

## KNOWLEDGE TRANSFER THROUGH UNIVERSITY-INDUSTRY RELATIONS: SOME ASPECTS OF ORGANIZATIONAL CULTURE<sup>1</sup>

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### Abstract

The role of national universities and other higher education institutions in knowledge transfer in countries with post-Soviet economies has been studied in very modest extent, especially in the context of small countries. This paper concentrates on the organizational culture aspects playing important role in the commercialization of university research within the university knowledge transfer and knowledge based society framework in Estonia. Knowledge sharing and commercialization depend on nature of organizational culture, as a part of internal environment. Two largest Estonian universities (University of Tartu and Tallinn University of Technology) are compared in various factors influencing knowledge transfer using document analysis and interviews. The present study has shown that knowledge transfer faces numerous issues, and in particular soft issues (individual mindsets and organizational values) may differ from university to university.

**Keywords:** university knowledge transfer, commercialization of university research, organizational culture, organizational values

**JEL Classification:** M14, I123, O31

### 1. Introduction

The role of universities and other higher education institutions in knowledge commercialization in countries with post-Soviet economies has been studied in very modest extent. This is a wider problem and analysis, carried out by Geuna and Muscio (2009) revealed that there are some features (beyond technological ones) related to the corporate partner's strategic and functional characteristics, which come to be decisive for success. Knowledge creation and transfer into industry, and contract and collaborative research are still weak in various respects.

Traditionally, teaching has been considered to be the role of the university since medieval times. Research became a legitimate function of the university in the late 19th and early 20th centuries. This turn was called as the first academic revolution (Etzkowitz 2004). Now, about 100 years later, the previous missions of universities – teaching and research – have been complemented by a third – contributions to economic and social development of the society. The adoption of this third mission

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of universities is referred to as the second academic revolution. For universities this means descending from the ivory tower and becoming a generator of economic wealth in society. This is mainly achieved by valuing the intellectual products of research as assets, and commercializing the results of research as a way of 'capitalizing' knowledge assets (Etzkowitz 2004). The intensive economic and social development after World War II led to the creation of alliances between universities, government, and business for the production of 'useful knowledge' instead of the traditional view according to which researchers were autonomous in producing knowledge that was perceived as an 'endless' frontier assuring ever-increasing wealth (Stevans, Bagby 2001: 259). There is an outstanding experience of creation of such an alliance in the recent history. Namely, the organization of networks, money, and talent around Stanford's research engine generated "Silicon Valley Fever". (Rogers, Larsen 1984). It is assumed that universities should take a proactive role in the knowledge transfer in the modern society.

The entrepreneurial role of the universities is examined most often in traditional market-economy countries (Etzkowitz 2004; Etzkowitz, Webster *et al.* 2000). The role of national universities and other higher education institutions in developing technology and knowledge commercialization in countries with post-Soviet economies has been studied less, especially in the context of small countries.

The Lisbon Strategy was worked out for gaining economic growth in the EU, through the formulation of various policy initiatives to be taken by all EU member states. Ertl (2006) has expressed it as follows: "The discourse on the concept of economic competitiveness has changed the formulation of new EU policies in education and training, exemplified by a strong emphasis on educational indicators, benchmarks and quality controls." Here, understanding factors influencing knowledge transfer are proper for this shift. Due to the systemic change from the command to the market economy, universities have gained a new role, especially in the situation where the Estonian firms need professional assistance for working out innovative products and developing innovative organizations. As universities had in the Soviet system mainly the role of educator, the corresponding culture may dominate in these organizations. Thus, there is a need to find out characteristics of organizational culture that may influence on knowledge transfer processes addressed to industry.

The current paper aims to provide an explorative analysis of the impact of organizational culture factors on the knowledge transfer within university research frameworks in a small country on an example of two largest Estonian universities - the University of Tartu (UT) and Tallinn University of Technology (TUT).

The paper is organized as follows. The next section is a brief overview of the previous investigations in the field of university-industry relations and its influencing factors. The third section outlines the societal and economic background of commercialization of the universities and the fourth is concentrating on organizational culture and value aspects in two largest Estonian universities. The fifth section is focusing on the analysis of main factors of commercialization at the

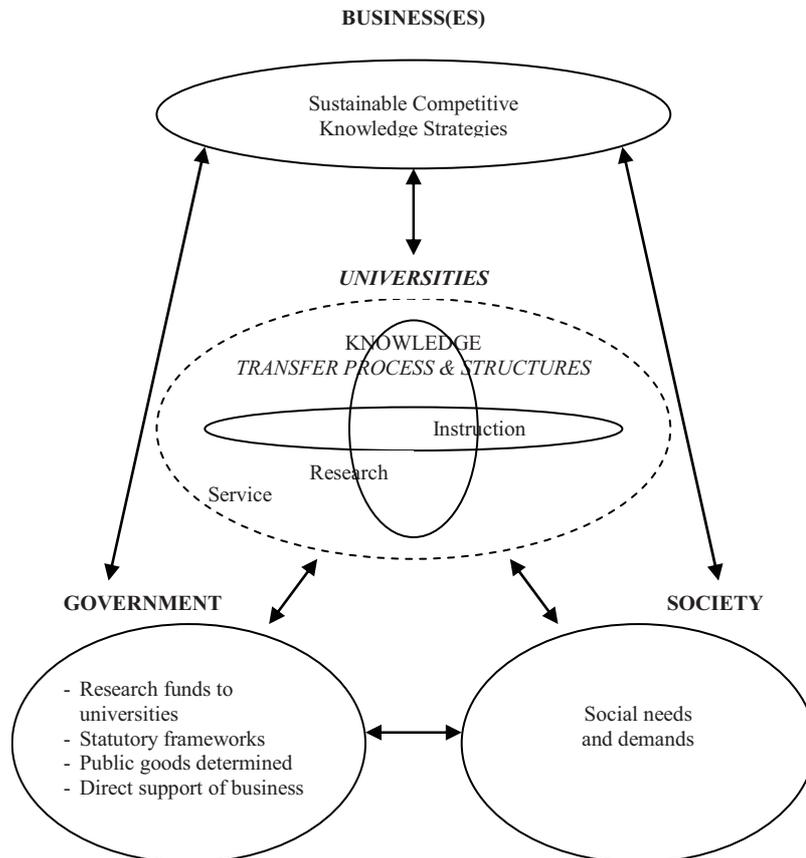
Estonian universities. Finally, section 6 presents some concluding remarks on the commercialization of university research.

