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Setting Innovations as a Strategic Aim for Technical Universities

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Abstract: The aim of the research is to show the role of the strategy for Technical Universities in creating environment for enhancing creativity and promoting innovation and technology transfer. Paper explores Strategy development process for Technical Universities and provides guidelines how to update them. Paper describes why for Technical Universities it is important to maintain relationships with the State and business companies to reach strategic aims. Strategies of four Baltic Technical Universities are analyzed as an example, providing evaluation of strategic settings and practical implementation of innovations development process and tools used. Paper identify how Baltic Technical Universities create environment for innovations through their strategies, what are the tools they use to implement their strategic settings in creating innovative environment for themselves and industry in general. Paper also describes what are the contributions of Technical Universities to the economy of the country. Paper identifies how Universities set their strategies and what are their activities in the field of creativity and innovations. Paper provides good practice examples that could be implemented in other Baltic Technical Universities and thus enhance activity of Universities in this direction.

Key words: innovations; strategy; university
JEL codes: O320, I250

1. Introduction

Strategy sets development direction for Universities many years ahead. Some Universities set their strategic aims to become the leading University in the country, region or even the whole world; others differentiate themselves by defining the field they want to excel in. Technical Universities tend to set as their strategic goals development of new innovations, promotion of creativity and technology transfer processes. To strengthen these aims Universities incorporate them within their strategies. These aims are particularly important for 4 Baltic Technical Universities — Riga Technical University, Vilnius Gediminas Technical University, Kaunas University of Technology and Tallinn University of Technology — which serve as facilitators of innovation and technology transfer processes within Baltic countries, fostering development of local companies and economy in general.

This article describes Technical University's develop their strategies, what are the factors that must be taken into account during the development process and what must be done before University starts to create the Strategy. Additionally, article provides suggestions for Universities how to incorporate promotion of innovations and technology transfer within their Strategies and Action Plans and how Baltic Technical Universities have managed

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to define and implement their strategies.

2. University's Contribution to the Economy through Study Process, Research and Innovation

Universities in many different countries have analyzed how their activities contribute the economy of the country. Many Universities from United States of America, United Kingdom and other countries calculate what is the contribution of their work in financial terms to the economy of the country. It has been calculated that Universities in the United Kingdom have contributed £3.3 billion to the economy in years 2010-2011 (HEFCE, 2012). This contribution has been made through services to business, including commercialization of new technologies, delivery of professional training, consultancy and services. The same calculations can be found for other Universities as well.

Although financial impact of Universities is important, sometimes it is even more important to calculate or at least to understand what is the impact of Universities to the society and economy. Library House within its research "The Impact of the University of Cambridge on the UK Economy and Society" has come up with the model of Higher Education impact to the society and economy. Presented research and the model shows that Universities core activities are teaching and research, which in combination with innovation development and technology transfer processes ensure country's economy with increased level of entrepreneurship, knowledge transfer, greater labor productivity and positive social implications (Library House, 2005). This study shows that Universities ensure many positive outcomes to the economy. But to maintain productivity of University's in the long run, State has to provide support and investments.

3. University's Cooperation with the State and Companies

It is critical for Universities to cooperate with the State. From one side University has obligations to provide educated professionals for the economy, as well as ensure high-tech research and technology transfer process, which is especially important for Technical Universities. From other side State has some obligations towards University as well. State has to ensure University owns enough resources, full academic freedom and correctly adjusted legal system. If both parties perform duties and obligations, University in cooperation with the State can create a well-managed innovation ecosystem, which promotes creation of new products, commercialization process and development of new spin-offs.

3.1 Role of the State in Promoting University's Innovation and Technology Transfer Process

State can either promote or interfere the work of Universities. Although no State would ever like to interfere the activities implemented by Universities, sometimes it happens, because State needs or wants to support some other priorities or does not see the benefits delivered by Universities. Such interfering was observed in Latvia during economic downturn. While other countries tried to protect its higher education and research, Latvian Government did the opposite and decreased financing to the higher education along with cuts in other branches.

If State wants to support and promote Universities, it must understand the needs of higher education institutions and support them through providing targeted financial investments, adjusting the legislation and ensuring well developed infrastructure.

