4-point scale in order to avoid this confusion. Furthermore, the response group is not very large and some countries (e.g. UK and Finland) are overrepresented. Although this can be explained by the fact that these countries have their KT activities relatively more developed, a survey among a larger group is highly recommended. As mentioned in the introduction, the authors' own contacts database was used to gather respondents for sending the questionnaire. This can be considered as a 'convenience sample'. As a result, the sample population is not representative for European universities in general and the questionnaire respondents might be positively biased towards cooperation on knowledge transfer activities. Moreover, the respondents hold different positions in their institution, which will affect the interpretation of the questions provided. However, because of the specific nature of the knowledge transfer field, a random sample probably would
have resulted in a higher number of unusable results. It might even be argued that these respondents, generally in the vanguard of the knowledge transfer field, are able to provide better balanced judgements on e.g. the possibilities for cooperation on KT activities than a random sample group. Besides, by using the contacts database a high response rate (49%) is achieved. Despite all these comments, it is therefore in the authors' opinion that the study results can be qualified as indicative at least.

#### Implications for theory development

The introduction (paragraph 3.1) briefly touches upon the observation that knowledge transfer can be explored from various perspectives. The Innovation U. model (Tornatzky et al., 2002) is proposed to capture both the generative aspects of the Triple Helix and the developmental role of the literature on the engaged university, as distinguished by Gunasekara (2006). However, an adapted and enhanced version of the Innovation U. model is developed in Chapter 2. That conceptual framework is more sophisticated to the knowledge transfer task. In combination with the categorization of ten different KT activities, it proves to be useful for analyzing the knowledge transfer task. Considering the questionnaire responses, an activity like 'entrepreneurship development' should be included. 'Entrepreneurship development' would comprise entrepreneurship training, entrepreneurship promotion, etc., as preparation for any 'spin-off and enterprise creation' activity. As a consequence of the few responses, 'alumni affairs' might be omitted in further research on KT activities. Nevertheless, this 'operational' perspective on KT activities does not explain all variations among universities. Therefore, further research is recommended to study the influence of organisational characteristics and the university strategy towards KT. These observed differences and university specific characteristics have been captured in the conceptual framework. Chapter 4 will elaborate more on the institutional organisation of KT.

As mentioned in the introduction, a recent EU survey shows that research cooperation on knowledge transfer between public research organisations and industry is difficult, even when both are in the same country (EU, 2006b). This present study indicates that most universities do not have the ambition to persevere in structural cooperation. University cooperation on knowledge transfer activities is more a matter of exchanging knowledge and experience and cooperation in projects on specific purpose. Hence, European funding policy perhaps should emphasize the 'value adding' aspect over the explicit transnational focus. As widely acknowledged in literature, universities have a prominent regional role and *act* local; European policy can encourage them to *think* global.



# 4 The institutional organisation of knowledge transfer activities and its implications

#### Abstract

Universities usually have a knowledge transfer office (KTO) to execute and manage the knowledge transfer (KT) activities. The first section of this article studies the institutional organisation of knowledge transfer. Three different organisation types can be distinguished: (1) a centralized office, inside the university, (2) KT activities decentralized, inside the university and (3) a centralized office, outside the university. Four exploratory cases of European universities illustrate the existence of various KTO organisation types. Furthermore is demonstrated that universities have various motives to perform the KT task, vary in KT strategy and have different interpretations of KT activities. In order to better grasp these mutual differences, the university strategy towards KT, linked to (regional) contextual factors and the type of KT activities carried out, is advocated to be subject of further research. The second section addresses the influence of the organisational structure of KT activities on the kind of cooperation that universities want to establish on KT activities with other universities in other European regions. Questionnaire results suggest that the current extent of cooperation varies among the three organisation types, whereas the desired future extent of integration shows no remarkable differences. Hence, the organisational structure should not hamper university cooperation on KT activities. However, additional data is necessary to draw reliable conclusions; further research is advised to focus on studying possibilities for cooperation on specific KT activities.

Key words: knowledge transfer, knowledge transfer office, university, cooperation, transnational, university strategy

#### 4.1 Introduction

Universities are considered to be a key factor in regional development (Tornatzky *et al.*, 2002; Etzkowitz and Klofsten, 2005). Next to the traditional education and research activities, universities increasingly interact with their region. This activity of universities is encapsulated in the mutual interdependence of government, industry and university, described by Etzkowitz and Leydesdorff (2000) as a triple helix relationship. The triple helix thesis states that the university can play an enhanced role in innovation in increasingly knowledge-based societies. This entrepreneurial approach towards regional interaction (Etzkowitz and Leydesdorff, 2000) is e.g. expressed in the establishment of business and science parks to foster (knowledge-based) entrepreneurship or active patent portfolio management. Universities usually have a centralized department, the knowledge transfer office (KTO), to execute and manage these activities. Publications and surveys (ProTon, 2005; AUTM, 2006; ASTP, 2006) on KTOs and knowledge transfer (KT) activities tend to focus on practical issues regarding e.g. the number of patents filed (Saragossi and Van Pottelsberghe, 2003) or staff reward systems (Siegel *et al.*, 2004; Link and Siegel, 2005). This is in some way a heritage of the (recent) past, while the first KTOs

chiefly focused on technology and the related patents and licensing activities. However, the field is broadening and nowadays 'knowledge transfer' is the encompassing term to describe the "transfer of know-how, expertise, skills and knowledge from one party to another leading to innovative, profitable or economic improvements for government, organisations and individuals in the private and public sectors and in the wider community" (ProTon, 2006) for mutual benefit (PhilipsKPA, 2006:31).

Many reports conclude that there is no single model for knowledge transfer offices (e.g. Milken Institute, 2006:232; Lambert Review, 2003:3.41). A recent survey by Decter et al. (2007) highlighted significant differences in the USA and UK between the motivations of universities to transfer technology, the consistency of university technology transfer policies and the accessibility of university technologies to business. Lockett et al. (2003) found that the more successful universities on spin-out activities have a clearer strategy towards these activities. University preferences regarding commercialization paths and the quality of entrepreneurial support affect the degree to which spin-offs remain within their region (Golob, 2006). Although Golob shows that other factors contribute to this decision too, university behaviour within its regional context is of significant influence. The institutional organisation of knowledge transfer is directly linked to the university's strategy towards KT (cf. Bresser and Millonig, 2003). However, except for a publication by Markman et al. (2005) and a ProTon research report (ProTon, 2003), KTO structures are hardly addressed in literature. This article provides a contribution by exploring the way universities have embedded their KT activities in their organisation. The university strategy towards knowledge transfer is considered and is related to the focus regarding the activities carried out. Four exploratory cases of European universities form the basis for addressing the following research question:

#### 1. How do universities organise the knowledge transfer task?

A recent European survey on transnational research cooperation on knowledge transfer between public research organisations and industry demonstrates that the exploitation of publicly funded research results is deemed to be an important driver for European competitiveness (EU, 2006b). The second section will therefore focus on the implications of the various organisation types for (transnational) university cooperation on knowledge transfer activities. The second research question reads:

2. Does the way universities have embedded the knowledge transfer activities influence the kind of cooperation that universities want to establish on KT activities with other universities in other European regions?

### 4.2 The institutional organisation of knowledge transfer

This article sets out to explore the institutional organisation of knowledge transfer. The institutional organisation of KT encompasses (1) the focus towards the KT task (or leading

motive to perform the KT activities), which is directly linked to the university strategy towards KT; (2) the knowledge transfer office (KTO) structure, i.e. the way universities have embedded and organize their KT activities; (3) the KT activities itself. In the previous chapter is demonstrated that universities both differ in the *kind* of KT activities that are carried out as well as choose various approaches as to *how* these activities are carried out. Markman *et al.* (2005) present a study on KTOs in the USA, in which a set of three different organizational structures is identified: 'traditional university structure', 'non-profit research foundation' and 'for-profit venture extension'. However, although Markman *et al.* (2005) distinguish three different structures, implicitly is assumed that KTOs are organized as a centralized body. The present paper will put more emphasis on *what* KTOs do and what kind of KT activities are carried out; therefore, a distinct categorization is preferred. In the ProTon Domain Synthesis Report (ProTon, 2003) different organizational forms of KTOs were inventoried. Among others the dimensions 'centralized – decentralized organised' and 'inside – outside the university' were identified. These two dimensions provide a tool to analyze as to how the knowledge transfer activities are embedded in the organization. Four organization types can be distinguished:

- 1. *Centralized* organised *inside* the university An institution has one central office where all the knowledge transfer activities are managed. The knowledge transfer office is a university department serving the university's interests only. This resembles the 'traditional university structure': an integral department within a university's administrative structure (Markman *et al.*, 2005).
- 2. *Decentralized* organised *inside* the university Knowledge transfer activities are spread out through the entire organisation.
- 3. *Centralized* organised *outside* the university A university can have its knowledge transfer activities managed by a separate (university-owned) body. Cf. 'the 'for-profit private extension' (Markman *et al.*, 2005): a KTO with a private venture extension.
- 4. *Decentralized* organised *outside* the university This can be the case when the university's KT activities are carried out by different actors outside the university.

Orientating desktop research indicates that the latter ('decentralized and outside') is not very common, which makes sense since it is quite complex to have KT activities managed by different external actors. The third KTO structure identified by Markman *et al.* (2005), a separate (research) body outside of the university's administrative structure, can generally be considered as 'centralized and inside', except if the KTO is both organizationally and physically separated from the university. In that case the 'non-profit research foundation' will be treated as 'centralized and outside'. Based upon the categorization explained above the following sub-question is formulated:

#### 1a. How are KTOs embedded in the university system?

The KTOs have a certain focus or leading motive to perform KT activities, which is directly linked to the university strategy towards knowledge transfer. Therefore, the following subquestions will be addressed:

## 1b. What is the university strategy towards knowledge transfer?1c. What is the university's leading motive to perform KT activities?

Chapter 2 contains an overview of the ten most mentioned KT activities, briefly described in Table 4.1. As illustrated in Chapter 3, universities do not carry out all these activities and have various interpretations of KT activities. Hence, when discussing the institutional organisation of KT and its influence on university cooperation, first this fourth sub-question is required:

#### 1d. What KT activities do universities carry out and what are the most important?

#### Table 4.1 'Shortlist' of the 10 most mentioned knowledge transfer activities

- 1. Patents and licensing concerns the exploitation of intellectual property (IP). Through patents an institute for higher education can protect its intellectual property and if a patent is granted it can be commercialised through sales of the patent or a license (ProTon, 2003).
- Spin-off and enterprise creation A spin-off company is a "new company, whose formation was dependent on the use of intellectual property that was created, and/or developed at a Public Research Organisation" (ProTon, 2003); spin-off is the entrepreneurial route to commercializing knowledge of public research (OECD, 2000), both IP and non-IP based.
- 3. University-industry networks describes the dynamic "two-way interaction between 'the actor' university and 'the actor' industry" in collaborative networks (Groen and Van der Sijde, 2002); cf. the 'partnership principle' (Chatterton and Goddard, 2000).
- 4. International cooperation University cooperation with public and private organisations beyond national borders.
- 5. European affairs Management, acquisition and monitoring of European projects and European funding.
- 6. Continuous professional development (CPD) comprises the post-initial education programmes aiming at improving the capability and realizing the full potential of professionals at work.
- 7. Alumni affairs Management of alumni contacts.
- 8. National subsidies National government programs and policies intended to encourage certain types of research programs and other specified university activities.
- 9. Regional subsidies Regional government programs and policies intended to encourage certain types of research programs and other specified university activities.
- 10. Grants Grants are provided by the government or other non-profit organisations to encourage (individual) development or growth in a particular area.