## **2. Knowledge commercialization in university-industry relations on the angle of organizational culture**

Andrijevskaia *et al.* (2006) have insisted that it becomes an urgent necessity to think about how to keep the economy competitive and innovative in the long run, accumulating new knowledge and technology and finding a high-value-added niche in global division of labour. Universities are forced to find new ways generating income, on one hand. From the other side, enterprises depend significantly on ideas and technologies developed by universities. Thus, universities must increasingly to commercialize their skills and research, or in other words – to commercialize their knowledge transfer. In general the term 'commercialization denotes the process or cycle of introducing a new product into the market. In respect with university research, according to Mirowski and Horn (2005) two broad and opposite understandings about commercialization of modern scientific enterprise have been pointed out. First, commercialization is applying resources for so-called practical subjects, both in teaching and research. Second, commercialization is seen as technology transfer from basic research conducted in university setting to their presumed apotheosis as novel commodities in the commercial sphere (Mirowski, Horn 2005: 503-504). These approaches follow the different traditions that vary along orientation towards customers and activities. In our paper we follow the latter view by underlying that university research must be turned into novel products.

If we take into account the view that an organization is in a constant relationship with its environment, it follows that changes of it will affect the behavior of the organization and its members. There are several factors which play a certain role in the process of knowledge transfer. Stevens and Bagby (2001) have proposed the model where business agents, government, society, and universities are seen as the interdependent partners in knowledge transfer process (see figure 1).

Figure 1 illustrates that several stakeholders are involved in the knowledge transfer process. Universities are directly related to all of these partners – to business, government and society - and thus the internal processes within the universities may play significant role for the whole process of knowledge transfer. We can conclude that the central role is given to the universities to meet certain expectations. The factors influencing the cooperation between university and industry are often influenced by external factors, including social demand and request, statutory framework, proper research funding etc. But also a number of internal institutional factors, including organizational and/or management culture are influencing knowledge transfer.



**Figure 1.** Interdependence between business, government, society, and universities in knowledge transfer processes. (Stevens, Bagby 2001: 261)

Ellström (1983) has claimed that educational organizations tend to be strictly ordered and rational bureaucracies, characterized by a hierarchical and coordinated structure whereas being same time ambiguous and loosely coupled. Tirený (1988) argues that the perspective of organizational culture gives possibility to open various aspects how the university functions interact with its environment. Dill concludes according to the several studies: "Universities are characterized by lifetime employment, collective decision making, individual responsibility, infrequent promotion, and implicit, informal evaluation." (Dill 1982: 307). These features allude on some problems that typical old fashion organizational culture may create. Thus, in the following discussion the potential barriers of cooperation will be explored.

First issue comes from historical perspective. Namely, the university's rules, culture and reward system has ensured that scientific employees focus on basic research and teaching. Thus, the majority of the university processes have not yet adjusted to the requirements of commercialization, such as receiving specific training and consultation, or obtaining temporary leave from the university to develop a business idea. The process of becoming entrepreneurial is well described by Clark (1998). In terms of policy-making, it would be useful to think about how to develop an entrepreneurial culture that embraces change, while sustaining the fundamental values of the institution.

The second issue is that the reluctance of academics to engage in commercialization activity younger generation is often really weak due to the attitudes and behaviours of superiors, such as professors or departmental heads (O'Shea *et al.* 2004). The experienced faculty members underestimate younger colleagues' capacity due to various factors. Third, there is a need for strong top-down leadership and policies that support and encourage the process of academic entrepreneurship and which merge entrepreneurial orientation objectives with the traditional academic values of the university. Fourth, it would be beneficial to invite more faculty members who have a background in industry. Blumenthal *et al.* (1996) surveyed 2,052 faculties at 50 universities in the life sciences field and found that industry-funded faculty members are more commercially productive (i.e. in terms of patent applications, new products brought to market). Fifth, the organizational structures might be not suitable for commercialization. For example Stevens and Bagby (2001) claim that university structures can be highly formalized or these have informal dependence upon between various areas of activities (study, research, marketing etc).

All the abovementioned aspects put impact on cooperation. But still, one important problem comes from the nature of academic work in general. Academic people often work as individuals. Cronin (2001: 132) illustrates it as follows: "The 'lone scholar' stereotype may well be fading in the age of 'Big Science'." But according to modern approaches, the success of an organization as a whole depends not on the performance of some remarkable individuals, but on the collective contribution of all members (Jacobs 1981). To achieve success, many people have to support the well-being of the organization, the organization should be aware of the desire of its members' to support their organization and there should be an understanding of the essence of collective work. For example, Østergaard (2009) pointed out in his study that knowledge was more likely transferred when interpersonal contacts (i.e. informal) and social networks were involved into university-industry contacts. (Østergaar 2009). Therefore we can conclude, that organizational issues and nature of academic work may form important aspects for knowledge transfer.

The concept of organizational culture could serve as a framework for relevant analysis because researchers as well as practitioners use the term organizational culture if they want to emphasize the idea that organizational matters, basic values, field of activities, and environment constitute as a whole. The definitions of organizational culture vary from a very short description given by Deal and Kennedy – "It's the way we do things around here" (1982: 13) – to more

sophisticated definitions, for example, as proposed by Schein (1985: 9). He asserts that organizational culture is a pattern of basic assumptions - invented, discovered, or developed by a given group as it learns to cope with its problems of external adaptation and internal integration - that has worked well enough to be considered valid and, therefore to be taught to new members as the correct way to perceive, think, and feel in relation to those problems. The latter definition involves several aspects and gives also ideas about functions of organizational culture- external adaptation and internal integration. Several taxonomies exist in order to capture the variation of mechanisms that form commonly shared, but unique combinations of values and behaviour patterns in organizations. The complex nature of culture leads to multidimensional approaches (see Detert 2000; van der Post *et al.* 1997; Lau, Ngo 1996) in analysis of impacts on knowledge transfer processes.