Especially important this support is for Technical Universities, which ensure development of innovations and runs technology transfer. State has many possibilities to help reaching Universities aims. State can invest in

entrepreneurial support organizations, such as incubators, help through changing tax laws to motivate private-sector investments in new technologies and cooperation with Universities, remove legal barriers to university-industry technology transfer and develop special seed funds to finance the most promising spin-offs (Tornatzky, 2000).

Additionally, State can develop an ecosystem by enhancing companies to more actively cooperate with the Universities and promote the cooperation process between these two parties. These collaboration and the support processes are showed within Figure 1.

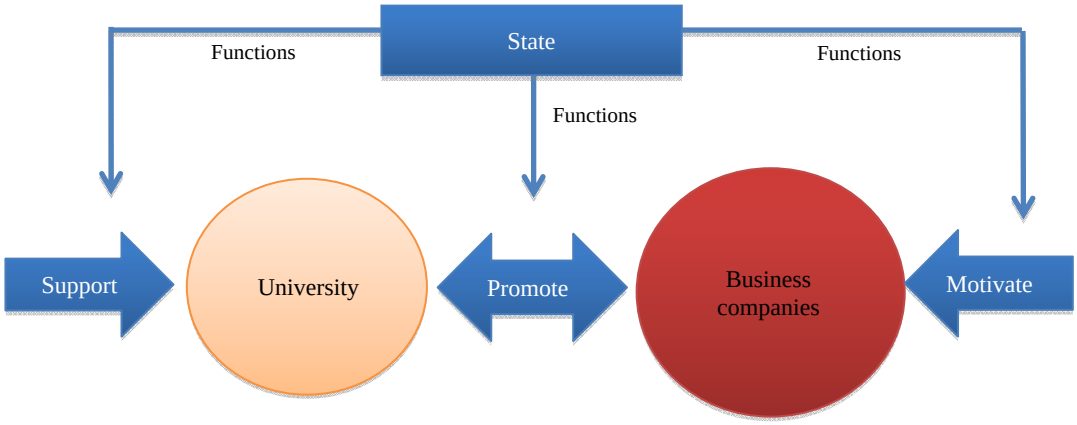

Figure 1 State's Support Functions to Promote Technical Universities

Figure 1 shows that by providing support for innovation development and technology transfer State can promote these activities within Universities. Providing additional financing for seed capital funds to develop new companies that commercialize University's inventions is one of options. State can also promote the cooperation of Universities and companies by creating a joint infrastructure for Universities where to carry out the research process and for companies where to place their Research and Development teams. This allows creating synergy between both parties and promotes technology transfer process. Such cooperation is mostly implemented through University Science or Technology parks and Business incubators. State can motivate companies to work in closer cooperation with Universities by providing tax benefits to companies that invest in research carried out by Universities.

Although State has many options how to support research process, innovation development and technology transfer in Universities, it is still important for the State to realize the benefits that are granted through these investments. This understanding can be achieved by active communication from Universities themselves and companies that are benefitting from innovation development and technology transfer.

3.2 University Cooperation with the Business Companies

To maintain constant flow of innovations to the economy, University has to maintain constant cooperation with business companies producing new goods, technologies or services. This cooperation must ensure close collaboration within research activities that afterwards results in commercialization of new products with high added value. Figure 2 shows how Universities can maintain constant cooperation with companies no matter in which stage of product development or live cycle they are.

