GOVERNMENT SUPPORTING SCHEMES ENHANCING UNIVERSITY-INDUSTRY KNOWLEDGE TRANSFER ON THE EXAMPLE OF SPINNO PROGRAM IN ESTONIA[1]

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Abstract

The purpose of the study is to evaluate the relevance of the set-up (system of objectives, supported activities and measured indicators) of SPINNO program in facilitating university-industry knowledge transfer in Estonia since 2001 and make suggestions on its improvement. As the basis for the analyses the knowledge transfer support scheme formation and evaluation framework is composed, which is used in evaluation of SPINNO programme. The empirical analyses revealed that the program has not paid enough attention to the different aspects of sustainability of knowledge transfer functions. The evaluation of the SPINNO programme within its existence since 2001 indicated, that the gap between the aims, expectations and supported activities converged consistently. In the first and to lesser degree in the second SPINNO program period the concept was viewed by both, the programming institutions and applicants, as limited to technology transfer. By the third reporting period the importance of the support to the knowledge transfer as the precondition for technology transfer was acknowledged.

Keywords: knowledge transfer, knowledge-based economy, innovation policy, government support schemes, SPINNO program

JEL Classification: O32, O33, H43

Introduction

According to the literature on evolutionary and national innovation system theory (Nelson, Winter 1982; Lundvall 1992; Nelson 1993 etc), knowledge plays the central role in economic growth and competitiveness through the process of innovation. Innovation as the capability to create and apply new knowledge or old knowledge in a new way involves the interaction between the sources of knowledge resulting in knowledge transfer. Knowledge transfer refers to the process through which knowledge, ideas, research results, technology and skills move between sources of knowledge, mainly from universities and other research organisations to business and wider community, involving the transfer of codified forms of explicit knowledge as accumulated information and tacit knowledge based on subjective beliefs or know-how. Therefore, the prerequisite for knowledge transfer is interaction between the sources of knowledge.

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The interaction between universities and industry and the knowledge transfer resulting from it forms the basis of knowledge-based economy with according innovation- and technology policy support schemes being implemented in many countries including Estonia. These initiatives are usually based on the experiences of developed countries which share strong accumulated knowledge base, well functioning market system, developed institutional and infrastructure support of innovation activities (Varblane *et al.* 2007). Developing and transition economies come with less advanced background and capabilities of absorbing the knowledge, posing specific requirements also to knowledge transfer support schemes. At the same time, governments are expecting measurable outcomes from the public investments made to research and development activities in general and knowledge transfer activities in particular.

Therefore, for a public support scheme facilitating knowledge transfer to bring expected benefits, it is important to identify the socio-economic background and preconditions for knowledge interactions and aim the support mechanisms to according weaknesses to be overcome and advantages to be further used. Chosen focus and objectives must be accompanied with relevant activity systems to be supported and indicators measuring the actual results rising from the support scheme implemented. As the history of knowledge transfer support schemes (lead by Great Britain, USA and Canada) is of short duration (first initiatives dating back to the end of 1990-s) and the international experience continually developing, it is important to carry out different case-studies to build the basis for mutual learning and generalizations resulting in guiding principles for design and evaluation of knowledge transfer support schemes. Estonia was at the forefront of the drive of launching government support schemes facilitating knowledge transfer and opened SPINNO programme in 2001 with the aim to support the development of awareness, skills and infrastructures related to knowledge transfer between Estonian universities and industry.

The aim of the study is to evaluate the relevance of the set-up of SPINNO program in enhancing knowledge transfer in Estonia and make suggestions on its improvement based on the knowledge transfer support scheme formation and evaluation framework. The research object of this study is the set-up (system of objectives, supported activities and measured indicators) of government support schemes aimed at enhancing university-industry knowledge transfer. Empirical study object is the public support scheme aimed at facilitating university-industry knowledge transfer in Estonia – SPINNO program.

This article contributes to the development of knowledge transfer policy formation process through elaborating a systemic approach to evolutionary theoretical base of knowledge creation and innovation processes and their complex conjunction to according knowledge transfer processes, preconditions for their evolution and knowledge transfer channels. Output of the theoretical analyses is the knowledge transfer support scheme formation and evaluation framework being used in evaluation of SPINNO programme.

Methodology of theoretical part involves analytical modelling of theories and frameworks capturing innovation process, presumptions and activities for knowledge transfer processes to identify the channels through which knowledge transfer appears and according impacts devolve. Empirical analyses of SPINNO programme is based on two sets of baseline information:

1. Baseline-documentation of SPINNO program:
   - SPINNO 2001-2003 background report (de Jager 2001), regulations, evaluation report (Evaluation of... 2003);
   - SPINNO 2004-2006(7) regulation, explanatory report to the regulation, amendment regulations and their explanatory reports, impact evaluation report (Brighton, Kells 2007);
   - SPINNO 2008-2013 regulation, explanatory report to the regulation, amendment regulations and their explanatory reports, project material from Enterprise Estonia
2. Interviews with the representatives of the management authority of the Ministry of Economic Affairs and Communications (Jarmo Tuisk and Marika Popp), implementing authority Enterprise Estonia (Tiiu Evert, Tiina Kalju) and project applicants Tallinn University of Technology (Indrek Jakobson) and University of Tartu (Erik Puura)

Theoretical framework

In order to build a theoretical basis for carrying out the empirical analyses on SPINNO program, the knowledge transfer support scheme formation and evaluation framework was developed. The framework composes of three interconnected sets of developments. First, it catches the evolutionary changes taking place in theoretical and practical conceptualisation of innovation processes, described by the five generations of innovation models (see for example Rothwell 1994 or Trott 2002) in the scale of Mode I, II and III knowledge creation frameworks (being described by Gibbons *et al.* 1994 and Etzkowitz *et al.* 2001).

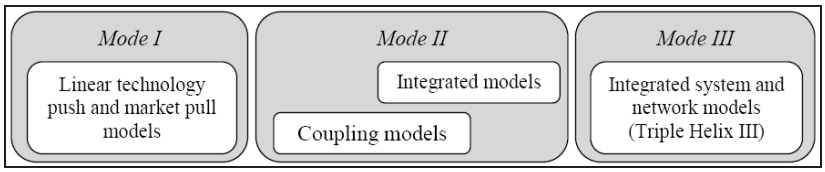

Figure 1. Development of innovation models in the scale of Mode I, II and III knowledge creation frameworks. (Compiled by authors)

Mode I framework corresponds to the linear model of innovation, where the creation of new knowledge takes place in universities, inside individual disciplines, in the form of academic basic research and independently from societal needs. Through the development of coupling and integrated innovation models characterizing Mode II framework, knowledge creation will turn into process initiated by interdisciplinary research, carried out in various institutions in accordance with societal needs and

regulated by national innovation systems. However, the role of universities is limited to the providing practical input to innovation processes carried out by businesses. Under Mode III framework characterized by Triple Helix innovation model, the sources of knowledge are no longer viewed as performing separate functions, but taking over each other's tasks and forming dynamic integrated networks and hybrid organizations. Universities play the leading role in this knowledge-based process as their functions of carrying out research, creating practical output and providing education build the basis for network-based aggregation and involvement of partners.

Secondly, the evolutionary development of innovation systems along the scale of Mode I-III involves the changing roles of university, industry and the state described on the following Figure 2.