In light of this, organizational culture aspects must also be considered when the knowledge transfer via university research is the focus. For example, Smilor *et al.* (2007) underline the role of organizational culture when they analyze how to develop high-technology centers within university system because they consider that the specific culture (innovative) mediates relationships between external and internal environment. The other role of organizational culture is related to the knowledge creation process. Cronin (2001) has developed the model of knowledge management within academic organization. He puts emphasis on both academic and management sphere, indicating that culture is like a glue that integrates various roles and domains together. If the equilibrium between representatives of different roles is created, it supports the knowledge creation and transfer too. On the example of Massachusetts Institute of Technology and Yale University it was shown that technology transfer policy to succeed, it is not enough for a university to initiate top-down changes – a real cultural change within the university has to occur (Breznitz, O'Shea, Allen 2008).

Every organization has its own special organizational culture created collectively by its members, and this organizational culture provides guidelines for how organizational members should behave, and thus it is related to performance at the organizational and individual level. This is a mutual relationship because a certain type of organizational culture impacts the individual's performance on the one hand, and on the other, how organizational members actually perform influences the organizational culture. Studies have demonstrated the relationship that exists between performance and organizational culture (see for example, Chan *et al.* 2004, Denison *et al.* 2003; Ogbonna, Harris 2000; Kotter, Heskett 1992).

Organizational culture is influenced by the environment because members of an organization transfer values into the organization from outside environment. Organizational culture may open important issues because this phenomenon evolves values, assumptions etc what play also a significant role in the knowledge transfer. The concept of organisational culture could serve as the framework for the knowledge transfer analysis because researchers as well as practitioners use the term of organisational culture if they want to underline people may either support or

obstruct organisational efforts to bring these people together in order to pursue certain goals.

Why is it important to study organizational culture to improve effectiveness of knowledge management and sharing? We can suggest following reasons.

Firstly, if organizational culture/values are well understood, we can more successfully facilitate building awareness in organization about the knowledge that exists in organization, thus, making it explicit. Here we refer on conclusions by Bennet & Bennet (2008) and they admit that tacit knowledge resides beyond ordinary consciousness leads to the search to develop greater sensitivity to information stored in the unconscious to facilitate the management and use of tacit knowledge. Surfacing, embedding and sharing tacit knowledge are approaches for mobilizing tacit knowledge in support of individual and organizational objectives. According to Ipe (2003) knowledge sharing depend on nature of knowledge (i.e. explicit vs. tacit), motivation and opportunities to share, culture and work environment. He has proposed that the latter is the most critical factor in the process (Ipe 2003: 354). Understanding the differences in perception of organizational culture can quite likely give a better picture of the reasons for knowledge sharing not working as well as expected.

Tell (2000) emphasize committed interest, trust, shared language and cognitive maps for interpreting information as important elements for building favorable environment for knowledge sharing in networks. Combination in the network of action and reflection, supported by trustful relations, also was shown as important condition in supporting questioning of the norms, values and 'world-views' of the managers and has enabled the learning in the networks to move, over time, towards a higher level learning. It was shown that network participants have been able to consciously change some of their value-level concepts and beliefs as the result. Other evidence comes from Simonin (2004) who considers organizational culture as the phenomenon having moderating effect in the process of knowledge transfer. All in all, there is a ground for thinking that knowledge transfer is related to the organizational culture.

Secondly, knowledge sharing is more effective when peoples' differences are understood and taken care of; and, thirdly, organizational culture is shared within organization both consciously and unconsciously for example through every interaction between organizational members. Therefore we can conclude that aspects of organizational culture may play a substantial role in the processes of knowledge transfer to business and society.

### **3. Comparison of two Estonian universities: preconditions for commercialization**

Commercialization is the phenomenon that has very specific nature and therefore it is mainly analysed by using case- studies. For example, Breznitz, O'Shea, Allen (2008: 141) have shown that Massachusetts Institute of Technology (MIT) and Yale

University selected different strategies. Namely, two differences were detected for this objective. First, Yale chose high support–high selectivity initiatives and micromanagement of technology transfer, MIT chose to stay with in its entrepreneurial culture and implement up until recently a low support–low selectivity models in terms of the creation and development of start-ups.has developed successful knowledge transfer. Second, the selection of a region is a significant strategic issue because the universities can rebuild the existing relationships or to establish these with new regions.

The University of Tartu is an university with long traditions. In 1632 King Gustav II Adolph of Sweden signed the Foundation Decree for Academia Dorpatensis, so on the one hand, we can mark this date as the beginning of the history of the University of Tartu; and on the other,, after the first World war it reopened its doors as an Estonian-language university in 1919 in the Republic of Estonia with Estonian as a fully recognised language of instruction. (*Facts about the History of the University of Tartu*). This last point is important because Tallinn University of Technology was also founded after the First World War. More precisely, in 1918, the Estonian Engineering Society opened an Estonian-based engineering school. That date has been recognized as the foundation of the Tallinn University of Technology (TUT History.). To date both universities have operated as national universities for almost ninety years, while the main difference is that the University of Tartu has had connections with scientists all over the world for more than three centuries. This university has been influenced by Swedish, Russian and Estonian cultures, and German settlers, such as the great Baltic landowners, and outstanding scholars have worked there.

Research funding changed from an administrative and planned system to a new system with a “science fund” based on scholarship and academic merits under the peer review process (Allik 2003). As a result of that process, universities became the main research institutions in many transition countries (Inzelt 2004; Glänzel, Schlemmer 2007), and faced the new challenge of serving society, which had already become rather topical in many western countries. One of the criteria of academic performance is the bibliometric indicator. This has had an impact on the structure and aim of research in universities. The University of Tartu was ranked higher in terms of ISI Web of Science publications (total number in 2004: 490 papers, 65% of the total Estonian contribution) and citations, and also had priority in Estonian public funding, obtaining approximately 48% of research grants and contracts (University of Tartu 2006). The share of industry contract research remains marginal. This is like ‘curiosity-driven research’. In that context, the research funding structure of the University of Tartu is quite similar to other (curiosity-driven) research universities in Europe (see Lambert 2003). This indicates that the Estonian universities follow the same path that western universities where problem of knowledge transfer is admitted.