After having identified what activities are carried out by universities, the extent of university cooperation on these activities can be measured through the 'extent of integration'-scale. This scale (see Figure 4.1) is explained in Chapter 2. The university cooperation on knowledge transfer activities will be further on referred to as 'trans-university knowledge transfer'.



Figure 4.1 Extent of integration and cooperation of KT activities

In order to discuss the influence of the institutional organisation of KT activities on possibilities for trans-university knowledge transfer, the following sub-questions will be addressed:

## 2a. To what extent do universities cooperate on KT activities with other universities in other European regions *at this moment*?

## 2b. What kind of cooperation do universities want to establish on KT activities with universities in other European regions *in the future*?

In order to meet the European focus on 'transnational' cooperation (see Chapter 3), the cooperation should explicitly surpass regional collaboration. This is covered by adding 'with universities in other European regions' to these questions.

## 4.3 Exploratory cases at four universities

#### Participants

Four exploratory cases at four different European universities are carried out to provide a perspective on the institutional organisation of knowledge transfer. The selection of the universities is based on the centralized/decentralized-inside/outside categorization presented in the previous section. The first university has its knowledge transfer activities bundled in a consortium of three regional universities (KTO #1). Two universities have their KT activities located in a centralized office (KTO #2 and #3). The fourth university has its KT activities distributed throughout its organization (KTO #4). Each university participates in the DIFUSE project.

#### Data gathering instruments

The cases consist of semi-structured interviews with KT stakeholders on different organizational levels. Interviews were conducted with department directors, directors of the incubation facilities, staff of the patents offices and business development managers. The interview protocol (enclosed as Annex C) consists of questions regarding the university's strategy towards knowledge transfer, the leading motive to perform KT activities, the approach towards KT activities and the opinion on trans-university knowledge transfer. Annex D.1 contains an overview of the interviewees. Furthermore, the self-evaluation case study reports produced by the participants in the DIFUSE project provided additional information. The case report of the University of Twente (University # 4) is enclosed as Annex D.2. The other participants produced similar reports; these will be published after finishing the DIFUSE project.

#### Design

Additional issues that emerged during the interview sessions informed the development of a survey questionnaire, which is used to gather more quantitative data on the prevalent KTO structures, the type of KT activities carried out and the opinion on trans-university knowledge transfer. Most of the questionnaire results are discussed in the previous chapter; the results on KTO structures in relation to the opinion on trans-university knowledge transfer and the 'driving force' behind the KT task will be discussed in the subsequent section on cooperation. The exploratory cases were carried out between October and December 2006 and the questionnaire was online from 22 November 2006 until 30 January 2007. Consequently, profound analysis of the cases took place after the questionnaire had circulated.

#### 4.3.1 Exploratory case results

Characteristics of the four universities are summarized in Table 4.2 (page 43). The KTO structure, differences among university strategies and the KT activities that are carried out are gradually discussed below.

#### KTO structure

The division in different organization types turned out to be very useful for a first categorization of the universities. However, in contrast to the prior categorization, the KTOs do not confine itself to one quadrant (see Figure 4.2). KTO #1 carries out a number of KT activities centrally, but collaborates with the individual universities on 'patents and licensing' activities and an affiliated incubation facility ('spin-off and enterprise creation'). KTO #2 has a central department for all KT activities, but is now planning to position business developers inside the research institutes in order to stimulate closer contact with the researchers. KTO #4 shows a similar, but opposite development. It recently established a central independent 'supervisor' in charge of monitoring and facilitating KT activities throughout the organisation. Professional support on legal and financial issues and alumni affairs are managed centrally; all other activities are embedded in the research institutes and faculties. KTO #3 has a coordinative task for all provided KT activities.



*Figure 4.2 Organization of KT activities within the university system. The left figure shows the selection before analysis; the right figure shows the situation at the universities after analysis.* 

Knowledge transfer strategy and focus or leading motive to perform KT activities Each university has a different strategy towards knowledge transfer. KTO #1 is primarily focused on regional economic development. Its region used to be dominated by a few multinational companies playing a central role in the regional industrial activities. However, these companies largely disappeared and the universities leaped into the gap by taking over this catalyst role and by promoting the 'engagement with industry'. KTO #2's primary role is to support university staff in undertaking research and attract and secure research funding for them. In addition they are responsible for developing commercialisation opportunities through 'patents and licensing' and 'spin-off and enterprise creation' activities. The underlying motive is to contribute to regional economic development. The regional role of KTO #3 is illustrated through its mission to assist the university and organisations in creating and strengthening mutually beneficial relationships. The creation and maintenance of 'university-industry networks', is therefore the most important KT activity. Besides that, students receive entrepreneurship and creativity training in the early stages of their studies and are involved in projects with (local) industry and new established (high-tech) ventures. Although many projects have a regional aspect, KTO #4 primarily focuses on knowledge exploitation. This is encouraged through promoting entrepreneurship and an enterprising culture. In that perspective it is no surprise that 'spin-off and enterprise creation' is the most important KT activity and less priority is given to 'patents and licensing'. The mainly decentralized organization is considered to be most appropriate to foster an entrepreneurial atmosphere among staff and students.

#### Knowledge transfer activities

The various strategies towards knowledge transfer can also be illustrated by the KT activities carried out. Interesting in this perspective is KTO #1. The three university members of the consortium have their own 'patents and licensing' office. The same holds for 'spin-off and enterprise creation' activities: the consortium has direct links with an incubator facility; however, except for some central support, the consortium itself is not involved in these activities. This is reflected in the consortium's strategy, which does not focus on e.g. knowledge exploitation, but primarily aims at engagement with industry. Both KTO #2 and #3, alike at first

sight, have a distinct approach of e.g. 'spin-off and enterprise creation'. KTO #2 is slightly more focused on knowledge exploitation itself, whereas KTO #3 puts more emphasis on its regional benefits. Note that both KTOs give different priority to the various KT activities. University #2 has 'CPD' accommodated in another department, while it is an important activity for KTO #1. Interesting in this context is the interpretation and labeling of KT activities. It can be noticed that, although discussing the same activities, the approach towards the various KT activities can differ substantially among universities. E.g. KTO #2 is not in charge of 'alumni affairs', but it carries out 'alumni entrepreneurship', a programme to link entrepreneurial alumni to the university and to consolidate and cultivate this relationship. University #4 offers a to some extent comparable programme, but considers it as one of its 'enterprise creation' activities.

Although the approach towards the activities can vary substantially, 'spin-off and enterprise creation', 'patents and licensing' and 'university-industry networks' are generally considered to be the most important activities (except for KTO #1). Activities such as 'national subsidies' and 'regional subsidies', are not considered to be the most important KT activities. However, in most cases these activities provide the necessary financial resources to support and facilitate (regional) projects.

University	#1	#2	#3	#4
				(cf. the case report in Annex D.2)
'Driving force' behind knowledge	University's mission	University's mission	University's mission	University's mission
transfer activities				
University strategy towards	Engagement with industry	Knowledge exchange	To ensure knowledge transfer to the	Enterprising culture; promote
knowledge transfer			region/knowledge exploitation. To	entrepreneurship
			ensure an enterprising culture within	
			knowledge intensive entrepreneurship.	
KT focus (i.e. leading motive to	Regional (economic) development	Regional (economic) development	Regional (economic) development,	Knowledge exploitation
perform KT activities)			knowledge exploitation.	
KT activities carried out at the	1. University-industry networks	1. Spin-off and enterprise creation	1. University-industry networks	1. Spin-off and enterprise creation
university	2. European affairs	2. Patents and licensing	2. Spin-off and enterprise creation	2. University-industry networks
(ranked in order of importance)	3. Continuous professional development	3. University-industry networks	3. Patents and licensing	3. Patents and licensing
	(CPD)			
		4. Regional subsidies	4. Continuous professional	4. Continuous professional
	4. Regional subsidies	5. National subsidies	development (CPD)	development (CPD)
	5. National subsidies	6. European affairs	5. Regional subsidies	5. Regional subsidies
	6. International cooperation	7. Alumni affairs*	6. National subsidies	6. National subsidies
		8. International cooperation	7. European affairs	7. Alumni affairs
			8. International cooperation	8. European affairs
				9. International cooperation
Year of establishment KTO	1987	1984	1989	1979
Institutional organization	Centralized, outside the university	Centralized, inside the university	Centralized, inside the university	Decentralized, inside the university
	(consortium of three regional universities)			
Remarks	The consortium collaborates with the	* Alumni affairs are a separate		Centralized: an independent
	individual universities on 'patents and	department that look after all		'supervisor', Professional support on
	licensing' activities and an incubation	relationships with alumni, including		legal and financial issues, alumni
	facility (spin-off and enterprise creation).	raising funds / receiving gifts.		affairs. All other activities are
		The KT office primarily looks after		embedded in the research institutes
		alumni entrepreneurship.		and faculties.

Table 4.2 Characteristics of the four universities and the knowledge transfer offices (KTOs)

## 4.4 University cooperation on knowledge transfer activities

The exploratory cases provided a substantial amount of information on the institutional organization of KTOs. The previous section illustrates that KTOs have various approaches towards knowledge transfer. However, sufficient data on possibilities for trans-university knowledge transfer is lacking. In order to collect additional quantitative data a questionnaire has been developed. The questionnaire is introduced, explained and discussed in the Chapter 3. In this section the results on KTO structures in relation to the opinion on trans-university knowledge transfer and the 'driving force' behind the KT task will be discussed. The university strategy towards KT is not addressed in the questionnaire, because it is rather complex to provide general KT strategy descriptions and qualitative answers are difficult to compare. Moreover, it was decided to keep the questionnaire concise.

#### 4.4.1 Survey results

Figure 4.3 shows the KTO structure of the questionnaire respondents. Most respondents indicate to be centrally organized, inside the university. However, it is not, as illustrated in the previous section, the only organisation type; 22,2 percent of the respondents indicates to be decentrally organized and 7,4% is centrally organized outside the university. None responded to be decentrally organized outside the university, which was to be expected.

Although the university strategy towards KT is not addressed, the 'driving force' behind the KT activities is put forth. As Figure 4.4 shows, most respondents consider KT as their mission and for only a few it is an imposed activity. Three out of four centralized offices outside the university mark 'money making' as driving force behind their activities; those three KTOs indicate to be a limited (Ltd) company. Altogether 17% of the respondents indicate to regard KT as a money making activity, hence, 83% does not. Respondents marking 'other' mentioned 'learning the way of working in general in KT issues' and 'increasing university-enterprise cooperation in combination with regional innovation strategy' as driving force.