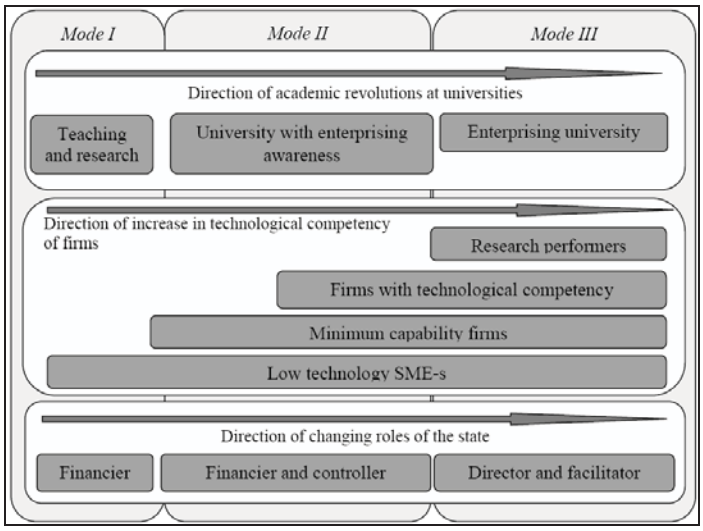

Figure 2. Development of the roles of university, industry and state in the scale of Mode I, II and III knowledge creation frameworks. (Compiled by authors)

Universities in the Mode I framework perform the role teacher and independent research body. To enter into Mode II knowledge creation framework and develop cooperation relationships with firms and other actors in innovation process, universities have to undergo second academic revolution and acknowledge their roles in economic processes through capitalization of knowledge, cooperation and knowledge transfer. Changing the spirit of universities, who have for long time been independent performers of academic basic research lead by linear logic, is a long-term process demanding wide inner informing and awareness rising activities and setting up of supporting regulative arrangements. Therefore, after universities have acknowledged their roles in the entrepreneurial activities and innovation process, a

preparatory phase follows until they develop into really enterprising universities – get involved in wide range of complex knowledge transfer activities implying to Mode III framework.

At the same time, for Mode III kind of interactions to evolve, enterprises need also to hold certain capacities (have sufficient technological competency and innovative capacities) to be able enter into cooperation relationships among themselves and with universities, and even to know how to use this cooperation. Enterprise sector will contain firms of different technological competency under each level of knowledge creation and innovation processes, but when moving towards Triple Helix and Mode III, the share of firms with technological competency and research performing capacities have to increase.

The role of state under Mode I is lead by linear logic of innovation and therefore its functions are limited to financing the basic research taking place in universities. As the basic research in universities is carried out independently from societal needs, the state does not perform according coordinating and control functions over the invested funds. In entering Mode II framework, knowledge creation develops into interdisciplinary process motivated by societal needs. Therefore, the state acquires regulative and control functions and begins to develop systemic innovation policy. When evolving towards Mode III framework, the traditional roles of the state, universities and enterprise sector start to diffuse, where financing and control functions of the state will also diffuse to other sectors and state will obtain the role of facilitator of these processes.

The development in the Mode I, II and III scale is characterized by the growing complexity of knowledge transfer activities between university and industry, which is enabled by the cumulative development process of the parties. Howard (2005) has proposed a systemic framework describing the channels via which universities and research organisations generate economic benefits composing of the following four broad channels:

1. Knowledge diffusion: via encouraging the broad industry-wide adoption of research findings through communication, building capacity within industry through extension in spin offs, education and training;
2. Knowledge production (standard model of research commercialisation): by selling or licensing the results of research in the form of commodified knowledge;
3. Knowledge relationships: by providing services that indirectly exploit broad intellectual property platforms consisting of trade secrets, know-how and other forms of tacit knowledge. This approach centres on cooperation, collaboration, joint ventures and partnerships.
4. Knowledge engagement: universities and research organisations generating useful economic outcomes as a by-product of shared interests and concerns that transcend the boundaries of the university per se.

The consecution of Howard's channels of knowledge transfer (from 1 to 4) stands for their increasing complexity in the scale of Mode I-III knowledge creation framework accompanied by changing roles of university, industry and state.

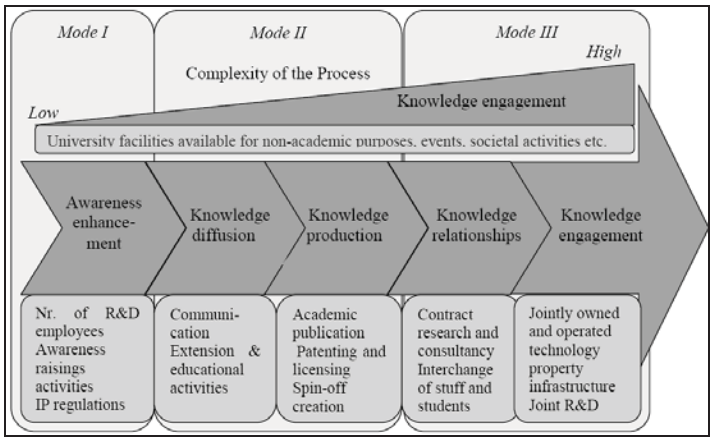

Figure 3. Development of knowledge transfer channels and indicators in the scale of Mode I, II and III knowledge creation frameworks. (Compiled by authors)

Development of these forms of cooperation requires that the universities have gone through the second academic revolution and the companies have sufficient technological expertise. Thus, knowledge diffusion is preceded by the stage of awareness enhancement (inner development of the involved organisations, raising awareness and building supporting infrastructure) as a prerequisite for reaching out for cooperation and knowledge exchange.

In addition, the last stage of knowledge engagement appears in two forms. First, non-academic use of universities' facilities (libraries, cultural centres, sports grounds etc.), University-organised events for community and regional economic and social benefit (workshops, seminars etc.) participation in non-academic community and economic activities, which accompany and support knowledge transfer activities in all levels of complexity. Knowledge engagement in a more specific context of knowledge transfer activities stands for a stage following the cooperation, collaboration, joint ventures and partnerships developed under the phase of knowledge relationships when research and development infrastructure convergences near universities and science parks and knowledge transfer appears based on jointly owned and operated technology property infrastructure – technology and research parks, buildings, equipment, instruments etc.

Described three interconnected sets of developments compose the knowledge transfer support scheme formation and evaluation framework presented on Figure 4.

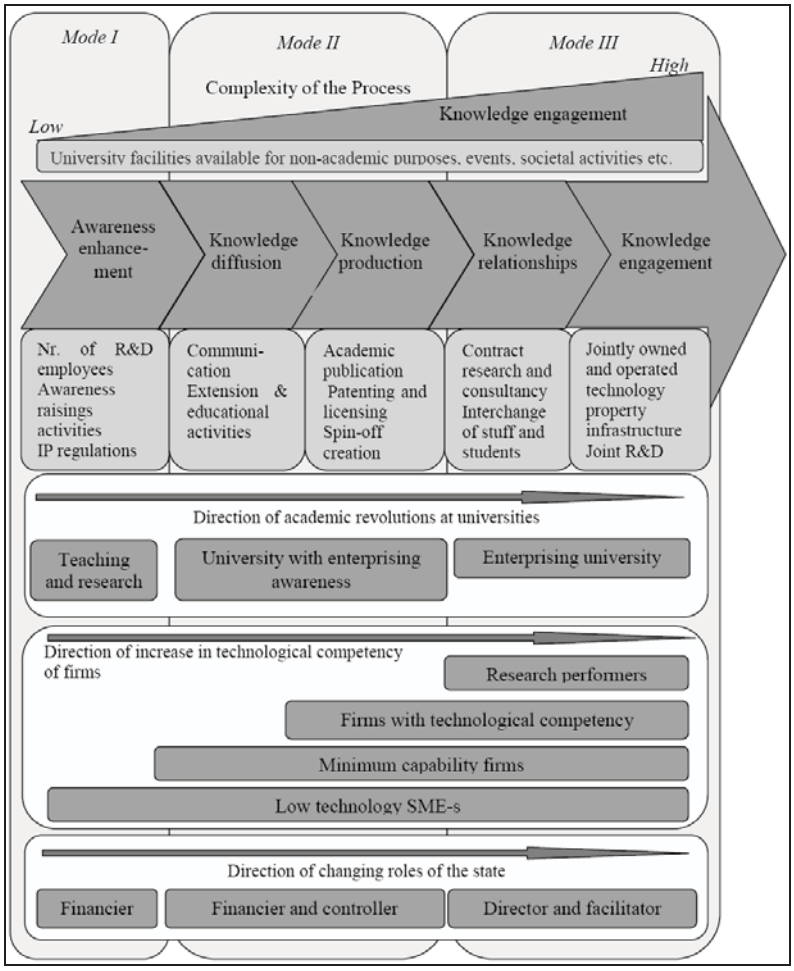

Figure 4. Knowledge transfer support scheme formation and evaluation framework. (Compiled by authors)

Criteria for Government support scheme development

According to the framework, government support schemes enhancing knowledge transfer must follow inductive logic. Under Mode I framework the focus of the support scheme should be in inner developments of the participating institutions, in the case of universities on raising awareness of innovation and entrepreneurship and setting up according regulations and rules (intellectual property and business activity regulations, motivation systems, communication strategy etc). Outputs of this stage

are the support structures built, regulations adopted, number and volume of awareness-raising activities implemented. The result of these activities is the second academic revolution taking place in universities.