Research is considered to be an area of activity for universities, and commercialization is the process of converting science and technology, new research or an invention into a marketable product or industrial process. The University of

Tartu and Tallinn University of Technology are both active in research and their performance is internationally approved. What has been presented by both universities can be exemplified in the area of economics and business (1). According to the data from the *Web of Science*, Estonian economics and business scholars have published 127 articles in indexed journals within the last ten years (as of 1 November 2008) and these articles have been cited 192 times. Scholars from the University of Tartu and Tallinn University of Technology have contributed respectively 44.9 and 33.1 per cent to this outcome (ISI Web of Knowledge). This means that more than three quarters of the respected academic publications on economics and business have been produced by scholars working at UT and TUT, and also that these universities have a comparable level of research. It shows that both universities are active in research and it meets to the international standards. Universities would have knowledge to share with industry, or in other words, there are building blocks for the co-operation.

Masso and Ukrainski (2008: 23) have pointed out that in general, institutions have received funding as follows: University of Tartu (80.6% of funds), Tallinn University of Technology (6.4% of funds), Research Institutes (10.6% of funds) and one museum (2.4% of funds). There are different ways that research can be funded, and Table 1 illustrates how different resources are allocated to different research institutions in Estonia. As we can see the large universities have received the major part of different resources.

**Table 1.** Structure of allocation of funding instruments across Estonian higher education institutions in 2005

Institution	Base financing	Infrastructure funds	Targeted finance	ESF grants	Centres of Excellence
University of Tartu	49.3%	44.1%	41.9%	49.6%	73.1%
Tallinn University of Technology	20.5%	23.5%	23.9%	18.9%	11.0%
University of Tallinn	4.3%	2.3%	2.3%	2.4%	
Estonian Agricultural University	7.3%	9.5%	7.2%	10.7%	
Estonian Academy of Music and Theatre	0.2%	0.2%	0.2%	0.2%	
Estonian Academy of Arts	0.1%	0.2%	0.2%		
Research Institutes	14.9%	15.8%	18.7%	12.7%	16.0%
Other	3.3%	4.4%	5.6%	5.5%	
Total, '000 EEK	74 463	77 400	230 450	85 945	

Source: Masso, Ukrainski 2008.

All in all, we can conclude that both universities have an internationally competitive level of research and a significant position in respect to research in Estonia. The results also show that important preconditions for the successful commercialization of university research are met in both cases, making an investigation of influencing

factors possible. We admit, however, that resources for research can be more plentiful at UT than at TUT.

#### 4. The organizational culture and values at UT and TUT

Two studies have made it possible to compare UT and TUT in terms of their values and practices. First, Jaakson (2008) collected student opinions about organizational values. As students are important stakeholders of universities, this study provides a good picture of organizational values. Second, within the framework of the *REDEL* project, Estonian universities were compared in terms of organizational values and culture. These studies evolved different roles and thus represent various opinions about values.

Jaakson's study compares core values and her data was collected using a combination of different methods. The students started by naming the three values that in their opinion best characterize the university. This was followed by small group discussions that tried to achieve a consensus on the three most distinctive values, and finally, they were asked to generate values that some students might potentially disagree with and recall situations that violated the value in question. Every student was asked to describe one critical incident in university-life related to one of the values. The incident could either be in line with the value or violating it. The results are presented in Figure 1.

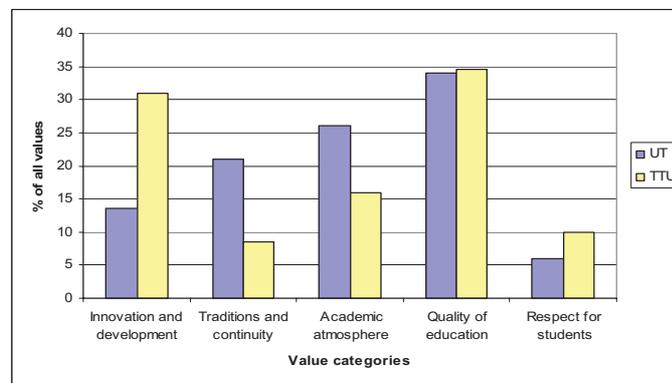


Figure 1. The frequency of mentioning different value categories in UT and TTU

The perceived value patterns differ from each other. Students from TUT pointed out that innovativeness and therefore modern applications, novel solutions and initiative are the most important values at their university (Jaakson 2008). Many also admitted that these values were the main motivators for deciding to study at TUT. For UT, two sets of values – traditions and continuity, academic atmosphere – constitute the values that distinguish it from other universities in general and TUT in particular. Two out of three students, which is a notably high proportion given the small variety of the wording in the category, mentioned tradition as the core value at UT. Secondly, aspects of academic atmosphere were attached to UT, including unity, devotion, teamwork, academic orientation and the particular spirit at UT.

### **5. Factors of commercialization at the universities: empirical analysis**

Empirical analysis was conducted in order to compare understandings about the commercialization of university research and its influencing factors. The interview method was chosen and the sample consists of representatives from both universities and from two companies that have a collaborative relationship with both universities. Therefore, the potential exists for discovering what factors determine cooperation between universities and companies.

The relevant administrators from the universities were the Senior Specialist in business relations from UT (respondent A), the Head of the Centre of Technology and Innovation (respondent B) and the Head of the Department of Research and Development from TUT, (respondent C) The representatives of the companies, having contracts with both universities were the CEO of ESTIKO PLASTAR AS (respondent D) (Estiko Plastar's vision is to be the first choice producer of packages and packaging materials in the target market), and the environmental manager from Estonian Energy (respondent E) (Estonian Energy is an international energy company with an integrated value chain).

Several of the interview questions focus on commercialization and co-operation between universities and companies. The role of geographical location is also asked because it gives possibility to clarify whether the external environment or internal environment/organizational culture play more important role in the university-industry relationships. Some illustrative answers are presented in Table 2.