Figure 4.3 Respondents' KTO structure (N=54) Figure 4.4 Driving force behind KT activities

#### KTO structure in relation to trans-university knowledge transfer

The questionnaire results point out that the three most important KT activities are 'patents and licensing', 'spin-off and enterprise creation' and 'university-industry networks'. These results confirm the observation made after analyzing the exploratory cases. These three activities are

selected for further analysis of the questionnaire results on the influence of the institutional organization on the opinion on trans-university knowledge transfer. These and other KT activities and the individual results are discussed in more detail in Chapter 3.

The average positions on the 7-point scale (introduced in Chapter 2) for the current situation ('Now') and the desired situation ('2020') for the three activities are presented in Table 4.3. It can be observed that the averages for the current situation differ considerably among the three groups for the KT activities 'patents and licensing' and 'spin-off and enterprise creation'. The average results for the desired situation ('2020') are more similar. However, unfortunately the sample size is too small to apply statistics. The possibilities to draw general conclusions are therefore rather limited; e.g., differences *among* the groups per activity can not be tested.

Patents		Total valid responses (n=40)	Centralized and Inside (n=33)	Decentralized and Inside (n=3)	Centralized and Outside (n=4)	Decentralized and Outside (n=0)
licensing	Average 'Now'	3,4	3,3	5,7	2,8	-
	Average '2020'	5,3	5,3	5,3	5,8	-
Spin-off and		Total valid responses (n=44)	Centralized and Inside (n=33)	Decentralized and Inside (n=7)	Centralized and Outside (n=4)	Decentralized and Outside (n=0)
enterprise	Average 'Now'	3,8	3,7	4,7	3,0	-
creation	Average '2020'	5,3	5,2	5,4	5,5	-
University-		Total valid responses (n=44)	Centralized and Inside (n=33)	Decentralized and Inside (n=7)	Centralized and Outside (n=4)	Decentralized and Outside (n=0)
networks	Average 'Now'	4,6	4,7	4,4	4,3	-
	Average '2020'	5,6	5,6	5,6	5,8	-

Table 4.3 Average position on the scale ('Now' and' 2020') per group and activity

## 4.5 Conclusions and discussion

#### Institutional organisation

The first section of this article set out to explore the institutional organisation of knowledge transfer activities. The exploratory cases reveal substantial differences among the four universities. Universities have a distinct strategy and focus towards knowledge transfer and KTOs vary in the number of KT activities carried out, the perceived importance of these activities and the interpretation of the activities. Moreover, universities can label more or less similar KT activities differently. Except for KTO #3, none of the KTOs can be categorized in one quadrant, all have a more or less hybrid structure. While 70,4% of the questionnaire respondents indicate to work in a central university department, KTOs might be more similar than this study predicts. However, as illustrated, although KTO #2 and #3 seem to be identically organized, both differ substantially in strategy and focus towards KT, the perceived importance of KT activities carried out and the interpretation of these activities.

Given the questionnaire results, KTO #1 (consortium of three regional universities) appears not to be perfectly representative for KTOs in the 'centralized, outside the university'-quadrant. Three out of four 'centralized and outside' respondents indicate to be private for-profit companies. According to an American study (Markman *et al.*, 2005) these for-profit bodies provide the strongest support for new venture creation. These issues are not addressed in the present study. The insights provided on the organizational aspects of knowledge transfer are well captured by the decentralized/centralized approach. For further KTO analysis with a more operational focus, however, the approach chosen by Markman *et al.* (2005) could be more useful, moreover because their theoretical model encompasses common commercialization strategies and various technology stages at which KTOs get involved in the commercialization process. Even though the four cases form a rich source of information and the university KT strategy is included in this study, additional research is necessary before firm conclusions can be drawn. Furthermore, a broader study would allow an actual assessment of the *fit* between the university strategy towards KT, the institutional organisation and the way KT activities are carried out.

#### Trans-university knowledge transfer

The second section explores the influence of the KTO structure on the kind of cooperation that universities want to establish with other universities in another region. The average results for the current situation suggest a possible relationship between the KTO structure and the extent of integration and cooperation of KT activities. On average, the decentralized organizations inside the university seem to be most integrated and cooperating with other universities, whereas the centralized organizations outside the university seem to be least integrated and cooperating with other universities. 'Centralized and outside' is on average aiming at the closest cooperation for all three activities, although the variation among the group does not seem substantial. However, a larger sample size is necessary to apply valid statistical tests. On average, respondents pursue project or 'ad hoc' cooperation for 'patents and licensing', 'spin-off and enterprise creation' and 'university-industry networks' activities. During the exploratory case interviews possibilities for trans-university knowledge transfer were discussed. It seems that cooperation on specific projects or activities is desired only when it is explicitly beneficial for both parties. E.g. transuniversity cooperation on specific fields of research like life sciences or biotechnology is rather common and generally driven by a lack of sufficient funding. However, most interviewees seem to prefer to exchange knowledge and experience rather than establishing structural cooperation with other universities. Integration of KT activities with other universities is not considered as an option on short notice, while the benefits of such integration are not clear. However, again, additional research data is necessary to draw reliable conclusions. Nevertheless, this preference for cooperation on specific projects with a finite horizon is in line with Hagedoorn's findings for interfirm R&D partnering (Hagedoorn, 1996, 2002). Hence, considering the results, the KTO structure does not seem to influence the kind of cooperation that universities want to establish on KT activities with other universities in other European regions. Moreover, the approach of the various KT activities appears to be a much more influential factor. This is demonstrated in the previous section and discussed in Chapter 3.

#### Limitations

It is in the authors' opinion that the case analyses provide sufficient details to have sketched an impression of the institutional organisation of knowledge transfer. Nevertheless, some remarks have to be made. The exploratory case results are based on a limited number of interviews with persons from various organisation levels. University board members were, due to time restrictions, not interviewed. Additional analysis of strategic plans and university policy on knowledge transfer should largely compensate this lacuna. Furthermore, these four universities are merely indicative, not representative for European universities in general. Initially, the interviews focused more on possibilities for trans-university knowledge transfer. However, during the case analysis the observed differences among the universities came into prominence. Consequently, it was decided to focus this present chapter on the institutional organisation of knowledge transfer. At that moment, the questionnaire was sent out already. Therefore, the questionnaire does not include questions on the university strategy and the university's leading motive to perform KT activities; only the 'driving force' was included. Combined with additional questions on the KTO structure, the questionnaire would have better complemented the exploratory case results on the institutional organisation. The questionnaire is discussed in more detail in Chapter 3.

#### Implications for further research

The authors believe that this study underpins the opinion that, as many studies indicated, there indeed is no single model for knowledge transfer activities. Given the variety and overlap among the three main models, the authors suggest two directions for a more sophisticated approach of knowledge transfer. First, knowledge transfer can be considered from an organizational perspective. As pointed out in the introduction of this paper, university strategies towards knowledge transfer influence the way knowledge transfer activities are organized. The university strategy itself, linked to contextual factors and the KT activities carried out, should therefore be subject of study. The present article demonstrates that the way a KTO is embedded in the university stems directly from that strategy.

However, as the questionnaire results point out, the KTO structure is not of crucial importance for trans-university knowledge transfer. From cooperation perspective, it is therefore more relevant to view knowledge transfer as a collection of different processes. The specific processes and the knowledge involved can be quantified in such a way that experiences can be exchanged with other universities. Moreover, knowledge transfer office staff is usually specialized in a certain activity, e.g. patenting or student entrepreneurship. As briefly mentioned in the analysis of the exploratory cases, transnational cooperation on knowledge transfer seems viable within specific projects. Further KT research should hence focus much more on organizational structures given the university strategy and contextual factors, or on studying specific knowledge transfer activities (e.g. spin-off and enterprise creation).



## **5** Finishing conclusions and recommendations

## 5.1 Retrospective

The research process (illustrated in paragraph 2.5) proved itself as a challenging and bumpy road through knowledge transfer theory and practice. The exploratory cases, in combination with the questionnaire, revealed many (subtle) differences among universities. In Chapter 3 and 4 is demonstrated that universities carry out various kinds of KT activities and that they evince diverse interpretations of these KT activities. Moreover, in Chapter 4 is illustrated that the institutional organisation of KT has several characteristics; in addition to the variation in KT activities, universities choose different KTO structures, depending on the university's leading motive to carry out KT activities and its relation to the strategy towards KT.

Trans-university knowledge transfer is approached from two perspectives. Chapter 3 describes the possibilities for cooperation on the provided KT activities. It is shown that the current and desired extent of cooperation vary among the KT activities. Chapter 4 introduces different KTO structures and within the current sample group no significant influence of the KTO structure on trans-university knowledge transfer can be observed. Given the variation among the KT activities, it is argued that, from cooperation point of view, focusing on individual KT activities offers the best opportunities.

However, during the process of interpreting and analyzing the research results, the original attention for university cooperation on knowledge transfer activities slightly dwindled. The focus shifted more and more towards introspection and reflection on the 'university system' itself. This is illustrated by the development of the conceptual framework, which merely provides a representation of the university system of knowledge transfer. Apparently, this inward analysis is an essential prerequisite before trans-university knowledge transfer can be studied. Literature confirms the importance of (strategic) similarity (Darr and Kurtzberg, 2000) and the presence of mutual benefit (PhilipsKPA, 2006).

Besides that, many research areas remained untouched. The university position within the Triple Helix, the mutual interdependencies with industry and government, the outcome of the KT activities or the (intended) contribution to economic development are left over for further analysis.

Recapitulating, this thesis demonstrates that the university approach towards the knowledge transfer task is primarily a matter of local *acting* and *thinking*. One might argue that European policy can encourage *global* thinking; however, global *acting* on knowledge transfer activities seems one bridge too far.

### 5.2 Conceptual meditations

The topics addressed in Chapter 3 and Chapter 4 can roughly be condensed into two main perspectives: (1) the organizational perspective and (2) the operational perspective. The organizational perspective comprises the university strategy towards KT, the institutional organization and the interaction with industry, government and other universities. Furthermore, economic development can be considered from organizational perspective, when the fit between the university strategy towards KT and the actual contribution to economic development is studied. The operational perspective focuses on KT processes and studies specific KT activities (e.g. spin-off and enterprise creation) and KT mechanisms. In addition, a third approach, which is not so much illuminated in the two articles, is the 'outcome perspective'. This perspective focuses on the tangible outcome of the KT activities and mechanisms, like e.g. the number of new ventures or the number of patents filed. Besides that, it addresses the contribution of the knowledge transfer task to economic development in general. Each perspective is well included in the conceptual framework.