Under Mode II framework, the universities have acknowledged their role in the process of economic value creation and less complex knowledge transfer processes (Knowledge diffusion) phase will evolve characterized by widespread dissemination of research results (communication, training, etc.) and the creation of knowledge products (patents, licenses, spin-off companies, etc.). The result is increasing public awareness of the research taking place at universities, evolving cooperative arrangements and the respective competencies and increase in the volume of knowledge transfer activities and complexity.

Under Mode III framework more complex Knowledge relationships will evolve (contract research, analytical and testing services to companies, etc.). With progressing interactions, diffusion process of traditional separated roles described by Triple Helix innovation and Mode III knowledge creation framework will start followed by convergence of research and development infrastructure near universities and science parks and emergence of cluster infrastructure.

According to the knowledge transfer support scheme formation and evaluation framework, the design and evaluation of government support schemes enhancing knowledge transfer must be based on the following principles:

- the task of the support scheme is to guide and develop the participants of knowledge transfer process on the scale of Mode I-III: to foster the progress of academic revolutions in universities, the increase in technological competency and innovation awareness in enterprises, parallel of which the role of the state will alter from funder and controller to protector and director.
- The focus of the aims and activities of the support scheme has to follow national framework conditions, development assets and deficiencies of the involved parties and direct the aims and activities of the program to utilizing the preconditions and elimination of the deficiencies.
- The indicators of the support scheme aimed at enhancing knowledge transfer have to measure the whole range of knowledge transfer activities with growing complexity in the scale of Mode I-III, to enable the analyses of the appearing changes.
- Government support must lead to sustainable development of knowledge transfer processes through diversification of the sources of academic research funding.

Knowledge transfer support scheme formation and evaluation framework provides a basis for qualitative assessment of the results of the program through the quantitative inputs and outputs, thus compensating the lack of socio-economic impact indicators.

Framework conditions for knowledge transfer in Estonia

Analysis of framework conditions for knowledge transfer in Estonia shows significant shortcomings in the preconditions for Triple Helix development:

1. Research and development in Estonia has been characterized by a strong orientation towards basic research and linear model, which has rooted in the vision about the functions of university among its academic staff.

The process of academic revolutions in Estonian universities compared to developed countries is somewhat shifted. The first academic revolution emerged after the disintegration of the Soviet Union and the process continued during the second half 1990ies. Estonia is currently in transition to the second academic revolution: the traditional roles of a university – teaching and scientific research – are being supplemented with new roles – direct participation in the creation of economic and social capital (Mets 2009).

Estonia has been characterized by very low patenting activity – up to 28 times smaller than EU Members average (Eurostat 2009), which is also related to Estonian socialist background, where invention was public good and inventors supported by state with no need to intellectual property creation (Vinter 2005).

2. Business sector is largely made up of small or medium size and relatively low-technology companies, whose specialization is not aligned with the universities orientation resulting in the lack of cooperation between them.

Approximately 98% of Estonian enterprises are small or medium-sized companies and only small numbers of firms registered in Estonia are middle or high-tech companies (Eesti väikese... 2005). Almost half of Estonian enterprises are innovative (49%), which is a better result than the EU average, but the total expenditure on research and development composes of large proportion of investment to machinery and equipment (70%), which has increased substantially between 2000 and 2004 (Viia *et al*. 2007: 9). This means that real R&D share of firms is quite small.

Case study analyses of Estonian companies are close to the European Union Community Innovation Study, according to which a third of companies are capable of delivering change, one tenth are able to change their position on value chain, but 40% do not see the need for change or can change (Eesti konkurentsivõime... 2009: 36). Thus, a great share of Estonian businesses are situated in lower boxes of technological competence and need according support measures before they are able to enter into cooperation and knowledge transfer activities.

3. The State has been the main financing body of national research and development activities with strong orientation towards basic research in universities, hampering the cooperation possibilities between university and industry.

Aggregate expenditure on research and development in Estonia is increasing but sharing still comparatively low level, constituting 0.61% of gross domestic product (GDP) in 2000 and 1.29% of GDP in 2008, which is only about the half of the European Union "old" Member States` corresponding average (Eurostat 2009). Positive is however, that the Estonian R&D investment ratio to GDP has increased almost twice during the period.

Dominating financer of R&D has been public sector (state) amounting to 60% of total R&D expenditure in 2000, that has dropped to about 57% to 2008 (Eurostat 2009). In addition, R&D expenditure has been strongly inclined towards linear model, as most of the investments support academic basic research. In developed countries the ratio is the opposite, with an emphasis on applied research and development activities. State support has been aimed to develop high-technology in universities and technology and innovation policy has been too complicated for average firms (Jürgenson *et al.* 2005).

State function must refocus on diversification of R&D investments instead of only basic research-oriented approach. Thus, it is important for state to re-evaluate its priorities and position itself in knowledge-based economy which will be further elaborated and evaluated under the following analyses of SPINNO program.

Development of SPINNO program

Government is supporting the development of awareness, skills and infrastructures related to knowledge transfer in Estonian universities since 2001 with SPINNO program. SPINNO program were together with R&D program the first two innovation support schemes in Estonia. Also, in an international context, Estonia was at the forefront of the drive of launching government support schemes facilitating knowledge transfer. In Great Britain, which has been one of the leading countries in knowledge transfer management and pattern setting for Estonia, similar support scheme was initiated by Higher Education Funding Council in 2000 (HEROBC program).

Till now two funding periods (2001-2003) and 2004-2006(7) of SPINNO program have been implemented with 100 million Estonian kroons (EEK) altogether invested to enhancing the knowledge, skills and environment for knowledge transfer. Third period (2007-2013) is ongoing consisting of two-year core-funding periods with 80 million EEK planned.

Background report was prepared by independent experts (Technopolis and KU Leuven) before the launch of the program. Report (de Jager *et al.* 2001) confirmed, that Estonian research and development activities are strongly shifted towards basic research and the level of implementing the results of research and development for business purposes lags significantly behind the European Union average. The preliminary study (de Jager *et al.* 2001) showed that although Estonian universities are relatively good by their research capacity, the maturity of their business incentive structures varies, but in general they all lack proper support structures. It was

therefore stated in the regulations of the first SPINNO program (2000), that universities must take the leading role in stimulating knowledge based entrepreneurship and the aim of SPINNO program is to promote their entrepreneurship-targeted functions.

Due to the novelty of international development of knowledge transfer field, the system of knowledge transfer indicators were not developed during the first period of SPINNO and therefore no coherent system of indicators measuring the knowledge transfer activities facilitated was required also under Spinno 2001-2003. However, it was stated in the program regulations (SPINNO programm 2000: 3) that the business orientation towards entrepreneurship will be evaluated based on research and development results being used for commercial purposes, which may be organized in the following two ways: contract research and development; Spin-off entrepreneurship, patenting and licencing.

Three projects were financed with government support up to 75% from the eligible expenses in the 2001-2003 – Tartu University with partners, Tallinn University of Technology with partners and project BioSpinno composing of network of actors in Estonian biotechnology field.

In 2003, evaluation of the programme implementation and results (Evaluation of... 2003) was carried out by SQW limited, noting, that the programme should continue, as culture and attitude towards knowledge transfer and the conception of entrepreneurial universities is starting to change in positive way, but a long way is still to go. Also, it was noted, that there is a need for more thorough support system for demand side – enterprises.

Based on the recommendations made in Evaluation report, SPINNO 2004-2006 was launched with some changes – preliminary application procedure was initiated, set of indicators was launched reported by the applicants, the amount of support was decreased from 75 to 65% of the eligible expenses and participation in SPINNO was widened to applied higher education institutions. In 2004-2007 financing of previous three projects was continued and 4 more projects (Tallinn University, Estonian Academy of Arts, Estonian Maritime Academy, University of Applied Sciences) were financed.

In 2006, impact evaluation was carried out again by SQW Limeted. It was concluded in the Evaluation report (2007), that the program was effective in reaching qualitative goals – in motivating the members of beneficiaries, raising their awareness and skills in knowledge transfer, establishing the structures and regulatory environment for knowledge transfer. Quantitative indicators like incomes from contractual research and development, consultancy and training activities offered to firms were accomplished on the planned level. The results did not meet the expectations set regarding patenting, licensing and spin-off creation and there were problems also regarding finding and financing suitable personnel.