The common opinion of the respondents was that geographical location does not play a significant role in university-industry relationships and commercialization. These findings do not support Brenitz *et al.* (2008) findings, described above. It seems that expertise and the profile of the activities are more important than region. There was one exception when respondent A mentioned the importance of infrastructure – UT is located 200 kilometres from international airports, and this can indeed be a limitation (barrier?) for international collaboration. Although Tartu has also flights to Stockholm and Riga since August 2009. Another interesting aspect was mentioned by respondent E, who mentioned that projects in the capital city are a bit more costly than outside of it. This sounds logical because most costs can be higher in capital cities, and under certain conditions this may lead to differences in

regional conditions. In general, we can conclude that neither companies nor universities mention that geographical location (i.e. region) plays a significant role in the opportunities and forces for the commercialization of university research in a small country.

**Table 2.** The respondents' opinions about the role of behavior patterns location in the commercialization of academic research

<b>Representatives of universities: variation of opinions:</b>	<b>Representatives of companies:</b>
TU, (respondent A) location is an important issue because of infrastructure (i.e. lack of international airport, port); traditional cooperation areas are more important than geographical regions.	(respondent E): The geographical location is not an issue. We collaborate with all the universities and the most important thing is what kind of expertise the university has. (respondent E): The relative cost of research projects is a bit higher in Tallinn.
TUT, (respondent B): location is not an issue and location ≠ region, the profile of companies, historical traditions. (respondent C): historical traditions are more important than location.	(respondent D): all the other factors are more important than geographical location.

Source: Based on interviews.

The other set of questions was targeted towards organizational culture. Here the respondents from the companies were asked to compare the working culture in both universities. Here opinions show that the work culture is seen as being similar, with only minor differences. Respondent E expressed it as follows: "In general the work culture is unified, but sometimes it seems that people from Tartu do not rush so much as people in Tallinn. When comparing Estonian working speed and culture against these aspects in the USA, then the differences between Tartu and Tallinn are minimal." Respondent D stated: "There are no differences in the working culture; differences exist between the mindsets of different people." Thus, it turns out that working culture does not distinguish the possible collaboration needed for the commercialization of university research. We can propose that a uniform sector-based working culture exists, although Trice and Beyer (1993) refer to local trends among others as a source of new ideologies in the organizational environment. Estonia is a homogeneous region in this respect. Here we can conclude that the internal environment (organizational culture) is more important than external environment in respect with university-industry co-operation.

There was a clear difference between the opinions regard with the substance of organizational culture. Both company representatives mentioned that UT and TUT present different values. For example, Respondent E said that the main difference is that Tartu's scholars are oriented towards theoretical knowledge and Tallinn's faculty members are oriented towards the development of technical solutions. Respondent D asserts that with UT we mostly have contacts related to fundamental research

(generation of ideas), while TUT mostly collaborate on research for the application of ideas. This seems like a minor matter, but if we put this into the context of organizational values, it can be interpreted as a difference in organizational culture and values. The previous section showed that UT is more oriented towards traditions, while TUT towards practical issues.

The empirical research tabled another important issue beside the main theme of this study. Both company representatives said that there is a very urgent need for a database of general information about applied research possibilities. Here applied research is seen as the counterpart of basic research. At the same time, the university representatives did not see this as such a necessary step, and instead they emphasised the protection of intellectual property. This difference of opinion here seems to be due to different interests. The representatives of companies wish get more information, while university representatives want to get a better position in the commercialization process. Here the organizational value "*opened-closed to the society*" can be discussed. If the closeness is dominating the universities may go far away from companies and commercialization cannot happen. It is also dangerous for the universities because respondent E has expressed the experience that due to the lack of comparable information sometimes universities do not produce to industry customers new, special, and innovative solution merely run over the typical and old materials. If the industry customer would know about the possibilities at hand, they can be better prepared for negotiations. The educated customer pushes universities to work creatively in order to meet expectations.

One handy possibility for organizing information system of applied research can be found from The Estonian Research Information System (Estonian Research Information System). This concentrates information from research and development institutions, researchers, research projects and various research results. The Estonian Research Information System (ETIS) is also an information channel for submitting and processing grant applications and for submitting and confirming project reports. Although ETIS reflects all the grants Estonian R&D institutions have gained, there is still one blind area in this system. Namely, information about applied research (i.e. direct contracts between R&D institutions and other organizations) is not generally presented to the public. For example, faculty members at the University of Tartu declare this information in their personal annual report, but this information is not transmitted to the public information domain. This is a comprehensive system and it would be supplemented with the section of applied research.

## **6. Conclusions**

The two largest Estonian universities, which are located in different regions, have many similarities in terms of the existence of the preconditions for the knowledge transfer or in other words commercialization of their academic research. Therefore, studying the commercialization of research in these universities raises questions about the general framework characterizing the development of the universities' third mission in this small post-Soviet country. These questions are common to universities in neighbouring countries, due to their similar historical backgrounds.

The factors influencing the cooperation between university and industry are often influenced by external factors, including social demand and request, statutory framework, proper research funding etc. But also a number of internal institutional factors, including organizational and management culture, nature of academic work are influencing knowledge transfer. Based on our study we can conclude that:

1. Universities in a small country do not differ in terms of the commercialization of research due to geographical location;
2. Differences that do exist are related to organizational values and traditions;
3. Working culture and personal relationships/communication may play significant role in the process of knowledge transfer.
4. There is a need for development information system that provides overview of applied research (university – industry joint research actions and projects).

In light of this, the values held by universities are discussed. Our research has shown that on the one hand, values and beliefs that were introduced as part of a long-term development strategy influence the understanding inside universities, while on the other hand, they shape the reputation and public image of universities for organizations and people in the community outside the university. Thus, one barrier to commercialization could be stereotypical attitudes to academic life.

The analysis of university practices and the relevant elements of the preconditions for the knowledge transfer from universities to industry help us develop suggestions for how universities can improve the quantity and the quality of the process.