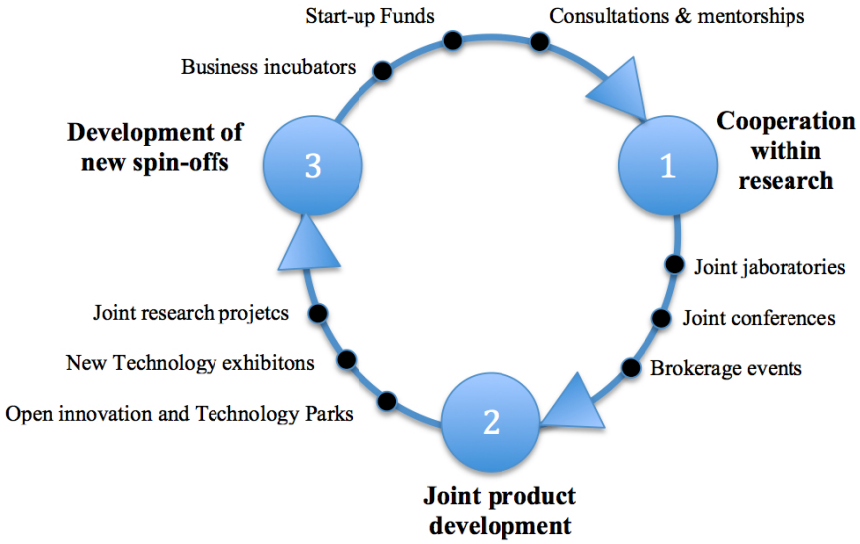

Figure 2 University Cooperation Cycle with Business Companies

Figure 2 shows that at first University might start to collaborate within research projects, implementing some testing of company's products within its laboratories. When companies have gain awareness of the services offered by the University, both parties might cooperate on joint product development that is one of direct outcomes of technology transfer process or innovation that is created in close cooperation. When University and Business has achieved the level of joint product development, they can start to create new companies by commercializing the new products or do it within existing companies. These new companies then once again can enter the University cooperation cycle with business companies.

Figure 2 also shows what are the University's activities it must maintain to enter the University cooperation cycle with new companies and how the cooperation can be strengthen by increasing the cooperation level and moving to the next step of new product development and development of new spin-offs.

Although activities presented in Figure 2 are well known to majority of Universities, it is critical to include them as tasks within the Strategy of the University, if it defines development of innovations and technology transfer processes as one of its strategic goals.

4. Strategy Development Process for Universities

Strategy allows University to define where it is heading, what are the main obstacles in its way and what are the activities defined by the Actin Plan that will help to overcome these obstacles and reach the goals set by the institution. University must clearly define the Strategic aims, tasks and indicators, follow the Action process and monitor the results as well as constantly update the Strategy in accordance with the changes in external and internal environment.

To fulfill these settings, University must understand what is the typology of local Universities and define under which segment does it see itself in the future; perform a peer review and environmental analysis. When these things are done, University can carry on with development of its new Strategy.

4.1 Strategy and Typology of Universities

According to Michael E. Porter strategy is the process of choosing and performing the activities different from the rivals. If this is not the primary goal of creating the strategy, then it becomes just a marketing slogan that

does not withstand the competition (Porter M., 1996).

This explains why strategy for any organization must be developed with dedication, proper attention and allocation of time and recourses. This goes for all organizations and Universities are no exception.

Although Universities as other organizations can develop their strategy based on commonly used principles, it is important to differentiate themselves from other higher education institutions in the region. Choosing University's future development direction can be accomplished based on existing typology of institutions. Although there are many different typologies used in defining the different types of Universities, each University must find its own mission and purpose of existing.

Table 1 offers possible typology options, based on which University might define its own type and purpose of existing. This is an important thing to start working on developing the Strategy and Action Plan. First option is to divide Universities by national importance.

This allows determining whether University provides education in variety of fields important to the whole country or it has specified in some field that as well has country vide importance. If University is based in some region — it might serve the need of strengthening the regional development by fostering the economic growth with providing educated graduates and research activities.

Table 1 Typology of Universities

By national importance	National		Regional		Purpose based	
By research level	Research		Applied Science		Research and Innovation University	
By field of science (ARWU, 2013)	Natural Sciences and Mathematics	Social Sciences	Engineering/ Technology and Computer sciences	Life and Agriculture Sciences	Clinical Medicine and Pharmacy	Art sciences

Second option how to divide Universities is based on the type of research level. Here Universities might be differentiated by the basic activities they pursue. If University is oriented towards research activities and sets it as one of its basic aims it can be defined as Research University. If University defines its main mission as educating students, then it falls under Applied Science University's category. Universities that have defined research activities as one of their core goals, but also sees providing the economy with innovations and ensuring technology transfer process as their mission, can be defined as Research and Innovation Universities.

Universities can also be divided based on the field of science they do their major research or academic work in as it is seen in Table 1.