The report concluded that SPINNO program has significantly increased the readiness for cooperation between universities and industry, but the field of knowledge transfer still shares low reputation amongst the managements of universities as a whole and, consequently, their poor representation in the strategic development priorities (Brighton and Kells 2007). The evaluators supported the continuation of the program, but recognized as in 2003 that the main challenge is the low level of knowledge and skills in research and development cooperation in the vast majority of Estonian companies.

New period of SPINNO funding was launched in 2008 when based on the example of Great Britain, system of two-year core financing periods of the knowledge transfer function are implemented. Financing is based on the formula composed of indicators characterising presumptions and results of knowledge transfer of the applicants two years before. The indicators used for calculating core funding formula are related directly to the necessary base for successful knowledge transfer (the number of applicant's research and development personnel), performance indicators characterising knowledge transfer results during the agreed time-period (revenues from R&D contracts, sale of licenses and patents, testing and analysis, training and consultancy services), and indicators characterizing sustainability of knowledge transfer function in the organization (the number of contracts with business, public and non-profit partners, the number of employees in the field of knowledge transfer) (Seletuskiri majandus... 2008: 6). Size of the grant is calculated based on the formula and applicants have to additionally submit application form where they describe the aims, activities, their results and impacts facilitated by the money used.

The aim of core-funding system is to guarantee insured and stabilized funding that enables to hire and keep relevant personnel and guarantee elementary platform for knowledge transfer activities. In 2004-2007 existing 7 institutions were financed with BiosPinno being replaced with single institution of Estonian University of Life Sciences.

Evaluation of SPINNO program

During the first implementation period of Spinno program, the similar support schemes in the international arena were freshly launched in comparatively more developed Triple Helix contexts (eg. Great Britain, Sweden etc). The best practices were imperfect and the systems of knowledge transfer activities and indicators to be developed. As an important prerequisite for Triple Helix creation, the program-makers have taken the international experience as the basis for SPINNO set-up development and evolved together with it. Next, the evaluation on the set-up of SPINNO program is given regarding its objectives, activities, indicators and results. Following, the problems revealed and solutions proposed are elaborated.

Objectives

In the early years of SPINNO program Estonia was positioned mainly in the Mode I framework (universities were predominantly academic basic-research oriented, business sector consisted mainly of low-technology small-and medium-sized enterprises and up to 60% of research and development activities were financed by state of which most part was directed to academic basic research). According to inductive approach based on knowledge transfer support scheme formation and evaluation framework, the program should have had strong emphases on the developing knowledge transfer infrastructure, raising awareness through internal processes of universities and disseminating knowledge, educating and shaping values of society, which devolves from universities into business and wider society and allows universities to start participating in economic processes.

Objective setting of the first SPINNO programme was characterized by contrarily deductive logic. During the first program period the strategic objective was set on very broad terms aiming on Estonia's international competitiveness and strengthening of national innovation system. On the second period the objective was focused on expanding the cooperation between universities and industry and strengthening the capacity of universities to participate in these relationships and lead the innovation process. On the third reporting period, the system of objectives was reduced to the level of universities and aimed at increasing the sustainability of knowledge transfer function as one of their strategic missions on equal basis with teaching, research and development. This evolution of general objectives of the programme could be seen as refocusing of the program, but at the same time, the substance of knowledge transfer concept has also altered.

In the first and to lesser extent in the second program period the concept was viewed by both, the programming institutions and applicants, as limited to technology transfer. By the third reporting period it was acknowledged, that even more important is to facilitate knowledge transfer as the precondition for technology transfer. It was also realised by the programming institutions, that knowledge transfer does not only include the interaction between university and industry, but is concerned with interactions between universities and the rest of society (including public and non-profit spheres).

Supported activities

Despite the inconsistencies revealed in programme targeting and considerations regarding the nature of knowledge transfer, the activities financed by the program were consistent with the development needs of the Mode I-III framework.

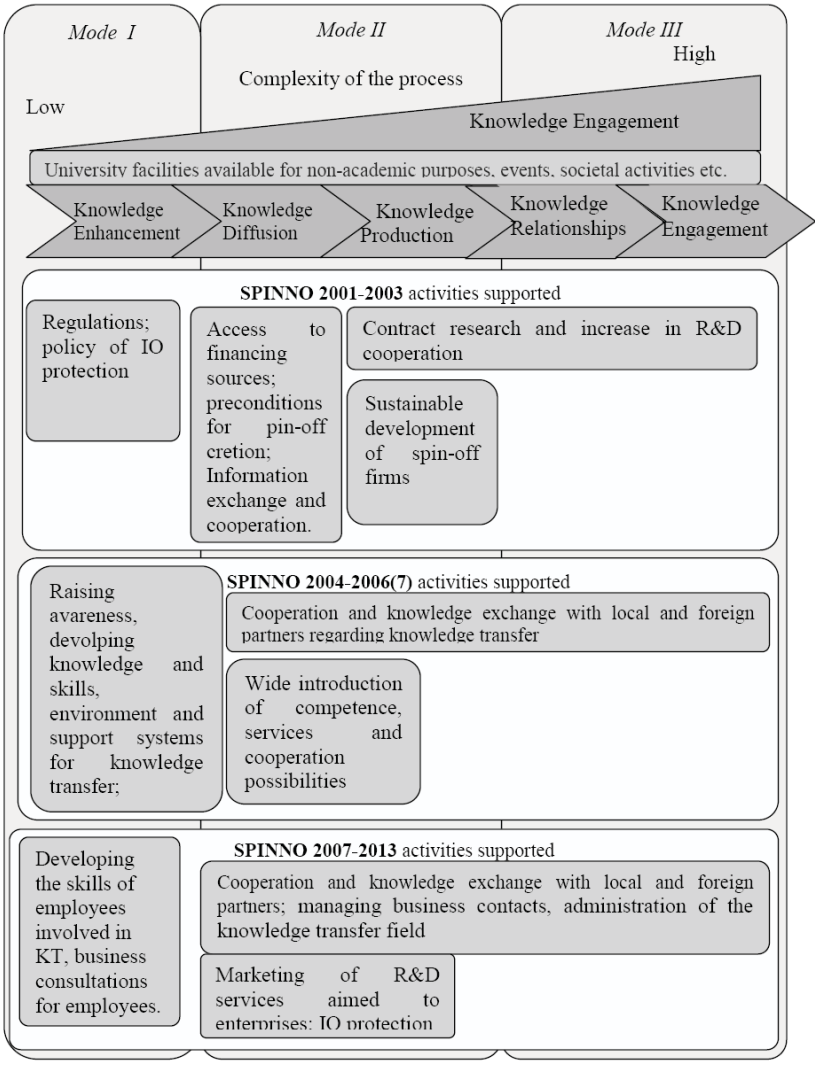

Figure 5. Activities supported by SPINNO program during financing periods of 2001-2003, 2004-2006(7) and 2008-2013.

Figure 5 reveals how the activities supported are focused around Mode I and Mode II knowledge creation frameworks and therefore are consistent with the needs of framework conditions of Estonian national innovation system. Also, comparing the activities supported with general and sub-objectives of the programme and the

indicators expected, it could be said, that the gap between the aims and expectations on one side and supported activities the other has been consistently converged.

Indicators

The system of indicators on different SPINNO programming periods is presented on Figure 6.