However, as well some remarks can be made. It is proposed to omit 'alumni affairs' as KT activity. The few questionnaire responses on the KT activity seem to indicate that 'alumni affairs' is not regarded as a KT activity, or is not included in the university strategy towards KT. On the contrary, the questionnaire results suggest including a KT activity like 'entrepreneurship development'. Respondents indicate to offer 'entrepreneurship training' and 'entrepreneurship support', which can be regarded as preparatory activities or facilitating mechanisms for stimulating entrepreneurial activities among students and/or staff. 'Entrepreneurship development' could contribute as predecessor to enhancing the 'spin-off and enterprise creation' activity. There might occur conceptual confusion with the labels 'university-industry interaction' and 'university-industry networks', while these both seem to signify the same. However, within the framework, 'university-industry interaction' is used to label the sciencebusiness interaction within the Triple Helix relationship from organizational perspective. 'University-industry networks' is regarded as KT activity and describes the contacts and relationships between university and industry from operational perspective. Notwithstanding these remarks, it seems that the conceptual framework can serve as a useful model for studying the knowledge transfer task.

Nevertheless, the exploratory case analysis suggests some additional variables for studying the institutional organisation of knowledge transfer. It might e.g. be of interest to include the extent of professionalisation of the KTO staff. Besides, the interaction of the KTO with both internal parties (e.g. researchers and students) and external parties (ventures, capital funds, regional support agencies, etc.) seems to be relevant for explaining the KTOs' performance and institutional support.

In the next paragraph the conceptual framework is used to point out directions for further research.

## 5.3 Further research

Chapter 3 and Chapter 4 provide two main opportunities for further research on knowledge transfer, namely studying the university strategy towards knowledge transfer and studying specific KT activities and mechanisms. However, as somewhat elucidated above, the subject 'knowledge transfer' offers many research possibilities. Figure 5.1 shows seven 'main' research areas. In order to provide a modest headstart, these areas will be briefly discussed and some relevant literature (if available and as far as not yet mentioned in other chapters) is provided. References can be found in the reference section. Please notice that these research areas can not be studied in isolation, but at least with the university strategy in mind.



Figure 5.1 Conceptual framework – further research opportunities

1. University strategy towards knowledge transfer – (1) organizational perspective The present study points at the university strategy towards KT as important subject of study. Theory suggests, that economic development is a driving force behind KT activities; however, Markman et al. (2005) show that out of a sample size of 128 North-American technology transfer offices only 27% explicitly have added 'economic development' in their mission statement. It might be interesting to repeat this study in a European context.

#### 2. Institutional organization of knowledge transfer -(1) organizational perspective

Like in Chapter 4, the institutional organisation of KT can be studied. This is e.g. done by Markman *et al.* (2005). Furthermore, staff reward systems and incentives or KTO staffing in general can be studied. See therefore e.g.:

• Siegel *et al.* (2003) – Assessing the impact of organizational practices on the relative productivity of university technology transfer offices: an exploratory study

3. Knowledge transfer activities and mechanisms – (2) operational perspective

As advocated in Chapter 3, knowledge transfer activities itself can be studied. See e.g.:

- Bekkers *et al.* (2006) Determining Factors of the Effectiveness of IP- based Spinoffs: Comparing the Netherlands and the US
- Clarysse et al. (2005) Technology transfer and university spin-out strategies
- Nerkar and Shane (2003) When do start-ups that exploit patented academic knowledge survive?
- Lockett et al. (2003) Technology Transfer and Universities' Spin-Out Strategies

## *4.* University-industry interaction (or industry-science relationships) – (1) organizational perspective

Industry-science relations are rather well studied from public policy point of view. See e.g.:

- OECD (2000) Benchmarking science-industry relations
- OECD (2003) Turning science into business

From university perspective, e.g.:

 Ayoubi and Al-Habaibeh (2006) – An investigation into international business collaboration in higher education organisations: A case study of international partnerships in four UK leading universities

From firm perspective, e.g.:

• George *et al.* (2002) – The effects of business–university alliances on innovative output and financial performance: a study of publicly traded biotechnology companies

#### 5. University-government interaction -(1) organizational perspective

This area focuses on e.g. the university role in the region or its contribution to regional development from university policy perspective. See e.g.:

- Bozeman (2000) Technology transfer and public policy: a review of research and theory
- Florida (1995) Towards the learning region
- Lundvall (1992) National systems of innovation: Towards a theory of Innovation and interactive learning.
- Rip (2002) Regional Innovation Systems and the Advent of Strategic Science

#### 6. Knowledge transfer outcome – (3) outcome perspective

Organisations like AUTM, ASTP, ProTon and AURIL provide annual reports on the actual output of KT activities, such as the number of patents filed, number of spin-offs, number of licensing agreements, and characteristics of the institutional organisation of KTOs, like e.g. the number of staff. Reports, case studies and other publications can be found at the organisations' websites:

٠	Association of European Science & Technology Transfer	www.astp.net
	Professionals (ASTP, EUR)	
٠	Association of University Research and Industry Links	www.auril.org.uk
	(AURIL, UK)	
•	Association of University Technology Managers (AUTM,	www.autm.org
	USA)	
•	ProTon Europe, "the pan-European network of Knowledge	www.protoneurope.org
	Transfer Offices (KTOs) and companies affiliated to	
	universities and other Public Research Organisations (PROs)"	

Although economic development is represented as a result of the possible outcomes of the knowledge transfer activities, it might as well be argued that this could be turned around; then, the fit between university KT strategy and the actual KT output could be studied.

7. Economic development – (1) organizational perspective and (3) outcome perspective As mentioned before, Markman *et al.* (2005) point out that out of a sample size of 128 North-American technology transfer offices only 27% explicitly have added 'economic development' in their mission statement. Moreover, Golob (2006) claims that knowledge transfer efforts "have produced only modest returns". Hence, (the contribution to) economic development can both be studied from organizational perspective and outcome perspective. See further e.g.:

• Chatterton and Goddard (2000) - Response higher education institutions to regional needs

Underlying these economic development efforts is said to be the entrepreneurial university and its dedicated role in knowledge-based economic development. A multitude of literature is available:

- Bercovitz and Feldmann (2006) Entrepreneurial universities and technology transfer: a conceptual framework for knowledge-based economic development
- Clark (1998) Creating Entrepreneurial Universities: Organizational Pathways of Transformation.
- Davies (1987) The entrepreneurial and adaptive university: report of the second US study visit
- Röpke (1998) The Entrepreneurial University Innovation, academic knowledge creation and regional development in a globalized economy
- Van den Kroonenberg (1987) Wordt de universiteit te ondernemend? [Is the university becoming too entrepreneurial?]



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## List of annexes

- Annex A Knowledge transfer terminology
- Annex B Online questionnaire (screenshots)
- Annex C Interview protocol exploratory cases
- Annex D.1 Sources of information for exploratory cases
- Annex D.2 Case report University of Twente



## Annex A Knowledge transfer terminology

Throughout this thesis, the label 'knowledge transfer' is used to describe the 'third' university task, next to education and research. 'Knowledge transfer' is in this thesis described as the "transfer of know-how, expertise, skills and knowledge from one party to another leading to innovative, profitable or economic improvements for government, organisations and individuals in the private and public sectors and in the wider community" (ProTon, 2006) for mutual benefit (PhilipsKPA, 2006:31).

The choice for this definition will gradually be discussed below. First the questionnaire results on prevalent terminology will be discussed and subsequently a collection of knowledge transfer definitions will be provided.

#### **Questionnaire respondents - terminology**

The questionnaire respondents were asked to indicate which description they preferred to describe their third stream activity. Of the list provided, more than half of the respondents appointed 'knowledge transfer' as preferred description or label. See Figure A.1 below.



Figure A.1 Questionnaire responses on terminology (n=56)

Respondents who marked 'other' mentioned: collaborative research, knowledge exploitation, knowledge interchange and knowledge sharing. Perhaps the label 'engagement', which appears in an Australian report (PhilipsKPA, 2006, p. 11) should be added. 'Engagement' should give a more explicit emphasis to two-way partnership models that involve mutual learning and knowledge exchange. This typology illustrates the problem which most respondents have with the label 'knowledge transfer': transfer implies too much an one-way relationship.

Almost all respondents agree with the use of 'knowledge' instead of e.g. 'technology'. Technology is regarded as a part of knowledge. In this context 'knowledge' should be

interpreted "to incorporate knowledge, skills, technologies and other capabilities related to an institution's areas of academic specialisation." (PhilipsKPA, 2006) The questionnaire respondents preferring 'technology transfer' generally indicate that their third

stream of activities only consists of transferring technology.

The US Association of University Technology Managers (AUTM, 2006) describes Technology Transfer as:

"a term used to describe a formal transfer of rights to use and commercialize new discoveries and innovations resulting from scientific research to another party. Universities typically transfer technology through protecting (using patents and copyrights), then licensing new innovations. The major steps in this process include the disclosure of innovations, patenting the innovation concurrent with publication of scientific research and licensing the rights to innovations to industry for commercial development."

Many universities have their technology transfer activities organised in a (central) office. The ProTon Domain synthesis report (ProTon, 2003b:10) formulates the root definition of such a Technology Transfer Office (TTO) as:

"an organisation created by the University with the purpose of managing and facilitating the transfer, to enterprises, of technology generated from the results of its own research and development activities, in order to promote the innovation capabilities and the competitiveness of the firms."

These descriptions illustrate the purpose of raising revenues through selling or licensing university based intellectual property to the market, though ProTon more emphasizes the benefits of industry innovation promotion. 'Transfer' as it is described here is primarily an oneway flow from university to industry.

Ergo, though still often used, the term Technology Transfer as umbrella term is becoming outdated, while it does not encompass all university's third mission activities; as stated by a respondent in our questionnaire: "Knowledge transfer has a wider definition (Technology transfer is part of Knowledge transfer) and is becoming accepted as the descriptor in the UK."

However, the comments of the questionnaire respondents regarding the term 'knowledge transfer' relate to the fact that they consider it "as a dynamic and interactive process"; 'transfer' and 'exchange' apparently breathe more a situation like 'I give you something and then you give me something'. The term 'interchange' is proposed, because it should require deeper collaboration and common synergies and should therefore better cover the nature of the third stream activities.

The same is observed in the Australian report (PhilipsKPA, 2006) when explaining the term 'engagement': "the inference of a one-way flow of knowledge, versus a two-way negotiated flow of knowledge for mutual benefit which is usually stressed as a key feature of 'engagement'."

Another comment brought up in the report is that "the 'knowledge transfer' term appears to relate to its historical usage in the knowledge commercialisation domain, thus potentially limiting the scope of the activity it covers." It is in the authors' opinion, though, that this argument is more valid for 'technology transfer'.

In brief: there is an obvious distinction between technology transfer and knowledge transfer (i.e. the latter encompasses the first), but the choice for terminology is somewhat arbitrary. New terms might better capture the two-way flow will come into fashion, but for the time being is complied with the generally accepted term 'knowledge transfer'.

#### **Knowledge transfer definitions**

Keeping in mind the remarks made in the previous paragraph, a number definitions of knowledge transfer is summed up.

In the Lambert Review (2003: 31) is written:

"Transferring the knowledge and skills between universities and business and the wider community increases the economic and social returns from [public funding]. This process is referred to as knowledge transfer."

In a report on entrepreneurship in the Netherlands (EIM, 2003: 22) the focus lies on the transfer of technological knowledge from public knowledge institutions to SMEs. Knowledge transfer, hence, is:

"The transfer of the results of research from the institutions to the commercial sector."