## References

1. **Allik, J.** (2003). The quality of science in Estonia, Latvia, and Lithuania after the first decade of independence. – *TRAMES*, Vol 7 (57/52), No 1, pp 40-52.
2. **Andrijevskaia, J., Mets, T., Varblane, U.** (2006). University spin-off processes: Creating knowledge-based entrepreneurship in Estonia. 14th Nordic Conference on Small Business Research May 11-13, 2006 Stockholm, Sweden. Online proceedings. Available at: [http://www.ncsb2006.se/pdf/University\\_spinoffs.pdf](http://www.ncsb2006.se/pdf/University_spinoffs.pdf).
3. **Bennet, D., Bennet, A.** (2008). Engaging tacit knowledge in support of organizational learning. – *VINE*, Vol. 38, No. 1, pp. 72-94.
4. **Blumenthal, D., Campbell, E. G., Causino, N., Louis, K. S.** (1996). Participation of life-science faculty in research relationships with industry. – *The New England Journal of Medicine*, Vol 335, No 23, pp. 1734-1739.
5. **Breznitz, S. M., O'Shea, R. P., Allen, T. J.** (2008). University Commercialization Strategies in the Development of Regional Bioclusters. – *Journal of Product Innovation Management*, Vol. 25, Issue 2, pp. 129-142.
6. **Chan, L. L. M., Shaffer, M. A., Snape, E.** (2004). In search of sustained competitive advantage: the impact of organizational culture, competitive strategy and human resource management practices on firm performance. – *International Journal of Human Resource Management*, Vol. 15 (1), pp. 17-35.

7. **Clark, B.** (2001). The entrepreneurial university: new foundation for collegiality, autonomy, and achievement. – *Higher Education Management*, Vol. 13, No. 2, pp. 9-24.
8. **Clark, B. R.** (1998). *Creating Entrepreneurial Universities: Organizational Pathways of Transformation*. New-York: IAU Press.
9. **Cronin, B.** (2001). Hyperauthorship: a postmodern perversion or evidence of a structural shift in scholarly communication practices? - *JASIS (Journal of the American Society for Information Science)*, No. 52(7), pp. 558-569.
10. **Dana, L. P.** (2005). *When Economies Change Hands A Survey of Entrepreneurship in the Emerging Markets of Europe from the Balkans to the Baltic States*. The Haworth Press.
11. **Deal, T. E., Kennedy, A. A.** (1982). *Corporate Culture*. Reading: Addison-Wesley.
12. **Denison, D. R., Haaland, S., Goelzer, P.** (2003). Corporate Culture and Organizational Effectiveness: Is There A Similar Pattern Around The World? – *Advances In Global Leadership*, November, Vol 3, pp. 205-227.
13. **Detert, J. R., Schroeder, R. G., Mauriel, J. J.** (2000). A framework for linking culture and improvement initiatives in organizations – *Academy of Management Review*, Vol 25, No 4, pp. 850-863.
14. **Dill, D. D.** (1982). The Management of Academic Culture: Notes on the Management of Meaning and Social Integration. – *Higher Education*, No. 11, pp. 303-20.
15. **Ellström, P.-E.** (1983). Four faces of Educational Organizations. – *Higher Education*, No. 12, pp. 231-241.
16. **Ertl, H.** (2006). European Union policies in education and training: the Lisbon agenda as a turning point? – *Comparative Education*, Vol. 42, Issue 1, pp. 5-27.
17. Estonian Research Information System. Available at: <https://www.etis.ee/index.aspx?lang=en>.
18. **Etzkowitz, H.** (2004). The evolution of the entrepreneurial university – *Int. J. Technology and Globalisation*, Vol 1, No 1, pp. 64-77.
19. **Etzkowitz, H., Webster, A., Gebhardt, C., Terra, B. R. C.** (2000). The future of university of the future: evolution of ivory tower to entrepreneurial paradigm. – *Research Policy*, Vol. 29, pp. 313-330.
20. Facts about the History of the University of Tartu. Available at: <http://www.ut.ee/university/general/history>.
21. **Geuna, A., Muscio, A.** (2009). The Governance of University Knowledge Transfer: A Critical Review of the Literature. – *Minerva: A Review of Science, Learning & Policy*, Vol. 47, Issue 1, pp. 93-114.
22. **Glänzel, W., Schlemmer, B.** (2007). National research profiles in the changing Europe (1983-2003). An exploratory study on sectoral characteristics in the Triple Helix. – *Scientometrics*, 70(2), pp. 267-275.
23. IEEE Technology and Society Magazine, Summer, pp. 18-29.
24. **Inzelt, A.** (2004). The evolution of university–industry–government relationships during transition. – *Research Policy*, Vol. 33, pp. 975-995.
25. **Ipe, M.** (2003). Knowledge Sharing in Organizations: A Conceptual Framework. – *Human Resource Development Review*, Vol. 2, No. 4, pp. 337-359.

26. ISI Web of Knowledge. Available at: <http://pcs.isiknowledge.com>.
27. **Jaakson, K.** (2008). Students' Perceptions about University Values: Some Influencing Factors. – *Journal of Human Values*, Vol 14, No 2, pp. 169-180.
28. **Jacobs, D.** (1981). Toward the Theory of Mobility and Behavior in Organizations: An Inquiry into the Consequences of Some Relationships Between Individual Performance and Organizational Success. – *American Journal of Sociology*, Vol. 87, pp. 684-707.
29. **Kazakova, N.** (2001). Innovation, universities and changing environment in modern Russia. Paper presented at the conference on 'The future of innovation studies', Eindhoven, 20-23 September.
30. **Kotter, J. P., Heskett, J. L.** (1992). *Corporate Culture and Performance*. The Free Press.
31. **Lambert, R.** (2003). *Lambert Review of Business-University Collaboration, Final Report*. Available at: [www.lambertreview.org.uk](http://www.lambertreview.org.uk). / [http://www.hm-treasury.gov.uk/d/lambert\\_review\\_final\\_450.pdf](http://www.hm-treasury.gov.uk/d/lambert_review_final_450.pdf).
32. **Lau, C-M., Ngo, H-Y.** (1996). One Country Many Cultures: Organizational Cultures of Firms of Different Country Origins. – *International Business Review*, Vol. 5, No. 5, pp. 469-487.
33. **Masso, J., Ukrainski, K.** (2008). *Public Research Funding in Central and Eastern European Countries. Estonian Country Report*. PRIME, European Network of Indicator Designers.
34. **Mirowski, P., Van Horn, R.** (2005). The Contract Research Organization and the Commercialization of Scientific Research. Available at: <http://sss.sagepub.com/cgi/content/abstract/35/4/503>. The online *Social Studies of Science*, 35, 503.
35. **O'Shea, R., Allen, T. J., O'Gorman, C., Roche, F.** (2004). Universities and Technology Transfer: A Review of Academic Entrepreneurship Literature. – *The Irish Journal of Management*, Vol. 25, No. 2, pp. 11-29.
36. **Ogbonna, E. Harris, L.** (2000). Leadership style, organizational culture and performance: empirical evidence from UK companies. – *International Journal of Human Resource Management*, Vol. 11, Issue 4, pp. 766-788.
37. **Østergaard, C. R.** (2009). Knowledge flows through social networks in a cluster: Comparing university and industry links. – *Structural Change & Economic Dynamics*, Vol. 20, Issue 3, pp. 196-210.
38. **Rogers, E. M., Larsen, J. K.** (1984). *Silicon Valley fever: Growth of high-technology culture*. New York: Basic Books.
39. **Schein, E. H.** (1985). *Organizational Culture and Leadership*, Jossey Bass Publishers.
40. **Simonin, B. L.** (2004). An empirical investigation of the process of knowledge transfer in international strategic alliances. – *Journal of International Business Studies*, Vol. 35, pp. 407-427.
41. **Smilor, R., O'Donnell, N., Stein, G., Welborn, R. S.** (2007). The Research University and the Development of High-Technology Centers in the United States. – *Economic Development Quarterly*, 21, pp. 203-222.
42. **Stevens, J. M., Bagby, J. W.** (2001). Knowledge Transfer from Universities to Business: Returns for all Stakeholders. – *Organization*, 8, pp. 259-268.