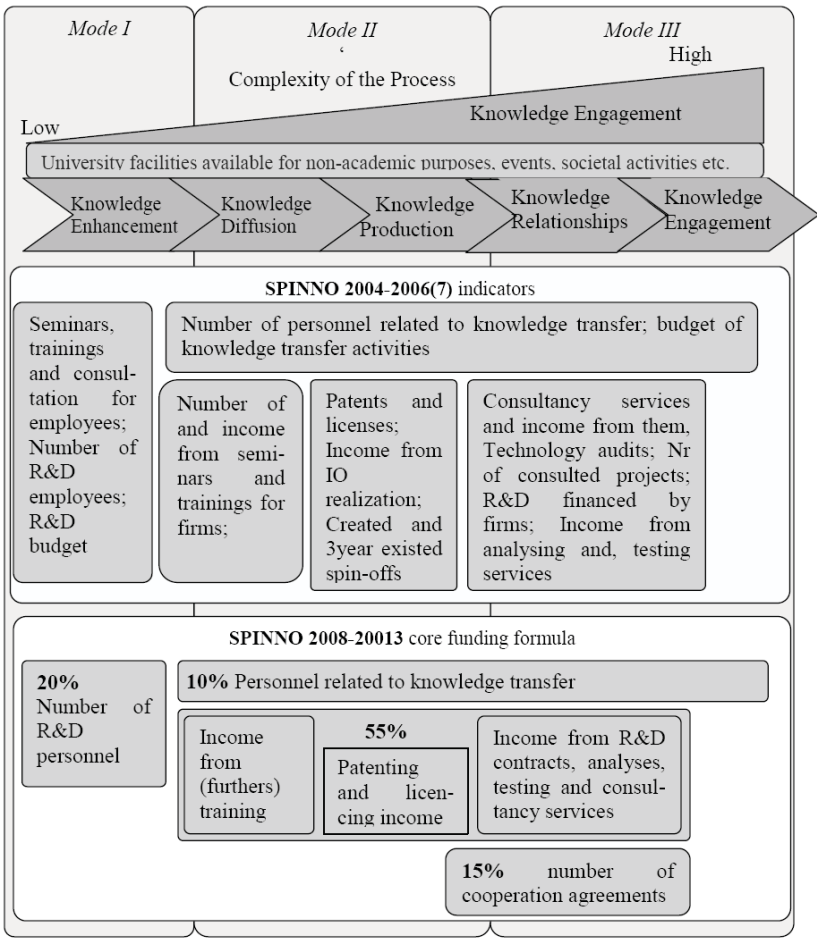

Figure 6. Indicator systems of SPINNO program during financing periods of 2001-2003, 2004-2006(7) and 2008-2013.

In the first program period no general indicator systems were set. The second period was characterized by plurality of indicators in places with disputable interpretation resulting in loss of quality and posing a huge administrative load to the project applicants obligated to report them. Third period is ordered and reasoned with indicators measuring the activities in the whole scale of Mode I-III.

Results

Table 1. Aggregated performance and targets for all projects during 2001-2006

Indicator	**2001**	**2002**	**2003**	**2005**	**2006**	
Income from consultation and training services (1000 EEK)	4 100	6 162	8 731	14 580	17 515	Prognosis
				24 665	35 668	Actual
Income from R&D contracts with businesses (1000 EEK)	19 104	3 474	37 581	46 180	56 900	Prognosis
				54 108	57 731	Actual
Income from analysis and testing services (1000 EEK)	3 451	4 228	7 345	9 800	11 300	Prognosis
				8 180	5 659	Actual
Patents granted (pc)	5	8	9	9	34	Prognosis
				3	8	Actual
Licenses granted (pc)	3	4	7	6	12	Prognosis
				6	13	Actual
Income from realisation of IP (1000 EEK)	2 779	2 695	4 315	6 330	8 400	Prognosis
				877	3 185	Actual
Spin-off businesses established (pc)	5	7	15	7	10	Prognosis
				5	10	Actual
Spin-offs existing for 3+ years (pc)	7	12	19	32	38	Prognosis
				26	29	Actual

Source: Brighton and Kells 2007

The dynamics of SPINNO aggregated output indicators is corresponding to the expected dynamics defined by knowledge transfer support scheme formation and evaluation framework, with the exception of Knowledge Production stage. The most important change revealed by documentation analyses and interviews is the qualitative change taken place (Mode I, Awareness Enhancement) – the universities have been acknowledging the nature and importance of knowledge transfer function. The highest growth amongst quantitative indicators has been achieved regarding the income levels related to consultation and training services (increased 8.7 times over the period 2001-2006), which represent knowledge diffusion phase of Mode II framework. Incomes from contract research representing the knowledge relationships phase of Mode III framework have been growing three times during the period of 2001-2006. The expected outputs of knowledge production phase (patents, licences and spin-off creation) have not been achieved in Estonian context. The phase represents the linear model of innovation referring to technology transfer,

which in Estonian context therefore has to be preceded by longer knowledge transfer period

The interviews and documentation analysis revealed, that amongst both, the program-setting institutions and applicants, there has been a positive shift in the scale of Mode I-III. Amongst program-setting institutions the change has been towards Mode III and amongst applicants towards Mode III or Triple helix framework. In conclusion, SPINNO program has been following the described line of government policy and been at some point biased towards linear technology push theory, but it can be said that the state has been able to be a step ahead from the general development in the scale Mode I-III and take the lead on directing the knowledge transfer processes.

Problems and proposals

The analyses revealed, that the program has not paid enough attention to different aspects of sustainability of knowledge transfer function and on spreading according attitudes among the applicants. At present, when the knowledge transfer functions are supported for eight years and is well known that in 2013 the following decisions must be made regarding the continuation of the program, more attention must be paid to the potential for knowledge transfer function and its independence of assumptions through the analysis of sustainability indicators that reflect the diversity of sources of funding such as research, knowledge transfer process, the complexity and an increase in the working duration and repetition.

The core funding formula used in third program period is fraught with danger for qualitative change to be hampered in the simple optimization of the formula components. Therefore, in order to guide the qualitative change taking place in universities towards sustainable development of core-financed knowledge transfer function and to ensure data for assessing the need for further financing of the function during the funding period, next to input and output indicators qualitative indicators should be analyzed alongside.

Qualitative indicators, systems and practices are still evolving and current study does not attempt to carry out a thorough analysis of any qualitative or impact indicators, but in light of the analyzes some of the recommendations in the context of the existing system can be made regarding possible qualitative indicators:

- separating the income volumes from corporate, public and private sector cooperation gathered for core funding formula enables to analyze the dynamics of research and development funding sources in regards of different sectors and knowledge transfer channels of different complexity;
- consideration should be given to involving the indicator measuring the percentage of income generated by repeated cooperation, enabling to assess the sustainability of cooperation in form of duration and repetitiveness.

Next to the process of designing the set-up of Spinno programme, the developments amongst business sector (knowledge transfer demand side) taken place on scale Mode I-III has been insufficient studied, elaborated and taken account. Since the program has 8 years of history and the focus of the program has been evolving to improving the quality of knowledge transfer activities, an analyses exploring the sustainability of cooperation relationships developed (their length and repetitiveness) and changes in demand should be carried out. This should be an important input to possible following evaluations and deciding on continuation of the program.

Although in the long term, the knowledge transfer to non-profit and public sector is also important, in current knowledge transfer framework the focus of the programme should be on university-industry knowledge transfer activities which is an important key to solving the major problems of Estonian innovation system – both the low innovation awareness of business sector and the low contribution of the private sector in research and development.

Conclusion

The gap between the aims and expectations on one side and supported activities the other has been consistently converged. In the first and to lesser extent in the second SPINNO program period the concept was viewed by both, the programming institutions and applicants, as limited to technology transfer. By the third reporting period it was acknowledged, that even more important is to facilitate knowledge transfer as the precondition for technology transfer. It was also realised by the programming institutions, that knowledge transfer does not only include the interaction between university and industry, but is concerned with interactions between universities and the rest of society (including public and non-profit spheres).

The dynamics of SPINNO aggregated output indicators is corresponding to the expected dynamics defined by knowledge transfer support scheme formation and evaluation framework, with the exception of knowledge production stage. The most important change revealed by our analyses is the qualitative change taken place (Mode I, awareness enhancement) – the universities acknowledged the nature and importance of knowledge transfer function. The highest growth amongst quantitative indicators has been achieved in the income levels related to consultation and training services (increase of 8.7 times over the period 2001-2006), which represents the knowledge diffusion phase of Mode II framework. Incomes from contract research representing the knowledge relationships phase of Mode III framework were growing three times during the period of 2001-2006. The expected outputs of knowledge production phase (patents, licences and spin-off creation) have not been achieved in Estonian context.

The analytical framework developed under this study provides an useful basis for the design and case studies of programs enhancing knowledge transfer.