The Scottish Funding Counsel writes in its Joint Corporate Plan 2003-2006:

"The term 'knowledge transfer' is used to describe the ways in which colleges and universities use their knowledge, ideas, skills, expertise and assets to bring benefits to the economy and society in general, whether at a local, national or international level."

In the Australian report different definitions are given for knowledge transfer in general and knowledge transfer for commercial benefit (PhilipsKPA, 2006:31):

"Knowledge transfer is the process of engaging, for mutual benefit, with business, government or the community to generate, acquire, apply and make accessible the knowledge needed to enhance material, human, social and environmental wellbeing.

Knowledge transfer *for commercial benefit* is the process of engaging, for mutual benefit, with

business or government to generate, acquire, apply and make accessible the knowledge needed to enhance the success of commercial enterprises."

While the Australian report focuses on research and research-related knowledge transfer, research-specific definitions are also proposed:

"Knowledge transfer is the process of engaging, for mutual benefit, with business, government or the community to plan, conduct, apply and make accessible existing and new research to enhance material, human, social and environmental wellbeing.

Knowledge transfer *for commercial benefit* is the process of engaging, for mutual benefit, with

business or government to plan, conduct, apply and make accessible existing and new research to enhance the success of commercial enterprises."

#### Argote and Ingram (2000:151) state that

"knowledge transfer in organizations is the process through which one unit (e.g., group, department, or division) is affected by the experience of another."

While reconsidering all these distinct definitions, the ProTon definition captures best the various nuances made in the other describes:

'knowledge transfer' is the encompassing term to describe the "transfer of know-how, expertise, skills and knowledge from one party to another leading to innovative, profitable or economic improvements for government, organisations and individuals in the private and public sectors and in the wider community" (ProTon, 2006) for mutual benefit (PhilipsKPA, 2006:31).

However, "for mutual benefit" is added to stress the reciprocal and two-way nature of knowledge transfer.

## Annex B Online questionnaire (screenshots)

liversi	ty c The	of Twente Netherlands	Nikos Dutch Institute for Knowlegde Intensive Entrepreneurship
Welcon Thanks	ne for par	ticipating in this online c	questionnaire on trans-university knowledge transfer.
The que	stionn	aire consists of 14 page	es: completing will take about 10 minutes.
Conten The proo Knowled Subseq These a	<b>ts</b> cedure dge Tra uently ctivitie	is rather straightforward ansfer organisation. you are asked to indicat s will be questioned in n	d. First you will find some general questions about your current te the Knowledge Transfer activities your office actually carries out. nore detail.
Privacy All inforr informat	r mation ion wil	will be treated confident I be used for research p	tially; reported will be on aggregated data. The provided background urposes only. You will find contact information on the last page.
Instruct After fini return to Please will rest:	ions ishing o a pre use thi art the	the questions on a page vious page, you can use ese navigation buttons a questionnaire.	e you can proceed by clicking the Next Page button. If you want to e the Previous Page button. and do <b>NOT</b> use the Back button of your web browser, since this
Good lu	ck!		Start questionnaire
, Ba	ckg	round informa	ation
1 Ba Pleas	ckg se prov	round informa	ation.
1 Ba Pleas	ckg se prov	round informa vide the following informa	ation.
1 Ba Pleas	ckg se prov 1 2	round informa vide the following informa Name Function	ation.
1 Ba Pleas	ckg se prov 1 2 3	round informa vide the following informa Name Function Organisation	ation.
1 Ba Plea:	ckg se prov 1 2 3 4	round informa vide the following informa Name Function Organisation Type of organisation	ation. ation. University / Technical University University of Applied Sciences Other Please specify
1 Ba Plea:	ckg se prov 1 2 3 4	round informa vide the following informative Name Function Organisation Type of organisation Country	ation. ation. University / Technical University University of Applied Sciences Other Please specify

Context (1/2)			
Please provide the followi	ng information.		
As written in the introduc However, the terminology Please indicate which of	tion, we use the term Kr is not without discussio following descriptions yo	nowledge Transfer. nn. nu prefer: (single answer)	
🔿 Technology Tra	nsfer		
🔿 Knowledge Trai	isfer		
⊖ Knowledge Exc	hange		
🔿 Knowledge Val	prisation		
○ Other Pleas	e specify		
Please explain your prefe	rence:		
Previous Page		Nex	t Page

3	Context (2/2)
J	Please provide the following information.
	What is the driving force behind your Knowledge Transfer activities? (single answer)
	🔿 Legal task
	○ University's mission (self imposed)
	O Money making activity
	O Other Please specify
	•
	Previous Page Next Page

	Inside the organisation	Outside the organisation (e.g. consortium)
Centrally organised (i.e. 1 central office)	0	0
Decentrally organised (i.e. KT activities diffused in the organisation)	0	0

5 Cur	rrent Knowledge Transfer activities (2/5) e provide the following information.
Pleas (multij	e indicate which activities your Knowledge Transfer Office carries out. ple answers possible)
	Patents & Licenses 🗌
	Spin-off / Enterprise creation 🗌
	University-industry links / networks
	Continuous Professional Development 📃
	Regional Subsidies 🗌
	National Subsidies 🗌
	European Affairs 🗌
	Grants 🗌
	Alumni Affairs 🗌
	International cooperation 📃
	Other <mark>please specify</mark>
	Previous Page Next Page

Current Knowledge Transfer	activitie	s (3/5)	
Please indicate the geographical focus for your Kr (multiple answers possible)	nowledge Tran:	sfer activities.	
	Regional	National	International
Patents & Licences			
Spin-off / enterprise creation			
University-industry links / networks			
Continuous Professional Development			
Regional subsidies			
National subsidies			
European affairs			
Grants			
Alumni affairs			
International cooperation			
Previous Page		Next	Page

7

#### Current Knowledge Transfer activities (4/5)

Please indicate the target group for your Knowledge Transfer activities.(multiple answers possible)

	Pacaarchare	Studente	Managare	MNCe*	SMEe*	Othor**
Patents & Licences						
Spin-off / enterprise creation						
University-industry links / networks						
Continuous Professional Development						
Regional subsidies						
National subsidies						
European affairs						
Grants						
Alumni affairs						
International cooperation						
/INC = Multi-national company; SME = Sn	nall/Medium Er	iterprise	** Please s	pecify oth	er (if appli	cable)
Previous Page			Ν	lext Page		
ease indicate in which phase of the entrepreneurial process the Knowledge Transfer tivities are situated.(multiple answers possible)						
-----------------------------------------------------------------------------------------------------------------------------------------	-------------------------	----------------------------	-----------------------------	--		
	Scouting & Screening	Opportunity exploration	Opportunity exploitation			
Patents & Licences						
Spin-off / enterprise creation						
University-industry links / networks						
Continuous Professional Development						
Regional subsidies						
National subsidies						
European affairs						
Grants						
Alumni affairs						
International cooperation						
Previous Page		Next F	Dage			



#### Trans University Knowledge Transfer (2/4) 10 Use the Previous Page button to return to the shown figure. Please use the seven-point scale to assess the level of Trans University Knowledge Transfer you are at in the current situation with respect to your Knowledge Transfer activities. (single answer) 1. Traditional 2. З. 4. 5. 6. 7. Virtual KTO Exchange Ad hoc KTO $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ Patents & Licences Spin-off / enterprise creation $\bigcirc$ University-industry links / networks $\bigcirc$ $\bigcirc$ $\bigcirc$ Continuous Professional Development $\bigcirc$ Regional subsidies $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ National subsidies $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ European affairs $\bigcirc$ $\bigcirc$ Grants $\bigcirc$ Alumni affairs $\odot$ $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ International cooperation $\odot$ $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ Previous Page Next Page



## Trans University Knowledge Transfer (4/4)

Use the Previous Page button to return to the shown figure.

12

Please use the seven-point scale to assess the level of Trans University Knowledge Transfer you want to be at in the **year 2020** with respect to your Knowledge Transfer activities. (single answer)

	1. Traditional KTO	2.	3. Exchange	4.	5. Ad hoc	6.	7. Virtual KTO
Patents & Licences	$\circ$	$\odot$	0	$\odot$	$\circ$	$\odot$	$\circ$
Spin-off / enterprise creation	0	$\odot$	$\circ$	$\bigcirc$	$\circ$	$\odot$	0
University-industry links / networks	$\odot$	$\bigcirc$	$\odot$	$\odot$	$\circ$	$\odot$	$\odot$
Continuous Professional Development	0	$\bigcirc$	0	$\bigcirc$	0	$\circ$	0
Regional subsidies	$\odot$	$\bigcirc$	$\odot$	$\odot$	$\circ$	$\odot$	$\odot$
National subsidies	0	$\bigcirc$	0	$\bigcirc$	$\circ$	$\circ$	0
European affairs	$\odot$	$\bigcirc$	$\odot$	$\odot$	$\circ$	$\odot$	$\circ$
Grants	0	$\bigcirc$	0	$\bigcirc$	0	$\circ$	0
Alumni affairs	$\odot$	$\bigcirc$	$\odot$	$\odot$	$\circ$	$\odot$	$\odot$
International cooperation	0	$\bigcirc$	0	$\bigcirc$	0	$\circ$	0
	0	$\odot$	$\odot$	$\odot$	$\circ$	$\circ$	$\circ$
Previous Page				Nex	t Page		

Knowledge Transfer activ	ities			
Please provide the following information.				
Please denote the three most important Knowledge Transfer activities. (1 = most important; 2 = second most important; 3 = third most important)				
Patents & Licenses				
Spin-off / Enterprise creation				
University-industry links / networks				
Continuous Professional Development				
Regional subsidies				
National subsidies				
European affairs				
Grants				
Alumni affairs				
International cooperation				
Previous Page		Last page		

14 The	e end
	This is the end of the questionnaire!
	Thanks for participating!
	Please feel free to address remarks and comments of any kind in the textbox below, or contact Sjors van der Heide or dr. Peter van der Sijde.
	e-mail: s.vanderheide@student.utwente.nl phone: +31 (0)53 489 5451
	University of Twente: www.utwente.nl/en Nikos: www.utwente.nl/nikos
	Fill out your e-mail address below if you wish to receive a summary of the questionnaire results.
	End & cond!
	Previous Page

## Annex C Interview protocol exploratory cases

- Short Introduction (of myself)
- Intention of the interview (getting information about the interviewee, his/her work and his/her vision on TUKT (seen from their work perspective))
- ➤ Time indication (+/- 1 hour)
- > Please tell something about yourself (short CV) and your work
- Start interview questions (and feel free to ask questions anytime)
- 1. Definition of the topics
  - a. What is KT? [KT = Knowledge transfer]
  - b. What is TUKT? [TUKT = trans-university knowledge transfer]
- 2. Analyzing the current KT organisation
  - a. from an economic (e.g. financing), strategic, cultural and network perspective
  - b. seen in the stage of development of the KTO (incipient stage, implementation stage, consolidation stage, self-sustaining growth stage; cf. Etzkowitz, p. 249)
  - c. KTO's focus (considering the entrepreneurship process as a three step process of (1) Business recognition  $\rightarrow$  (2) business exploration  $\rightarrow$  (3) business exploitation)
- 3. Analyzing possibilities for trans-university KT (forecast)
  - a. from an economic (e.g. financing), strategic, cultural and network perspective
  - b. on which level TUKT? (e.g. on KTO level, university level, project level, etc.)
- 4. What should be drivers for TUKT?
- 5. Can you show examples of projects that could be executed between universities?
  - a. How? (at which level, which structure, who will be involved, etc.)
  - b. What needs to be done to achieve TUKT on project level? / Can TUKT be achieved on project level?
- Do you have any questions?
- > Do you wish to add something (which we forgot)?
- > Are there relevant documents, websites or other stakeholders which I can consult?
- Can I contact you if there is anything I would like to ask (ask e-mail)

#### Thanks for your cooperation!

## **Annex D.1 Sources of information for exploratory cases**

The exploratory cases consist of interviews with various KT practitioners and additional written sources. This Annex provides a list of interviewees and some extra information on the first three universities.