43. **Tell, J.** (2000). Learning Networks – A Metaphor for Inter Organizational Development in SMEs. – *Enterprise and Innovation management Studies*, Vol. 1, No. 3, pp. 303-317.
44. **Tierney, W. G.** (2008). Organizational Culture in Higher Education: Defining the Essentials. – *The Journal of Higher Education*, Vol. 59, No. 1, pp. 2-21.
45. **Trice, H. M., Beyer, J. M.** (1993). *The Cultures of Work Organizations*. Prentice Hall.
46. TUT History. Available at: <http://www.ttu.ie/?id=1932>.
47. **Van der Post, W. Z., de Coning, T. J., vdm Smith, E.** (1997). An Instrument to Measure Organizational Culture. – *South African Journal of Business Management*, Vol. 28, No. 4, pp. 147-169.

## TEADMUSSIIRE ÜLIKOOUIDE JA MAJANDUSPRAKTIKA SUHETE ABIL: MÕNED ORGANISATSIOONIKULTUURILISED ASPEKTID

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Tartu Ülikool

Traditsiooniliselt on õpetamist loetud ülikooli rolliks juba keskajast. Teadustegevus sai ülikooli õigustatud funktsiooniks 19. sajandi lõpul ja 20. sajandi alguses. Seda muutust on nimetatud esimeseks akadeemiliseks revolutsiooniks. Nüüd, 100 aastat hiljem, on senistele ülikooli missioonidele – õppe- ja teadustegevusele – lisandunud kolmas – ühiskonna majandusliku ja sotsiaalse arengu toetamine. Viimast on nimetatud teiseks akadeemiliseks revolutsiooniks. Teise maailmasõja järgne intensiivne majanduslik ja sotsiaalne areng lõi ülikoolide, valitsuste ja ettevõtete vahelised alliansid „kasulike teadmiste“ tootmiseks, tõrjumaks välja traditsioonilist seisukohta, millele vastavalt teadlased olid autonoomsed looma teadmust „lõputult kasvavast heaolust“. Jõuti tõdemusele, et ülikoolid peaksid võtma pro-aktiivse rolli tänapäeva ühiskonna teadmussiirde protsessides. Näiteks, võrgustiku, raha ja talentide ühendamine Stanfordini teadusmootori ümber kujundas „Silicon Valley palaviku“ ning seda arengut peetakse üheks teadmussiirde väljapaistvaks juhtumiks.

Tänu süsteemsele muutusele üleminekul käsumajanduselt turumajandusele said ülikoolid uue rolli, eriti olukorras, kus ka Eesti ettevõtjad vajavad professionaalset abi innovaatiliste toodete ja innovaatiliste organisatsioonide arendamiseks. Kuna ülikoolidel oli Nõukogude Liidus peamiselt koolitaja roll, võib vastav kultuur domineerida nendes organisatsioonides ka tänases päevas. Kultuuri kujundamisel ja juhtimisel on suur mõju kogu organisatsiooni efektiivsusele (sh teadmussiirde osas) ja seetõttu on hakatud organisatsioonikultuuri tähtsustama ka paljude praktikute ja juhtide poolt. Seega on vajalik välja selgitada organisatsioonikultuuri aspektid, mis võivad mõjutada majanduspraktikale suunatud teadmussiirde protsesse ning seeläbi on võimalik tõhusamalt juhtida teadmussiirde mitmetahulist protsessi.

Ülikoolide ja teiste kõrgkoolide rolli teadmussiirde siirderiikides on uuritud väga vähesel määral, eriti seoses väikeriikide tingimustes. Käesolev artikkel keskendub organisatsioonikultuuri aspektidele, mis omavad olulist rolli ülikooli teadustöö kommertsialiseerimises ülikoolide teadmussiirde ja teadmistepõhise ühiskonna raames Eestis. Teadmusvahetus ja kommertsialiseerumine sõltub organisatsioonikultuuri kui organisatsiooni sisekeskkonna elemendi iseloomust. Kahte Eesti suurimat ülikooli – Tartu Ülikooli (TÜ) ja Tallinna Tehnikaülikool (TTÜ) analüüsiti teadmussiiret mõjutavate tegurite kaudu, kasutades dokumendianalüüsi ja intervjuusid.

Nimetatud ülikoolid, mis asuvad regionaalsete klassifikatsioonide alusel Eesti eri piirkondades, omavad palju sarnasusi teadmussiirde või kõrgkooliteaduse kommertsialiseerumise eelduste olemasolu osas. Seetõttu uuringud nende ülikoolide teaduse kommertsialiseerumise valdkonnas tõstatavad laiemaid küsimusi ülikoolide kolmanda missiooni kohta väikeses postsovetlikus riigis. Need küsimused on ühised ka naaberriikide ülikoolidele, võttes arvesse nende sarnast ajalooline taust. Koostöö

kõrgkoolide ja majanduspraktika vahel on sageli mõjutatud välistest teguritest, nagu sotsiaalsest nõudlusest, õiguslikust raamistikust, piisavast teaduse rahastamisest jne. Kuid ka rida organisatsioonisiseseid tegureid, sealhulgas organisatsiooni ja juhtimise kultuur, akadeemilise töö olemus, mõjutavad teadmussiiret.