References

1. **Brighton, R., Kells, K.** (2007). Impact Evaluation of Spinno Programme in 2001-2006. Implications for the EU Structural Funds Programming Period 2007-2013. December, 61 p. Available at: http://www.mkm.ee/failid/Impact_Evaluation_of_Spinno_Programme_in_2001_2006_SQW4.pdf, 09.10.2010.
2. **de Jager, D., van Looy, B., Hinoul, M.** (2001). High Tech Venturing in Estonia: Background Report for the ESTPIN Programme. September, 65 p. Available at: http://www.riigikantselei.ee/failid/Hich_Tech_Venturing_in_Estonia___Technopolis_BV_2001.pdf, 09.01.2009.
3. Eesti konkurentsivõime kava 2009-2011. (2009). Riigikantselei, 05. november 2009, 23 lk. Available at: http://www.riigikantselei.ee/failid/Konkurentsiv_ime_kava_2009_2011_02_11_2009_toimetatud2.pdf, 09.01.2010.
4. Eesti väikese ja keskmise suurusega ettevõtete arengusuundumused. Uuringu aruanne. (2005). Saar ja Poll OÜ, August, 103 lk. Available at: http://www.mkm.ee/failid/aruanne_251005.pdf, 09.01.2010.
5. **Etzkowitz, H., Asplund, P., Nordman, N.** (2001). Beyond Humboldt: Emergence of Academic Entrepreneurship in US and Sweden. Cerum Working Paper Nr. 27, 35 p.
6. Eurostati database. Available at: http://epp.eurostat.ec.europa.eu/portal/page/portal /statistics/themes, 01.12.2009.
7. Evaluation of the SPINNO programme. Final Report to Enterprise Estonia. SQW limited, July 2003, 41 p. Available at: http://www.riigikantselei.ee/failid/Evaluation_of_the_Spinno_Programme___SQW__2003.pdf, 09.01.2010.
8. **Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, R., Trow M.** (1994). *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies.* London: Sage, 179 p.
9. **Howard, J.** (2005). The Emerging Business of Knowledge Transfer. Creating Value From Intellectual Products and Services: Report of a Study Commissioned by the Department of Education, Science and Training, 157 p. Available at: http://www.dest.gov.au/sectors/research_sector/publications_resources/profiles/emerging_business_knowledge_transfer.htm, 08.01.2010.
10. **Jürgenson, A., Kalvet, T., Kattel, R.** (2005). Ettevõtluse toetusmeetmed riigieelarve strateegias 2007-2013. – PRAXISe Toimetised nr. 23, 84 p. Available at: http://www.praxis.ee/index.php?id=429&no_cache=1&tx_mmdamfilelist_pi1[showUid]=202&cHash=86e747d929, 08.01.2009.
11. **Lundvall, B.-Å.** (1992). *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning.* London: Pinter Publishers, 1992.
12. **Mets, T.** (2009). Ettevõtlik ülikool – kas Eesti võimalus? – *Õpetajate Leht*, 24. aprill. Available at: http://www.opleht.ee/?archive_mode=heading&headingid=474, 08.01.2009.
13. **Nelson, R. R.** (1993). *National Innovation Systems: a Comparative Study*. New York: Oxford University Press.
14. **Nelson, R. R., Winter, S. G.** (1982). *An Evolutionary theory of Economic Change.* Cambridge, Mass: Belknap Press of Harvard University Press, 437 p.
15. **Rothwell, R.** (1994). Towards the Fifth-Generation Innovation Process. – *International Marketing Review*, Vol. 11, No. 1, pp. 7-31.

16. Seletuskiri Majandus- ja kommunikatsiooniministri määruse 43 29. maist 2008 „Teadmiste- ja tehnoloogiasiirde baasfinantseerimise ja eriprojektide toetamise tingimused ja kord“ juurde. 11 lk. Available at: *http://eoigus.just.ee/?act=dok&subact= 1&DOK_W=216125, 09.11.2009.*
17. SPINNO programm. (2001). Kinnitatud Ettevõtluse Arendamise Sihtasutuse juhataja poolt Tallinnas, 03. oktoobril 2001, 20 lk. Available at: http://www.eas.ee/images/doc/Avalikule_ja_mittetulundussektorile/ylikoolid/spinno%20programm2001.pdf, 09.01.2010.
18. Statistics Estonia database. Available at: http://www.stat.ee, 01.12.2009.
19. **Trott, P.** (2002). *Innovation Management and New Product Development*. Harlow etc.: Financial Times/Prentice Hall, 2nd ed., 426 p.
20. **Varblane, U., Mets, T., Ukrainski, K., Võõras, M.** (2007). The Role of the Triple Helix Linkages in the National Innovation System of the Small Catching Up Economy. –6th International Conference on University, Industry and Government Linkages. Press: National University of Singapore, p. 1-18.
21. **Viia, A., Terk, E., Lumiste, R., Heinlo, A.** (2007). Innovaatiline tegevus Eesti ettevõtetes 2002-2004, Euroopa Liidu neljanda innovatsiooniuuringu (CIS 4) tulemused. Tallinn, 114 lk. Available at: http://www.mkm.ee/failid/Innovaatiline_tegevus_Eesti_ettev_tetes__CIS4_.pdf, 09.01.2010.
22. **Vinter, K.** (2005). Eesti majandusarengu, innovatsiooni ja patendinduse olukord, muutused ning arengusuunad. – *Keskkonnatehnika*, nr. 8, lk. 9-14.

TEADUSASUTUSTE JA ETTEVÕTETE VAHELISE TEADMUSSIIRDE RIIKLIK SOODUSTAMINE EESTIS SPINNO PROGRAMMI NÄITEL

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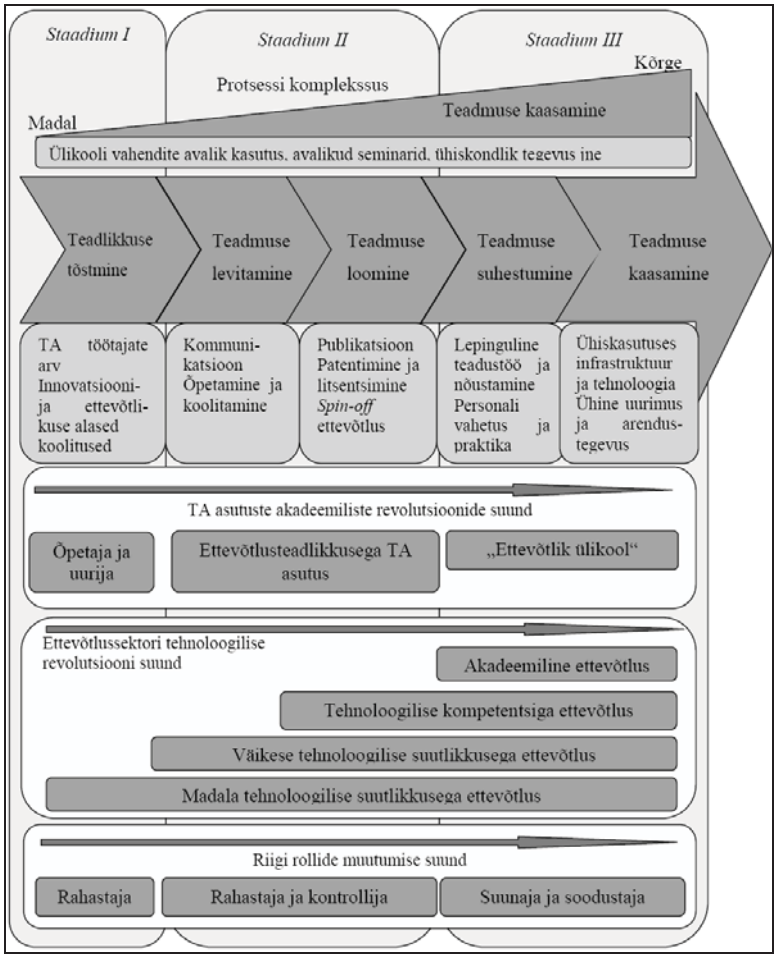
Tänapäeva riikide innovatsioonipoliitikate keskseks märksõnaks on teadmuspõhine majandus. Evolutsioonilise majandusteooria ja innovatsioonisüsteemide käsitluste kohaselt on riikide majanduskasvu ja konkurentsivõime aluseks teadmus ja sellel põhinev innovatsioon, ehk võime luua ja rakendada uusi või uudsel kujul vanu teadmisi toodete, teenuste või protsesside täiustamisel. Innovatsiooni tekke aluseks on teadmusallikate vaheline interaktsioon ja teadmussiire. Teadmussiire tähistab protsessi, mille käigus teadmus, ideed, teadustulemused ja oskused liiguvad teadmusallikate vahel, peamiselt ülikoolidest ettevõtetesse ja laiemasse ühiskonda, hõlmates nii avatud teadmuse kui akumuleeritud informatsiooni, subjektiivsete veendumuste ja oskuste kui varjatud teadmuse ülekannet.