If we would like to divide 4 Baltic Technical Universities based on typology of Universities, majority of them would be defined as National, Research and Innovation Universities, working in the field of Engineering/Technology and Computer Sciences. All four Universities ensure the need of Baltic countries for educating engineering specialists and providing high-level research activities that create new innovative products and services.

4.2 Process of Setting up the Strategy within the University

University's strategy is created after University has clearly defined how it wants to differentiate itself from competitors. Although creation of University's strategy is not an easy task, there is possibility to structure the process as shown in Figure 3.

Figure 3 Development Process of University's Strategy

Figure 3 presets a guideline for development of University's Strategy. First task is to perform Environmental analysis that can be done with the help of SWOT Analysis. This analysis will define what are the strengths and weakness of the University as well as define opportunities and threats. Additionally, it is important to perform competitors analysis based on which University might benchmark itself against competitors and see where it must invest more to reach its strategic objectives.

When Environmental and competitors' analysis are completed, University must create or update its strategy. The basic part of the strategy consists of the following counterparts — Mission, Vision, Values and Strategic goals. The Action Plan must supplement strategy. This document defines what measures and steps University will take to achieve its Strategic aims and what will be the measurable indicators that will determine whether goals are met.

When University has created the Strategy and Action Plan, it must receive feedback from internal parties — such as employees and internal Advisory councils — and external parties — such as Ministry of Education and Science and biggest cooperation partners. Additionally, University must ensure that created Strategy is developed in consistency with country's strategic development plans and documents.

5. Strategy for Strengthening Innovations and Technology Transfer

Developing new technologies and implementing technology transfer has an important role for any technology University. Association of University Technology Managers has defined that four outcomes of innovation development process activities, which are-facilitation of research results for public good, recruitment and retaining of academic talents, maintaining better relationships with business industry and generation of additional revenue (Closs L., Ferreira G. C., Soria A. F., Sampaio C. H., & Perin M., 2012). These outcomes should be considered for Baltic Technical Universities as well.

Innovations and technology transfer is a strategic setting for all four Baltic Technical Universities. Research done in these universities is closely linked with commercialization process that allows Universities to develop new products in close cooperation with companies. Based on the publicly available strategies of 4 Baltic Technical Universities it is possible to analyze whether and in what extent do Universities define development of innovations and technology transfer as their strategic priorities.

5.1 Innovation and Technology Transfer Process within Baltic Technical Universities

All four Baltic Technical Universities have defined their vision to become the leading Technical Universities, although they all have chosen different range of the region they want to excel in. Table 2 provides a comparison of visions of all four Baltic Technical Universities.

Table 2 Comparison of Visions of Baltic Technical Universities

University	Vision
Tallinn University of Technology	Leading university of technology in the Baltic Sea region and an active partner of cooperation networks of entrepreneurship clusters and public institutions
Kaunas University of Technology	A leading European university with knowledge and technology development and transfer based activities.
Vilnius Gediminas Technical University	Science University that combines a high level research and studies.
Riga Technical University	Riga Technical University — a modern university, internationally recognized, as a European center for studies, scientific research, and innovation — is a cornerstone of the development of Latvia.

While Tallinn University of Technology sets its aim to become a leading Technical University in Baltic Sea region, Riga Technical University and Kaunas University of Technology sees themselves as one of leading and well-known European level Universities. Vilnius Gediminas Technical University has not included in its vision the region it wants to excel in, but the strategy itself defines it as the Science University with high-level research and studies.

Tallinn University of Technology has defined a strategy until year 2015 and a vision for University for the year 2020. Development of innovations and close cooperation with industry is set as one of University's main priorities and is incorporated within core values definition and main objectives. Furthermore University has defined a separate Research strategy for years 2005-2015 (TTU, 2011).

Tallinn University of Technology has set cooperation with companies though research and development process as a priority. University until 2018 hopes to become Nordic Entrepreneurial Research University (TTU, 2013). University implements many projects that brings companies closer and allows creation of new spin-offs right in University itself.

Most important institutions and projects that were created by the University and that ensure close cooperation with companies, development of new innovations and spin-offs are:

- Innovation and Business Centre — runs and coordinates basic innovation activities within the University;
- Science Park Technopolis — provided a science and business environment for knowledge based companies (Technopolis, 2013)
- MEKTORY — interdisciplinary intellectual and tangible innovation center that actively engages companies, entrepreneurs, students and faculty in project implementation (Mektory, 2013).