Miks on oluline uurida organisatsioonikultuuri parandamiseks teadmuse juhtimise ja vahetuse tõhusust? Käesolevas uurimus näitab, et teadmussiire hõlmab erinevaid aspekte ja eriti pehmetes valdkondades (individuaalne meelelaad ja organisatsiooni väärtused) võib ülikoolides esineda olulisi erinevusi.

Esiteks, kui organisatsioonikultuur/organisatsiooni väärtused on hästi mõistetavad, siis saame edukamalt kaasa aidata teadlikkuse tõstmiseks organisatsioonis olemasoleva teadmuse kohta. Organisatsioonikultuuri tajumise erinevuste mõistmine võib üsna tõenäoliselt anda parema ülevaate ebarahuldava teadmusevahetuse põhjustest.

Teiseks, teadmusevahetus on oluliselt tõhusam kui inimeste erinevusi on mõistetud ja arvesse võetud, ning kolmandaks, organisatsioonikultuur levib organisatsioonis nii teadlikult ja alateadlikult näiteks organisatsiooni liikmete vahelise suhtlemise kaudu. Seega võime järeldada, et organisatsioonikultuuri eri aspektid võivad mängida olulist rolli ettevõtetele ja ühiskonnale suunatud teadmussiirde protsessides.

Dokumentide analüüsi alusel võib öelda, et mõlemal ülikoolil on rahvusvaheliselt konkurentsivõimeline teadustegevuse tase ja oluline koht Eesti teaduses. Lisaks näitasid tulemused, et olulised eeltingimused ülikooli teadustegevuse edukaks kommercialiseerimiseks on mõlemal juhul täidetud ning sellele mõjutavate tegurite uurimine on seega võimalik.

Viisime läbi empiirilise analüüsi, et võrrelda arusaamu ülikooli teadustegevuse kommercialiseerimise ja selle mõjutegurite osas. Meie uuring tõi välja järgmised olulisemad aspektid.

Esiteks, väikeriigi ülikoolid ei eristu teadusuuringute kommercialiseerimisel geograafilise asukoha alusel. Küll aga märgiti infrastruktuuri tähtsust – kuna TÜ asub ca 200 km kaugusel rahvusvahelistest lennujaamadest võib see kujuneda teatud takistuseks rahvusvahelisele koostööle.

Teiseks, peamised erinevused ülikoolides on seotud organisatsiooni väärtuste ja traditsioonidega. Võrdlemaks TÜ ja TTÜ väärtusi ja tavaid, on läbi viidud erinevaid uuringuid. Näiteks Jaakson (2008) uuris üliõpilaste arvamusi organisatsiooni väärtustest. Kuna üliõpilased on oluliseks ülikoolide sidusrühmaks, andis see uuring hea pildi organisatsiooni väärtustest. TTÜ üliõpilased märkisid, et innovatiivsus ning sellest tulenevalt kaasaegsed rakendused, uudsed lahendused ja algatusvõime on nende ülikooli kõige olulisemad väärtused. TÜ osas kujutasid kaks gruppi – traditsioonid ja järjepidevus ning akadeemiline atmosfäär – väärtusi, mis eristab TÜd teistest ülikoolidest ja eriti TTÜst.

Kolmandaks, ülikoolide ja ettevõtete koostöö tegureid uuriti intervjuude kaudu, kus küsitleti nii ülikoolide kui ka kahe äriühingu, millel on koostöösuhted mõlema ülikooliga, juhtivaid spetsialiste. Analüüsi tulemusena jõudsiime järeldusele, et organisatsiooni sisekeskkond (organisatsioonikultuur) on ülikooli-praktika vahelise koostöö puhul olulisem tegurgrupp kui väliskeskond. Meie analüüs näitas, et firmad teevad TÜga enamasti koostööd alusuuringute (ideede genereerimine) vallas, samas kui TTÜga tehakse koostööd peamiselt rakendusuuringute valdkonnas. See aspekt võib tunduda ebaolulisena, aga kui paneme selle organisatsiooni väärtuste konteksti, saab seda tõlgendada nii organisatsioonikultuur kui väärtuste erinevusena. Eelpool toodu näitas, et Tartu Ülikool on suunatud rohkem traditsioonidele, samal ajal kui TTÜ enam praktilistele aspektidele. Seega võime järeldada, et töökultuuri ning inimsuhted ja kommunikatsioon võivad mängida teadmussiirde protsessis olulist rolli. Nende arvestamine võib anda märkimisväärset tulemit, sest asjakohased suhted võivad julgustada tihedale ja usaldusväärsele koostööle.

Neljandaks on vajalik välja töötada infosüsteem, mis annab kõike ülevaate teostatud rakendusuuringutest (ülikooli – ettevõtete ühiste teadustegevuste ja -projektide kohta). Rakendusuuringute seisukohalt sobiva teabesüsteemi puudumine ei võimalda ressursse tõhusalt rakendada, sest informatsiooni vaeguse tõttu esineb tegevuste dubleerimist.

Meie uuringud näitasid, et ühelt poolt, väärtused ja uskumused, mis rakendati pikaajalise arengustrateegia osana mõjutavad ülikoolide-sisest mõistmist, ent teisest küljest kujundavad ülikoolide reputatsiooni ja mainet organisatsioonides ja ühiskonnas väljaspool ülikooli. Seega võivad üheks kommertsialiseerimise barjääriks olla stereotüüpsed hoiakud akadeemilise elu suhtes. Ülikooli tegevuste ja ülikooli – ettevõtete teadmussiirde aspektide ning tegurite analüüs võimaldab meil arendada soovitusi, kuidas ülikoolid saaksid arendada teadmussiirde protsesse nii kvantiteedis kui ka kvaliteedis.