#### \*\*\* The interview information is not disclosed due to privacy reasons \*\*\* (this is the public pdf-version)

Additional information for the exploratory cases was obtained through the self-evaluation case reports, written by each DIFUSE participant. These case reports are not publicly available, but a book with the project results will be published shortly after finishing the project (approximately spring 2009).

No formal interviews took place for the analysis of the University of Twente (University # 4). During the writing sessions for the DIFUSE Case report of the University of Twente, necessary information was obtained instantly by contacting the responsible staff members. Additional written sources are referred to in the Case report, fully enclosed as Annex D.2. The University of Twente case report is jointly written by Dr. Peter van der Sijde and Sjors van der Heide.

## **Annex D.2 Case report University of Twente**

## 1. University of Twente

## Profile of the Twente region

The region of Twente<sup>1</sup>, in of the Province of Overijssel, is located on the eastern border with Germany and is part of the *Euregio*, a transregional cooperation between bordering areas in Germany and the Netherlands. The size of Twente is 143,000 hectare; there are about 600,000 inhabitants, who live in 14 municipalities; half of them live in one of the three cities Enschede, Hengelo or Almelo. These three cities have a function towards the neighbouring towns for medical care, industrial estates and (large) companies.



Figure 1. Geographical map of Twente in relation to the Netherlands



Figure 2. Geographical map of Twente

Higher Education Institutions (HEIs) are concentrated in the largest city of Twente, Enschede: the University of Twente (UT), Saxion University of Professional Education (Saxion), AKI Visual arts and design academy, ITC (International Institute for Geoinformation Science and Earth Observation), Telematics Institute, TSM Business School, SWOT (business school).

The eastern Netherlands boasts a strong concentration of knowledge and high-quality business in health care, food and technology. A smart combination and application of this knowledge can contribute substantially to Dutch innovation potential and help to take full commercial advantage of the knowledge available. The provinces of Gelderland and Overijssel, the business community and leading knowledge institutes in the region have combined their strengths in TRIANGLE, focusing on 'healthy humans'. The partners in this collaboration look for solutions to the issue of 'staying healthy, becoming healthy and efficient health care' - a theme that can be addressed at a regional level but is of national and global significance.



Figure 3. University of Twente and its regional stakeholders

## Profile of the University of Twente

The University of Twente (UT) was founded in 1961 and is the only campus university in the country. The campus offers an environment in which the academic and personal development as well as the entrepreneurial senses of the UT-students are actively stimulated and facilitated. Organised under the all-encompassing *Student Union* students themselves are responsible for the management and governance of all the

campus facilities. Founded in 1999 and being the only organisation of its kind in the Netherlands. Currently some 7.700 students and almost 100 student organisations are affiliated. The *Student Union* is also actively involved in the stimulation of student entrepreneurship (see <u>www.use.utwente.nl</u>).

In 2005 the UT offers:					
•	19 Bachelor's				
	programmes				

• 25 Master's programmes

The figures show that almost 2.000 first-year students arrived in 2005. The total staff number sums up to 2388 FTE, of which 1400 FTE scientific personnel. Not included in this number are 732 PhD students, active in various research areas.

The UT is profiling itself<sup>2</sup> as an entrepreneurial research university with a focus on technological developments in the knowledge society. Mindful of the responsiveness this knowledge society requires from an university and the UT's special responsibility for designing and implementing a sufficiently broad knowledge potential in the science and technology sectors, the UT aspires to establish a single Federation of Technical Universities (3TU) in The Netherlands by 2010. The 3TU must be able to operate powerfully and decisively at the national and international level. Within the 3TU, the UT focuses on **education of excellent quality**, on **research of a recognised international level** – resulting in top-level research in several areas – and on the derived **valorisation activities** that encourage the economic and social development of the UT's environment, particularly the north-eastern Netherlands, Twente and the Euregion. Based on the interrelationship of social and technological innovation, the UT's special character manifests itself in strategic public-private networks and in a campus where academic training takes place.

## Research profile

Research at the UT is of a recognised – leading – international level and

- Contributes to fundamental technological and social innovation by its unique combination of experimental and design-oriented technical research and research in social and behavioural science focusing on the implications of technological innovation and the development of the knowledge society
- Is multidisciplinary, rooted in disciplinary knowledge domains
- Is organised in a limited number of powerful, internationally oriented research institutes
- Is performed in close interaction with public and private players in society

The UT concentrates its research in six socalled Spearhead Institutes:

- MESA+, Institute for Nanotechnology;
- BMTI, Institute for Biomedical Technology;
- CTIT, Centre for Telematics and Information Technology;
- IMPACT, Institute of Mechanics, Processes and Control Twente;
- IGS, Institute for Governance Studies;
- IBR, Institute for Behavioural Research.

• Offers opportunities for the development of new and potentially promising fields.

## Distinctive features

Knowledge valorisation and the stimulation of academic entrepreneurship are important features of the UT policy. The UT's structure for Knowledge Transfer and knowledge valorisation is illustrated below.



Figure 4. The UT's structure for Knowledge Transfer (KT) and knowledge valorisation (the size of the KT square does not refer to the contents or extent of the KT activities)

The UT is organised in five faculties:

- BBT, faculty of Business, Public Administration and Technology
- CTW, faculty of Engineering Technology
- EWI, faculty of Electrical Engineering, Mathematics and Computer Sciences
- GW, faculty of Behavioural Sciences
- TNW, faculty of Science and Technology.

On central level, one of the members of the Executive Board is responsible for the knowledge valorisation portfolio.

Legal and financial advisors can be consulted for all KT related activities.

The purpose of the Innovation Lab is to observe, monitor and manage the activities happening at the decentralised level. This is expected to provide more structured and systemized approach towards knowledge valorisation.

The faculties and the research institutes are in practice

intertwined in a matrix structure. Knowledge valorisation and technology transfer at the

UT are decentrally organised. Each research institute has it's own KV and TT structure for, and has an interface for dealing with, these matters.

While the Innovation Lab monitors these KT activities centrally, three research institutes have their own (i.e. decentral) business accelerator. Business accelerators are persons who fulfill, for a certain (technological) domain, scouting and screening activities, patent strategy, preparing business start ups, fund raising and similar activities. The UT research institutes set up Business Accelerators to put new products on the market at the accelerated pace by means of specific support of entrepreneurial employees or by finding companies that will market technological innovations. Matchmaking and specific business support are key activities.

Nikos (Dutch Institute for Knowledge Intensive Entrepreneurship) is an expertise centre on entrepreneurship that closely works together with the research institutes and the Innovation Lab. The core activities of Nikos are:

- Researching entrepreneurship in networks
- Teaching entrepreneurship at the undergraduate and graduate level; supervising PhD students at the UT and foreign universities
- Consultancy services and training in the field of entrepreneurship to primarily high-tech firms
- Implementing business development support projects focusing specifically on knowledge-intensive entrepreneurship in new or established companies, universities and regions. Business development, e.g. via TOP (see chapter 4), KEB (Kansrijk Eigen Baas – Be successfully your own boss) and the activities together with the Innovation Lab. Also activities outside the UT are developed.

The UT participates in the Knowledge Park (see chapter 3). BTC Twente is an incubator, located at the Knowledge park, offering office space and related facilities. BTC focuses on knowledge intensive and high tech service companies.

The Ontwikkelingsmaatschappij Oost NV participates in projects and programmes stimulating regional development.

Besides these direct relations, the UT actively cooperates with various regional and national institutions.

# 2. University of Twente's policy towards knowledge exploitation

## **Ownership of intellectual property**<sup>3</sup>

In 1996, the Dutch ownership of intellectual property Act was changed with respect to inventions made by researchers in higher education institutions. Before 1996, ownership was with the inventor; since 1996 ownership has been with the higher education institutions.

The consequence of this is that only the UT can enter into arrangements to exploit the Intellectual Property (IP) generated in the institutions. Further, the UT itself allowed to set framework conditions regarding the ownership of IP; in general terms, there are three different modes:

- IP generated via UT-financed research: in this case the UT owns all the rights
- IP generated in the framework of a (research) contract for a particular (large or small) company: UT can enter into a contract specifying who owns what and which party owns the right to exploit the IP generated from this contract. Often the company registers for the patent.
- IP generated in a research consortium: a research consortium formed to carry out a project under a European Framework Programme the terms for exploitation are written down in a Consortium Agreement among the partners and at the end of the project the partners have to submit an exploitation plan. Most often, the results are co-owned by all partners, although exceptions are possible.

In 2005 31 patents were registered.

# **3.** University of Twente's implementation of knowledge exploitation

## Breakdown of research financing

Total university budget (in M€)	253,3	256,6	265,1
Ministry of Education grant (in M€)	164,1	160,5	162,9

Tuition fees (in M€)	11,5	11,9	12,2
External funding (in M€):			
from secondary flow of funds (national)	19,6	22,6	25,8
from secondary flow of funds (international)	8,1	6,6	7,9
from tertiary flow of funds (private)	28,0	35,6	30,1
Sundries	22,0	19,4	26,2

## Financing of KT activities

Activities on central level are centrally financed. Activities on decentral level are paid by third parties (project based financing) or financed from the central organisation's lump sum.

## KT process description

Scouting of ideas and screening of potential business opportunities represent the first stage of the entrepreneurial process (see figure 5). Scouting and screening at the UT are fully decentralized processes, executed at the level of research institutes. Business Accelerators are established in three of them to provide structural commercialization. Scouting and screening are the responsibility of a business developer. Coordination of these activities, as well as of other aspects of knowledge valorisation from the centralized level, is executed by the Innovation Lab.

KT processes occur both at individual level and institutional level. While business developers focus on ideas with high potential on the research institution level, on inidividual level it is a matter of self selection. Nikos supports ideas from individuals, both of high and low potential, but of sufficient quality (e.g. via the TOP-programme (chapter 4)).



Figure 5. The entrepreneurial process (with scouting and screening in the first stage)

## KT organisation and support tool

See the distinctive features description in the first chapter.