Through activities implemented by Innovation and Business Centre and other projects, University has managed to develop a well working innovations ecosystem. Through the strategy Tallinn University of Technology for the period until 2015 has set strategic aims to advance its Research and Development infrastructure, join all doctoral schools in one, strengthen its research capacity to service national orders and to integrate itself into international R&D networks.

Kaunas University of Technology as well has included development of innovations and technology transfer as one of its main aims in its 2013-2015 Strategy. University sees itself as leading European University underlying knowledge and technology development and transfer. University has identified that it will spend 3.4 million Lithuanian Lits for this priority (KTU, 2013).

Main units that are run by the Kaunas University of Technology and help achieving its strategic aims are the following:

- KTU Regional Science park — assists and supports innovative and technology-oriented SMEs, start-up and spin-off companies in Kaunas region and Lithuania (KTU, 2013)

- Innovation office — facilitates the exchange of knowledge between the University, industry and other social partners through activities of technology transfer, as well as various initiatives facilitating accessibility of University research potential (KTU, 2013)

Kaunas University of Technology based on the strategy has decided to strengthen its Research and development team, attach the research process to the business needs, develop internationally recognized doctoral schools and joint study programs and to develop an international research center for cooperation with companies (KTU, 2013).

Vilnius Gediminas Technical University out of all four Baltic Technical Universities has the shortest publicly available Strategy. University's strategy defines as priority cooperation with industry and promotion of intellectual performance results, but do not highlight innovations and technology transfer as it has been done for other Baltic Technical Universities (VGTU, 2012).

Vilnius Gediminas Technical University's main unit working for strengthening research process is Science Directorate — unit that coordinates research departments and scientific activity. Technology transfer activities are implemented through a joint cooperation project "UniGeb" that is run by Kaunas University of Technology, Vilnius Gediminas Technical University and other institutions. This project creates ability to transfer knowledge and technology in continuing education (VGTU, 2013).

Science and Business in Sunrise Valley is another project that ensures innovation development and technology transfer process for the University. This project is run by Vilnius University and Vilnius Gediminas Technical University. It includes Science and Technology Park, Business Incubator, technology transfer center and business angels network (Sunrise Valley, 2013).

For the period of 2011-2013 Vilnius Gediminas Technical University has defined its priorities in strengthening the research infrastructure, improving the research processes and transforming the research process results into products (VGTU, 2013).

Riga Technical University's through year 2013 works on development of the new strategy for years 2014-2020. Previous Strategy of the University, in place for years 2008-2015, defines as one of University priority's technology transfer and development of innovations (RTU, 2008).

Main University's Units that ensure development of innovations and technology transfer process are:

- Business Support and Development Center — coordinates all University's cooperation process with companies (BSDC, 2013)
- Technology transfer and innovation center — provides companies with the information about the new products developed by University's researchers and organizes Innovation fares (TTIC, 2013)
- Latvian Technology Park at RTU and two Business incubators — offers premises and support for spin-offs created by University's researchers and students (LTP, 2013)

Riga Technical University till year 2015 as a strategic aim has set strengthening the research capacity, supporting doctoral studies, expanding scientific cooperation and promoting development and commercialization of innovative products and technologies, establishing competence centers and knowledge-intensive product business incubators.

5.2 Conclusions about Innovation and Technology Transfer Strategies for Baltic Technical Universities

All four Baltic Technical Universities use similar tools to strengthen innovation and technology transfer process. They all have technology transfer or innovation offices that are responsible for cooperation with companies, providing answers to technological requests from companies and foster new product development and

commercialization. Universities as well have developed Science or Business parks that allow companies to work within close cooperation with University's research personnel in joint premises. Such activity creates the synergy between University and business companies, allowing fostering open innovation process.

Open Innovation allows companies to work using mechanisms and strategies for achieving value in an environment where knowledge and technology are abundant and dispersed. Open innovation concept allows companies to work closely together with University's research teams and other companies thus in synergy coming up with new products that would never be developed if companies or University's research teams would have worked on their own (Creapolis, 2013). Baltic Technical Universities implement this concept within their Science or Business parks and promote this option of cooperation within local community of companies.