Ülikoolide ja ettevõtete vaheline interaktsioon ja sellel põhinev teadmussiire on seega teadmuspõhise majanduse ja selle arendamisele suunatud innovatsiooni- ja ettevõtlus- ning teadus- ja arenduspoliitikate üks põhilisi alustalasid, mille suunamisele ja toetamisele orienteeritud riiklikke toetusmeetmeid on suuremal või vähemal määral rakendamas palju riike. Samas on teadmussiirde valdkond kui selline rahvusvahelisel areenil jätkuvalt uudne ja arenev, parimad praktikad on alles kujunemas. Seetõttu on äärmiselt oluline erinevate juhtumianalüüside läbiviimine, mis loovad aluse vastastikuseks õppimisprotsessiks ja üldistuste tegemiseks.

Selleks, et teadmussiiret toetav meede tooks soovitud tulemusi, on meetme ülesehituse kujundamise käigus oluline teadmussiiret toovate mehhanismide, sotsiaalmajandusliku taustsüsteemi ning teadmuse alaste interaktsioonide ja koostööeelduste tuvastamine ning riigipoolsete toetusmeetmete taustsüsteemile vastav eesmärgistamine. Eesmärke peavad saatma nende saavutamisele kohased toetavate tegevuste süsteemid ning oodatavate tulemuste mõistmise vahendid (indikaatorid). Käesoleva artikli panuseks teadmussiirde valdkonna poliitika-kujundamise protsessi edasiarendamisse nii Eestis kui laiemalt on süsteemse lähenemise väljatöötamine teadmuse loomise ja innovatsiooniprotsessi käsitluse teooriate evolutsioonilistele alustele ja nende süsteemne seostamine teadmussiirde protsessi ja vastavate kanalite ning nende toimimise eeldusega. Väljundiks on teadmussiirde soodustamisele suunatud toetusmeetmete ülesehituse kujundamise ja hindamise raamistik.

Käesoleva artikli eesmärgiks on välja töötatud raamistikus anda hinnang SPINNO programmi ülesehituse asjakohasusele teadmussiirde soodustamisel Eestis ning teha ettepanekuid meetme ülesehituse edasiseks eesmärgipäraseks kujundamiseks. Teadmussiirde kanalid, koos teadmuse loomise protsessi arenemise ja seotud osapoolt rollidega moodustavad järgmisel joonisel kujutatud teadmussiiret toetavate poliitikameetmete ülesehituse kujundamise ja hindamise raamistiku (vt. joonis 1).



Joonis 1. Teadmussiiret toetavate poliitikameetmete ülesehituse kujundamise ja hindamise raamistik. (Autori koostatud)

Staadium I, II ja III (*Mode* I, II ja III) kujutavad ülikoolide rolle teadmuse loomise protsessis ja teadmuse loomise protsessi enda vastavat muutumist. Staadium I raamistikule vastab lineaarne innovatsiooni tekkemudel, kus uue teadmuse loojatena nähti ülikoole akadeemiliste alusuuringute ühiskonna vajadustest sõltumatu läbiviijana individuaalsete distsipliinide raames ja sõltumatult ühiskonna vajadustest. Staadium II raamistikus kujuneb läbi sidus- ja integreeritud innovatsioonimudelite teadustööst interdistsiplinaarne nähtus, mida viiakse läbi mitmetes erinevates institutsioonides vastavalt ühiskondlikele vajadustele ning mida reguleerib riigi innovatsioonisüsteem. Staadium III raamistikus on innovatsiooni-

protsessist saanud Kolmikspiraali (*Triple Helix*) mudeliga kirjeldatud integreeritud võrgustikel põhinev nähtus, kus ülikoolid, ettevõtte ja riik võtavad üksteise rolle, loovad teadmussiiret toetavaid võrgustikke ja hübriidorganisatsioone.

Teadmuse loomise ja innovatsioonimudelite arenguga Staadium I, I ja III skaalal kaasnevad teadus- ja arendusasutuste, ettevõtete ja riigi muutuvad rollid, mis loovad aluse teadmussiirde tegevuste komplekssuse tõusuks. Kolmikspiraali mudeli kohase teadmuse loomise protsessi käivitumise eeldusena peavad ülikoolid olema läbi teinud teise akadeemilise revolutsiooni ja teadvustanud oma rolli majandusliku väärtusloome protsessides, ettevõtted omama piisavat tehnoloogilist kompetentsi ja innovatsiooniteadlikkust ning riik olema mõistnud oma rolli rahastaja ja kontrollija asemel suunaja ja soodustajana ehk innovatsioonipoliitika kujundajana ning tagasisidestava kontrolli süsteemi tagajana.

Teadmussiirde funktsiooni toetamisel tuleb raamistiku kohaselt rakendada üksikult üldisele lähenemist. Staadium I raamistikus peab teadmussiirde toetamine ülikoolides keskenduma ettevõtlusteadlikkuse tõstmisele ja teadmussiirdeks vajalike regulatsioonide väljatöötamisel. Etapi väljundindikaatoriteks on loodud tugistruktuurid ja regulatsioonid ning töötajate teadlikkuse tõstmisele suunatud tegevuste arv ja maht ning tulemuseks ülikoolides toimuv teine akadeemiline revolutsioon. Staadium II raamistikus on ülikoolid teadvustanud rolli majandusliku väärtusloome protsessis ja saavad võimalikuks vähem-komplekssemad teadmussiirde vormid teadustöö tulemuste laialdase levitamise (infoüritused, koolitus jne) ja teadmustoodete loomise (patendid, litsentsid, *spin-off* ettevõtted jne) vormis. Tulemuseks on ühiskondliku teadlikkuse kasv ülikoolides tehtavast teadustööst, koostöösidemete ja vastavate kompetentside ning teadmussiirde mahu ja komplekssuse järk-järguline tõus. Staadium III raamistikus saavad võimalikuks komplekssemad teadmuse suhestumist iseloomustavad teadmussiirde tegevused (lepinguline uurimustöö, analüüsi- ja testimisteenused ettevõtetele jne). Protsessi süvenedes toimub Kolmikspiraali mudeli kohane traditsiooniliste rollide hägustumine, järgneb teadus- ja arendusinfrastruktuuri ja ettevõtete paiknemine ülikoolide ja teadusparkide lähedusse ning klastrite moodustumine.

Raamistiku järgne teadmussiiret toetavate poliitikameetmete ülesehituse kujundamine ja hindamine peaks vastavalt lähtuma järgmistest põhimõtetest:

- Teadmussiirde toetamise eesmärgiks on osapoolte suunamine ja arendamine Staadium I, II ja III skaalal, ehk ettevõtete tehnoloogilise kompetentsi ja muutumisvõimelisuse ja teadus- ja arendusasutuste ettevõtlikkuse soodustamine, millega paralleelselt teiseneb ka riigi enda roll rahastajalt ja kontrollijalt suunajaks ja soodustajaks.
- Toetusmeetmete ülesehituse kujundamisel tuleb arvestada riikliku innovatsioonisüsteemi kumulatiivseid raamtingimusi ja osapoolte vastava ajaperioodi arengueeldusi- ning takistusi ja suunata programmi eesmärkide ning tegevuste kompleks vastavate eelduste ärakasutamisele ja takistuste likvideerimisele.

- Indikaatorid peavad mõõtma kõiki teadmussiirde etappe Staadium I-III skaalal, et võimaldada toimuvate muutuste analüüsi ning programmi vastavat kujundamist.
- Toetus peab viima teadmussiirde funktsiooni iseseisvumiseni (jätkusuutlikkuseni) ülikoolides, läbi ülikoolides läbiviidava teadus- ja arendustegevuse rahastamisallikate mitmekesistumise.