## Knowledge transfer periphery<sup>4</sup>

Recent research commissioned by the Ministry of Economic Affairs and carried out by TopSpin shows that the UT has realised the most spin-off of all Dutch universities. The number two in the list has generated only half the spin-off. The UT intends to intensify its valorisation policy in the coming period to set itself apart as the most entrepreneurial university in Europe. European and Dutch policy appeals to universities to promote innovation and high-quality employment. Based on its mission and profile, the UT will establish a three-track policy comprising the conversion of knowledge into business, the encouragement of entrepreneurship among staff and students, and the establishment of a Knowledge Park. This three-track policy clearly demonstrates that in the UT's vision, knowledge valorisation is much more than realising spin-offs.

#### Converting knowledge into business

The UT established a UT Innovation Lab for the conversion of knowledge in business. Combining knowledge and experiences in the areas of intellectual property and knowledge exploitation, the Innovation Lab is supported by the commercial branches of the UT institutes and by the expertise available at central level. It also co-ordinates the two key tools that are to contribute to the conversion of knowledge in business: encouraging entrepreneurship in staff and students, and setting up the Knowledge Park. With the UT Innovation Lab, the structure has been created to efficiently support the content-related activities ensuing from the Technology Valley and to enable upscaling of successful practices to the national level.

## Encouraging entrepreneurship

Encouraging entrepreneurship in students and staff is not just one of the key instruments used to convert knowledge into business, it is also a de facto manner of putting a key part of the UT's profile into practice. Policy is aimed at further developing any elements already present in this respect, such as education and research in entrepreneurship by way of the minor in entrepreneurship, i.e. elective subjects in business development to stimulate an enterprising nature among students and graduates. The *Student Union* will also be developing activities in this area, while an important role is to be played by Nikos (see section 1, distinctive features).

#### Knowledge park

Converting knowledge into business by boosting entrepreneurship in students and staff is ultimately put into effect as part of the Knowledge Park, a collaboration of the province of Overijssel, the cities Enschede and Hengelo and the UT, supported by the Ontwikkelingsmaatschappij Oost NV. Set up to create high-quality employment, Knowledge Park is the conclusion of a growth process set in motion through the *entrepreneurial university* concept.

The UT involves its partners in research wherever possible. The partners, in turn, will offer UT the use of their facilities. An example is the T-Xchange Cell set up with Thales for co-operation at various levels and in various core areas, including the exchange of staff. The UT intends to set up several of these T-Xchange Cells in the period up to 2010.

Example of an innovation and development process accelerator

#### **T-Xchange**

Innovating the innovation process itself, the T-Xchange method enables industry, government, the business community and research institutes to expedite and further explore the innovation and development process.

T-Xchange approaches innovation and development processes in a unique way, challenging the designer for out-of-the-box thinking processes. This approach involves the use of scenario-based design, which means that no product or service exists yet, only a description of a situation requiring a solution. By visualising these descriptions, as well as potential solutions, you can start gaming to find the best solution.

VR technologies such as a semi-circular projection screen for 3D visualisations and desks with tablet PCs are available in the new lab. The players' moves are registered so that the process can be monitored and adjusted where necessary.

## 4. Case examples of major and distinctive initiatives<sup>5</sup>

## Case example 1: TOP – Temporary entrepreneurial positions

The University of Twente started the TOP-programme in 1984 to help graduates, university staff and people from trade and business to start their own companies. In the period 1984-2003 330 persons used the programme; they have established about 270 companies. Someone who wants to use the TOP-programme must fulfil the following criteria:

- have a concrete idea of a knowledge-intensive or technology oriented company that can be linked to the fields of expertise of the university;
- be available for a minimum of 40 hours a week;
- have a business plan that meets a number of set requirements.

As a rule, the future entrepreneur makes contact with one of the coordinators of the TOP-programme. In a first meeting, they check whether the business idea fits within the TOP-programme. An important criterion is the link of the company with the expertise of the university. If this is the case, it is time for a concrete business plan. This plan should be limited to the fundamentals; first it is discussed with the TOP-coordinator, thereafter with the TOP-committee. This body determines whether someone will be admitted to the programme. The committee also evaluates the progress during the year the entrepreneur takes part in the programme.

After admission the entrepreneur is expected to work full-time on the company. After 6 months there is a mid-term evaluation by the TOPcommittee and after 1 year the support via the TOP programme ceases; the TOP committee has one more meeting with the entrepreneur to discuss the future development of the company. During the one-year support the TOP entrepreneur receives office space and facilities, access to networks, a scientific and a business manager, and an interest- free loan ( $\leq 14,500$ ). The loan has to be repaid in 4 years starting in the year after leaving the TOP programme.

The TOP programme is open to all members of the academic community and to all others who meet the requirements.



About 20 persons participate in the TOP programme annually. Since 1984 some 370 individuals have received support and some 320 companies have been created. The survival rate of the companies: first-year survival rate is 99%, the 5- year survival rate is about 89%, and the survival rate of all companies since 1984 is 76% (data from 2000). On average TOP companies grow to 5 or 6 employees and on a regional level they are responsible for some 150 new jobs annually.

## Case example 2: Small business growth programme

The "Small Business Growth Programme" is an entrepreneurship / business administration course for directors, business unit managers and (family) successors in the SME sector. The business of the participant is central. Focus lies on business disciplines and/or personal management skills in reference to day-today problems: strategy, marketing, finance, innovation, personnel – and organisational theories.

Participants are asked to write and implement a business plan. Every participant is being assisted in this by an (experienced and technically-oriented) business administration student of the University or University of Professional Education. For example, the student would help and/or execute individual projects such as customer analyses, research of competitive market, financial queries, HRM regulations etc.

There is a beneficial interaction between participant and student: the participant uses the theoretical knowledge of the student (access to knowledge of University) and the student obtains practical access to the SME (SME fieldwork). The programme is offered by TSM Business School twice a year. The group size varies from 14-16 participants, consists of 5 two-day seminars over a period of 6 months. Group 34 recently started.

Participants have at least a few years managerial experience and are mostly from the Twente region. The programme stimulates access to and use of the local network. Participants regard this (spin-off) aspect of the programme as very important and they actively invest in this local network, even long after the programme has finished.

Lecturers in this programme show a broad entrepreneurial experience. The assisting students in turn get a chance to work in the SME field. Practical assignments are mostly carried out in large firms. This programme offers an excellent chance for students to access SMEs.

Participants' surveys show an improvement in customer relations, more knowhow / confidence concerning financial matters/risks, better use and understanding of HRM. Result for the participant is twofold: a positive result for their own business and growth in personal leadership skills. Lasting spin-off benefits of local network.

The benefits for the student (and lecturers of University / UPE) are not to be neglected: an excellent chance of interaction is offered as the student works directly with SME-managers.

## **5.** + **6.** Business creation and interaction with the

	Patents &	Interaction with	<b>Business Creation</b>
	Licenses	Industry	
UT	UT owns few	With large companies	Institutional spin-offs
Research	patents, but are	& clusters	/ research spin-offs
Institutes	"inventors"	<ul> <li>Facility sharing</li> </ul>	based on UT IP
		• Joint R&D ventures	
		• Joint research	
		Contract research	
		Consultancy	
		• CPD	
Nikos		Matching SME with	Individual spin-offs
		students & research	based on "non-UT"
		institutes	IP
		• Zone of opportunities	
Student			University Student
Union			Entrepreneurs

## business community

As reported in the earlier sections, the University of Twente does not have a knowledge transfer office as such, but it does have many knowledge transfer and valorisation functions. The task of knowledge transfer and valorisation is a task of the research institutes themselves. The tasks of the institutes are in three different domains:

- *Patents and licenses:* The UT owns very few patents and licenses at this moment. Most patents are developed in the framework of contract research and according to the contract underlying the research, the rights to patent and commercialise goes to the contractor. Although, via recent developments, such as the Innovation Lab, the university will develop and apply for (more) patents (see also section 2 Intellectual Property the remarks on Scouting and Screening).
- *Interaction with (large) Industry:* There are different routes or mechanisms for university industry interaction and all of the activities are part of the tasks of the research institutes:
- Exploitation of "*embedded*" *knowledge*: there is a lot of knowledge embedded in the university equipment and facilities; these university facilities are (most of the time) rather state-of-the-art and could be put at the disposal of companies (facility sharing).
- *Joint R&D ventures* with industry or clusters of companies: one of the core tasks of a university is doing research and the built-up expertise could be used to team up with industry (one company or a group of companies) to work on more industrial oriented research leading to the development of new products; such a joint venture will be a new legal entity in which the university receives equity e.g. in return for knowledge (expertise and patents/licenses) and the use of university facilities (equipment, building).
- *Joint research with industry:* The University carries out research together with (large) companies and R&D institutes, e.g. the cooperation with Cores.
- *Contract research for industry*: although contract research is a traditional way of commercializing knowledge, it is also a way of producing new knowledge under commission of and together with a third party. Especially this last aspect ("together") should be emphasized in the case of a university: contract research should not only bring in money, but also (new) knowledge (and technology.

- *Consultancy*: Via consultancy knowledge and technology can be transferred via a personal involvement of a staff member to industry.
- *Continuous Professional Development (CPD)*: Via CPD the knowledge and the technological developments are transferred to industry via training programmes and workshops.
- Interaction with SMEs: The interaction with small and medium sized enterprises is an activity that needs a more centralized approach at the University. Nikos runs a project (granted by the Dutch Ministry for Economic Affairs) called "Zone of Opportunities". Via this project SME, who do not have existing contacts with the University but are in need of support that can be supplied, are brought into contact with research institutes and/or students. There is a database with opportunities for students as well as for SMEs.
- Business Creation: Two types of business creation (spin-offs) are distinguished (1) spin-offs based on university IP, and spin-offs based on the entrepreneur's own IP or public domain knowledge.
  - Spin-offs based on university IP: The companies that spin-off from research in e.g. the research institutes as MESA+, CTIT and BMTI go through the institutes "accelerators" and are supported by experienced business developers. The coordination of this activity lies with the Innovation Lab.
  - *Spin-offs based on non-university IP*: The companies that created by graduates and staff members with no explicit UT-IP involved can be supported under the TOP programme of the UT (see Section 4).

The university also supports the entrepreneurial activities of students and facilitates via the Student Union and its taskforce USE (University Student Entrepreneurs) student-entrepreneurs.

Example of a joint R&D venture

#### Roessingh Rehabilitation Center and UT's Institute for Biomedical Technology (BMTI)

Started in the early 70-ies. Both organisations contributed on average with 5 - 10 FTE's in research capacity. In 1993 a formal cooperation agreement was signed between the two partners in which research objectives, organisational planning and sharing of infrastructure were described (CeRT). The mission of the group was to obtain a formal recognition as academic research centre for technical rehabilitation medicine, which was obtained in 2002.

Nowadays the joint capacity of the two groups is more 50 FTE.

The benefits for the UT are:

- Cooperation with (para) medical staff
- Availability of infrastructure and facilities for incorporation of patients in R&D projects, patient related procedures like Medical Ethical Cie, Insurances, safety instructions
- Increased funding options at Health Care organizations
- Improved possibilities for accurate Demand/Problem definition for research projects.

The benefits for the Roessingh Rehabilitation Center are:

- Academic status of own research organisation
- increased attractiveness for recruitment of senior staff
- Unique position at the forefront of technological developments.