Baltic Technical Universities work on common projects that promote innovations and technology transfer that are Baltic wide as well. One of such projects is Baltic excellence platform for the development of competitive technologies. This project allows joins strengths and activities of all Baltic Technical Universities focusing on developing research and innovation capacity and strengthening excellence in the Baltic Sea region (BIRTI, 2013).

6. Suggestions for Setting Innovations as a Strategic Aim for Technical Universities

To implement the task of developing University's strategy to foster innovations, creativity and technology transfer, University must not only think about the internal process of setting up the strategy, it must also analyze the external environment and understand how external parties can influence University. University must know what are its current relationships with the State to secure itself from unexpected negative surprises and grant support. Additionally, it is important to understand and follow University cooperation cycle with business companies, and define it as one of core priorities within the Strategy and Action Plan.

6.1 Process of Creating Strategy for Technical University

Universities should think of stimulating innovation and technology transfer process as a complex assignment that consists of many different variables and tasks. Universities should start with setting up a good relationship with the State in the person of Ministry of Education and Research. This will allow University to understand where the higher education system of the country is going to, what are the priorities and how University fits in them.

Additionally, University must strengthen its collaboration with the industry, what will allow to strengthening relationships with existing partners, by moving them further along the cooperation cycle and attracting new partners that are willing to utilize the opportunities offered by the University's innovation development and technology transfer departments.

When University has created good relationships with the State and companies it can start to plan next steps of development. These steps must be clearly defined as development directions and strategic aims. Based on this University must define its mission and vision for the next years, thus categorizing itself and differentiating from other competitors. Based on strategic aims and the vision the Strategy is created together with the Action Plan, which clearly defines what moves must be made to accomplish the strategic settings.

To develop the Strategy that is accepted by all stakeholders and employees, University's management should involve as many employees as possible in the discussion and development process of the new strategy. This will ensure that all employees know that there is a new strategy, what are the strategic aims for the University and how do they can benefit reaching these aims.

6.2 Suggestions to Technical Universities for Strengthening Innovations and Technology Transfer

Technical University through the process of Strategy development should clearly identify that one of its core tasks besides providing academic education and research is fostering innovations, creativity and technology transfer. This must be defined as one of strategic directions and clearly established as a separate and meaningful direction. This can be achieved by creating an Action Plan with clear tasks and measurable indicators that allow University to follow the progress of reaching this aim.

Following suggestions can help Technical Universities strengthen innovations and technology transfer:

- Define how University will differentiate from competitors in the region
- Create a separate Innovation and technology transfer strategy based on the general Strategy of the University
- Apply and adjust University cooperation cycle with companies for closer collaboration
- Collaborate with the State to gain support for University's strategy and collaboration process with companies
- Establish and develop strong Science or Technology Parks and business incubators that serves as a link between University and companies
- Make public non-confidential part of the strategy to inform potential partners about University's strategic aims
- Use Alumni associations for promoting business companies' collaboration with Universities and technology transfer

These activities will strengthen Universities efforts in creating a better synergy with industry for developing new innovations and ensuring technology transfer.

7. Conclusions

Innovation development and technology transfer processes are one of the most important tasks for Technical University. By creating and adjusting Strategy University can strengthen these functions, which ensure development of country's economy and constant flow of new products and creation of new companies.

To ensure long term development, well-considered and managed innovation development and technology transfer processes, University must find the balance and cooperation with the State and the industry represented by the business companies. Tools for strengthening cooperation with business companies are defined within University cooperation cycle with business companies.

When University has managed to align its strategic aims with the needs of the State and the business companies, it should define how it differentiates itself from other competitors in the region. Development of Strategy and Action Plan guides University towards its strategic aims and shows what are the exact steps to do that.

Baltic Technical Universities define innovations and technology transfer as important strategic aims, incorporating them within their Strategies. To implement these aims Universities have developed tools such as Innovation and Technology Transfer Offices, Technology Transfer Contact Points, Science or Technology Parks, Business Incubators and other Pan-Baltic cooperation projects.

By incorporating innovations and technology transfer within the strategy and actively promoting them Universities manage to maintain collaboration with the business industry, develop more patents and new products and ensure sustainable development of country's economy in the long run.

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