Kuigi teadmussiirde valdkond ja seda toetavate meetmed on rahvusvahelisel tasandil suhteliselt uudne ja jätkuvalt arenev, käivitati teadmussiirde funktsiooni soodustamisele teadus- ja arendusasutustes suunatud riiklik toetusmeede – SPINNO programm – Eestis juba 2001. aastal. Koos teadus- ja arendustegevuse projektide toetamise programmiga oli SPINNO esimeseks innovatsiooni edendamisele suunatud toetusmeetmeks Eestis. Võrdluseks Suurbritannias, kes on olnud teadmussiirde valdkonnas Euroopa üks juhtriike ja Eesti süsteemi eeskujuks, on sarnane initsiatiiv algatatud 2000. aastal. Ellu on viidud kaks SPINNO rahastamisperioodi. Perioodil 2001-2003 toetati kolme ja 2004-2006(7) jätkus toetus esimesele kolmele, millele lisandus neli uut projekti. Kokku ulatub kahel perioodil eraldatud toetus ligi 100 miljoni kroonini. Perioodiks 2008-2013 on meetme SPINNO jätkutegevuste finantseerimiseks planeeritud 80 miljonit Eesti krooni ja see on kahe-aastaste baasfinantseerimisperioodidena seitsme projekti osas käivitunud.

SPINNO programmi algusaastatel oli Eesti valdavalt Staadium I faasis. Ülikoolid olid orienteeritud valdavalt akadeemiliste alusuuringute läbiviimisele, ettevõtlussektor koosnes valdavalt madala tehnoloogilise kompetentsiga väike- ja keskmise suurusega ettevõtetest ja teadus- ja arendustegevuse peamine finantseerija ca 60% osas oli riik, mis suunati valdavas osas alusuuringute läbiviimisse. Järgneva kaheksa aasta jooksul rakendatud SPINNO programmi analüüsi ja toimunud arengute hindamise empiirilise alusena kasutatakse artiklis SPINNO programmi erinevate rahastamisperioodide alusdokumentatsiooni (programmi määrused, muutmiste määrused ja seletuskirjad, eeluuring, vahehindamise ja mõjude hinnangu raport, projektide tulemusnäitajad jne) analüüsi ning programmi korraldusasutus Majandus- ja Kommunikatsiooniministeeriumi, rakendusasutus Ettevõtluse Arendamise Sihtasutuse ja projektitaotlejate esindajatega läbi viidud intervjuusid.

Eesti raamtingimustest lähtuvas teadmussiirde soodustamisele suunatud toetusmeetmete planeerimise ja hindamise raamistikus läbi viidud SPINNO programmi analüüsi olulisemad järeldused on järgmised:

- Eesmärgid – programmi eesmärgistamist on iseloomustanud üksikult-üldisele loogika, eesmärkide fookus on liikunud laiematelt ühiskondlikelt taotlustelt teadmussiirde funktsiooni soodustamise keskseks teadus- ja arendusasutustes, millega paralleelselt on teisenenud teadmussiirde mõiste olemuse käsitlemise sisuline haare (tehnoloogiasiirdelt ülikoolide laiemale ühiskonnale ehk nii ettevõtlus-, avalikule- kui mittetulundussektorile suunatud kogu teadmussiirde tegevuste spektrit katvatele funktsioonidele).

- Tegevused – programmi tegevused on vaatamata eesmärgistamisel ilmnenud ebakõladele valdavas osas olnud Kolmikspiraali eeldustele vastavate tegevuste või arengutakistuste likvideerimisele suunatud.
- Indikaatorid – kui esimesel programmiperioodil väljendati ootusi peamiselt teadus- ja arendustegevuse tulemuste ärilistel eesmärkidel rakendamise väljunditele (tehnoloogiasiire), siis teisel programmiperioodil oli teadmussiirde kanalite käsitlus oluliselt laiem hõlmates ka teadmuse siirde erinevaid kanaleid. Sellega kaasnes aga mõõdetavate indikaatorite rohkus, mis tõi taotlejatele kaasa olulise indikaatorite kogumise ja raporteerimisega seonduva halduskoormuse tõusu. Kolmandaks rahastamisperioodiks on indikaatorid läbi teinud arengu korrastatud ja läbimõeldud süsteemile, keskendutakse strateegilistele indikaatoritele, mis mõõdavad tegevusi kogu teadmussiirde tegevuste komplekssuse skaalal.
- Tulemused – SPINNO koondtulemuste indikaatorite väärtuste dünaamika vastab teadmussiiret toetava programmi planeerimise ja hindamise raamistikule, välja arvatud teadmuse loomise etapi osas. Olulisima tulemusena on saavutatud kvalitatiivne muutus ehk teadlikkuse tõus teadmussiirde funktsiooni olemusest ja selle olulisusest ülikoolide ühe funktsioonina (Staadium I kohane teadlikkuse tõstmise etapp). Kvantitatiivsetest näitajatest on suurim kasv saavutatud konsultatsiooni ja koolitustega seonduvate tulude näitajas (8,7 korda perioodil 2001-2006) (Staadium II kohane teadmuse levitamise etapp), millele järgnevad lepingulise teadustööga (Staadium III kohane teadmuse suhestumise etapp) seonduvate tulude koondnäitajad, mis on perioodil 2001-2006 saavutanud kolmekordse kasvu. Teadmuse loomise etapi patentide, litsentside ja spin-off ettevõtetega seotud indikaatorite tulemused ei ole Eesti kontekstis vastanud analüüsimudelile. Need näitajad peegeldavad tehnoloogia siiret, millele järelikult Eesti üleminekutaustaga riigis peab eelnema pikem ja põhjalikum teadmussiirde faas.

Analüüsi tulemusel ilmnenud probleemid on järgmised:

- Käesoleval hetkel, kui teadmussiirde funktsioone on toetatud kaheksa aastat ja on teada, et aastaks 2013 tuleb teha järgmised otsused programmi jätkumise osas ei ole piisavalt palju tähelepanu pööratud teadmussiirde funktsiooni jätkusuutlikkuse erinevatele tahkudele (koostöö kestus, korduvus ja maht, finantseerimisallikate mitmekesistumine).
- Kolmandal rahastamisperioodil eraldatavate vahendite aluseks olev baas-finantseerimise valem kätkeb endas ohtu organisatsioonides toimunud kvalitatiivse muutuse teisenemiseks valemi komponentide optimeerimiseks.
- Programmi kujundamise kontekstis on ebapiisaval määral uuritud ja arvestatud nõudluse poolel (ettevõtlussektoris) toimunud arenguid Staadium I-III skaalal.

Ettepanekud SPINNO programmi kohandamiseks teadmussiiret toetavate meetmete kujundamise ja hindamise raamistikus:

- Töö raames analüüsitu valguses on võimalik teha mõned soovitused teadmus-siirde jätkusuutlikkuse analüüsiks läbi kvalitatiivsete indikaatorite:

- teadmussiirde protsessi komplekssuse tõus Staadium I-III skaalal võimaldab jälgida erinevate teadmussiirde tegevustega seonduva tulu dünaamikat;
- rahastamisallikate eraldamine baasfinantseerimise valemi tulu indikaatoris võimaldab jälgida teadmussiirde tegevuste rahastamisallikate dünaamikat;
- Kaaluda tuleks korduvast koostööst saadava tulu protsenti kogutulust näitava indikaatori kaasamist projektide aruandlusesse, mis võimaldab hinnata koostöö jätkusuutlikkust selle kestvuse ja korduvuse näol.

- Olulise sisendina võimalikule programmi vahehindamisele ja vastavale SPINNO programmi edasist jätkamist ja ülesehitust puudutavale analüüsile ühiskonna suunamisel Kolmikspiraali mudeli poole, tuleks läbi viia seniste koostöösidemete jätkusuutlikkust (koostöö kestuse ja mahu) ning ettevõtete poolse nõudluse uuring/analüüs.

Kokkuvõtvalt võib öelda, et on SPINNO programmi arengu käigus on toimunud oluline programmi eesmärkide ja ootuste ning raamtingimuste ja vastavate toetatavate tegevuste lähenemine üksteisele. Kuigi programmi fookus on mõneti olnud nihkes, näitas analüüs, et nii programmi kujundavate institutsioonide kui taotlejate hulgas on toimunud positiivne nihe Staadium I, II ja III skaalal ja välja töötatud raamistik loob olulise aluse nii selle kui sarnaste programmide edasiseks kujundamiseks ja täiendavateks juhtumianalüüsideks.