Each partner retains ownership and control of background and foreground know how. This was and is possible because of the clear difference between the two competences involved (technological vs (para)medical). No contract research occurred (i.e. no money flow from one partner to the other).

## 7. Building an entrepreneurial culture

The University of Twente is an entrepreneurial university and as such it was mentioned and described already in 1997 in a book by Burton Clark ("Creating entrepreneurial universities"). Clark considers universities entrepreneurial when they are entrepreneurial in their activities. In Clark's first book Twente is specifically presented as an example of a university spinning out companies. In Clarks second book (2003) he also mentions the UT changes in management structure. In this section some of the issues connected with these topics are addressed.

#### Stimulating entrepreneurship among researchers

It is difficult to exactly point out the university's activities to stimulate researcher to become more entrepreneurial. It is already embedded in the system of the research institutes – each research institute has a managerial of a commercial director whose task it is to look after knowledge valorisation. The stimulation to become aware of the commercial potential of research lies in the institutes themselves.

Further, entrepreneurship is widely stimulated on Campus via regular meeting in the Faculty Club: entrepreneurs and research meet on a once per month basis to discuss

mutually interesting topics. Researchers and research institutes are also members of entrepreneurs associations, such as the Industrial Circle Twente (<u>www.ikt.org</u>) and the Technology Circle Twente (<u>www.tkt.org</u>).

As mentioned before, the TOP programme (managed by Nikos) matches every entrepreneur with a mentor from science. Over the years every research group has had at least one entrepreneur to mentor and "live" in the research group – all research groups have been "exposed" to starting entrepreneurs.

## Stimulating entrepreneurship among students

The stimulation of entrepreneurship is a task of the Student Union's taskforce USE (University Student Enterprises. Entrepreneurship is supported in two manners:

- Student Business Centre on the Entrepreneurship Plaza of the Building Bastille: (registered UT) students can rent at below market-rates office space;
- Network activities: regular meetings between student-entrepreneurs;
- Training of entrepreneurial skills:
  - o Organisation of workshops (e.g. on "elevator pitches").
  - Skills programme: A new initiative started in October 2006, is a course in the framework of the Skill Certificate programme of the Student Union called "Spirit of Entrepreneurship". This course is extracurricular and taught in the early evening and emphasizes more than the curricular programme the entrepreneurial skills.

#### Education and training to support entrepreneurship

At the University of Twente there are entrepreneurship programmes for aspiring students since the mid 80s. Since the end of the 1990s there also is a so-called Minor programme in Entrepreneurship (executed by Nikos). This is a programme primarily for non-business (engineering) students, but also for business students.

It is a 20 ECTS credit programme and consists of the following courses for nonbusiness students:

- Market-oriented entrepreneurship
- Financial management
- Business law
- Become your own boss (writing a business plan for your own company), or

• Managing an SME (support writing a business plan for an existing company)

Further Nikos has a one year track within the M.Sc. in Business Administration programme. Via connections with Aalborg University in Denmark it is possible to also do the two-year programme which recognises all courses taken at the University of Twente.

## Incentive schemes

Presently the UT has few incentive schemes. Only for patents and the division of royalties coming through them is arranged. Other incentive schemes are informal – such as a new computer, a laptop computer, an extra conference etc.

## **Business competitions**

The UT runs no specific business competition, but takes part in the New Venture initiative. This competition has three rounds: (1) idea phase  $\rightarrow$  (2) feasibility  $\rightarrow$  (3) business plan.

Often teams from the UT participate and end receive prices in the first two rounds. In 2005 the TOP-company Recore won the main price in the competition. Also (spin-off) companies enter in the LifeWire competition and won in 2004 the competition.

## Engagement with financiers

For the TOP-programme the UT has its own fund. TOP-companies are provided with a loan under favourable conditions (no interest and 4 year pay-back period). The UT is a shareholder in the PPM-Oost fund, which includes the former Innofund. Further, the research institutes and the Innovation Lab have industrial board with representatives financiers.

## University investments in companies

Up to 1997 the University did not invest in individual companies. This policy changed and the University can and has invested in spin-off companies, especially those companies that are research spin-offs and close to the research.

## 8. Regional policy context

## Tasks and responsibilities of local authorities<sup>6</sup>

Like all areas in the Netherlands, Twente falls under the Dutch system of administrative governance. The Netherlands is a decentralised unitary state with two types of 'lower governments' besides the national government (*rijksoverheid*): provinces (*provincies*) at the regional/county level and municipalities (*gemeenten*) at the local level. The lower governments have an autonomous position, but the extent of their autonomy is determined by the national government. The higher administrative levels also supervise the lower ones and can demand cooperation from them. The set-up of this system implies that the tasks and responsibilities of Dutch provinces and municipalities are largely dependent on the national government. In matters of macro-economic and social-distributional policies, the national level is in charge. When it comes to the provision and allocation of local amenities, the lower governments come on the screen.

## Governance in the economic and educational domain<sup>7</sup>

As in all policy domains, spatial-economic and educational policy at the regional level cannot be separated from national and provincial plans in this field. At the moment, the economy of Twente is subject to national policy (funds within the framework of Dutch regional-economic policy) and provincial policy (Triangle-strategy and Regional Innovation Platform). In the recent policy document Peaks in the Delta (Ministry of Economic Affairs, 2004), Twente figures as one of the five Dutch regions that have been designated as R&D-Hot Spots. The designation of Twente as an R&D-Hot Spot is an important recognition; it shows that the Dutch government sees Twente as a region with opportunities rather than a place with problems. The Triangle is a project of Oost NV, the joint regional development corporation for Overijssel and Gelderland, promoting closer research cooperation between the UT (Technology Valley), Nijmegen (Health Valley) and Wageningen (Food Valley). With the help of all these partly overlapping policies Twente should develop into a Top Technology Region with a focus on innovation in clusters like materials and health technology. A similar goal has been formulated in the Region's Regional Economic Development Plan for Twente (REOP), although in this strategy also recreation and tourism receive a great deal of attention. At the moment, ES, Saxion and UT investigate the possibilities for the establishment of a *Twente Instituut voor Lerarenopleidingen* (Twente Institute of Teaching). This institute should help to attract more students for a job at primary and secondary schools. In this way, it is hoped to give in to the shortage of teachers and managers in primary and secondary education that is threatening the region of Twente.

## 9. Self-assessment SWOT

Strenghts	Weaknesses
<ol> <li>UT embeddedness in regional activities</li> <li>Supply of state-of-the-art knowledge and technology</li> <li>Extensive knowledge infrastructure</li> <li>Decentralised organisation of KT</li> </ol>	<ol> <li>Access to knowledge infrastructure (not an 1-stop shop)</li> <li>Location (in the eastern part of the country)</li> <li>Access to finance (business angels and venture capitalists)</li> </ol>
Opportunities	Threats
<ol> <li>Innovation Lab as 1-stop shop</li> <li>Cooperation with other higher education institutions</li> <li>3TU and ECIU networks</li> </ol>	<ol> <li>Stable government policy</li> <li>Other universities (the global challenge)</li> <li>Innovation Barometer (The Netherlands is 'losing momentum')</li> </ol>

## **10.** Perspectives

From this report and the SWOT analysis some conclusions with regard to the UT can be drawn:

- > The UT is decentrally organised.
- > Technology transfer functions embedded in different departments of the UT.
- Knowledge exploitation and valorisation is one of the three main topics within the UT policy (next to education and research).



- > The UT has three on campus incubators (i.e. business accelerators)
- > The UT actively stimulates entrepreneurship.
- > The UT participates in an incubator and in the knowledge park (located off campus).
- Interaction with industry and business creation are the most occurring activities concerning knowledge valorisation.
- > The UT is well embedded in the regional context.

The perspective the UT has on knowledge valorization is to optimize its procedures, increase its involvement in (research) spin-offs, in order to better improve the uptake of (new) research and technology in the society.

## Appendix A QUANTITATIVE DATA

	2003	2004	2005
Total number of students	7058	7357	7673
Number of first-year students (incl. enrolment in Master	1619	1813	1971
degree courses)			
Total number of PhD students	627	703	732
Number of completed doctorates	144	136	166
Number of teaching and research staff (fte's)	1352	1390	1412
Number of technical and administrative staff (fte's)	1020	1002	976
Number of knowledge transfer staff (fte's) (estimated)	6	8	11
Total university budget (in M€)	253,3	256,6	265,1
Ministry of Education grant (in M€)	164,1	160,5	162,9
Tuition fees (in M€)	11,5	11,9	12,2
External funding (in M€):			
from secondary flow of funds (national)	19,6	22,6	25,8
from secondary flow of funds (international)	8,1	6,6	7,9
from tertiary flow of funds (private)	28,0	35,6	30,1
Sundries	22,0	19,4	26,2
Number of invention disclosures ("pre-patents" filed)	n.a.	n.a.	n.a.
Number of patents filed	n.a.	n.a.	n.a.
Number of patents granted	46	26	31
Licensing income in €	n.a.	n.a.	n.a.
Number of licences assigned	n.a.	n.a.	n.a.
Number of spin outs	16	26	30
Number of student/staff start-ups (in TOP-programme)	9	11	15
University financial investment in spin-outs in €	n.a.	n.a.	n.a.
Third party investment in spin-outs in €	n.a.	n.a.	n.a.
Number of industrial contracts	n.a.	n.a.	n.a.
Number of science parks	1	1	1
Number of incubators	4	4	4
(3 business accelerators in research institutes on campus; 1 off			
campus: BTC Twente)			



- 1. The OECD Self-Evaluation Report of Twente 2005 is available at: http://www.oecd.org/dataoecd/15/60/35883426.pdf
- 2. The UT Institute Plan 2005-2010 is available at: http://www.utwente.nl/en/matrix/board/zbsmpae-instituteplan.pdf
- 3. More information on the TOP-programme is available at: <u>http://www.utwente.nl/top</u>
- 4. More information on the T-Xchange cells is available at: http://www.kennispark.nl/kennisparkuk/Projecten/T-Xchange/

<sup>&</sup>lt;sup>1</sup> This paragraph is adopted from the OECD Self-Evaluation Report of Twente 2005 (par. 1.1)

<sup>&</sup>lt;sup>2</sup> This paragraph is adopted from the mission statement in the UT Institute Plan 2005-2010 (p. 3)

<sup>&</sup>lt;sup>3</sup> This paragraph is adopted from the OECD Self-Evaluation Report of Twente 2005 (par. 3.3.1)

<sup>&</sup>lt;sup>4</sup> This paragraph is adopted from the UT Institute Plan 2005-2010 (pp. 25-26)

<sup>&</sup>lt;sup>5</sup> Both case examples are adopted from the OECD Self-Evaluation Report of Twente (app.G3,G20)

<sup>&</sup>lt;sup>6</sup> This paragraph is adopted from the OECD Self-Evaluation Report of Twente (par. 1.3.1)

<sup>&</sup>lt;sup>7</sup> This paragraph is adopted from the OECD Self-Evaluation Report of Twente (par. 1.3.3)