

**EVALUATION OF THE SPINNO
PROGRAMME**

**FINAL REPORT TO ENTERPRISE
ESTONIA**



economic development consultants

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Final Report to Enterprise Estonia

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Executive Summary

Introduction

1. This report was prepared by SQW Limited following a mid-term evaluation of the SPINNO programme commissioned by Enterprise Estonia (EAS). The SPINNO Programme was launched by EAS to strengthen the national system of innovation in Estonia and in turn, help to increase the competitiveness of the Estonian economy through the development of new science-intensive economic activity.
2. As the Programme only began in 2001 and some of the projects experienced delays in setting up, outputs generated so far have been fairly limited. It was therefore agreed that the main emphasis of the review would be to produce a forward look analysis. The study was undertaken between 9th and 13th June 2003 during which discussions were held with staff from Enterprise Estonia, the Ministries of Economic Affairs and Communication and Ministry of Education and Research and with project participants based in two HEIs. These discussions were extremely valuable but do not represent an in-depth survey of the programme and its impacts. As such we have relied on the views of those consulted, and some previous reports, in order to make an assessment of the need for SPINNO and its current position.

Key findings

3. In summary, the views of those consulted are that:
 - the original rationale for SPINNO – a need to develop capabilities in the universities and change academic attitudes towards interactions with business – was valid when the programme was launched and remains valid today
 - the more specific objectives of SPINNO are appropriate given its rationale. It is too early to assess whether objectives have been met. There are, however, some encouraging signs, especially in relation to the first established project (TTU)
 - the programme appears to have been efficiently managed. We believe that the resources devoted to some projects may be over generous given the likely levels of activity, but we do not consider this a major concern at present

- two of the projects are considering actively how their projects might be sustained without SPINNO funding. The third, on present plans, will not continue post-funding
- the projects would almost certainly not have gone ahead without SPINNO funding

Recommendations

4. Should SPINNO continue? Based on the consultations we have undertaken we believe the answer must be yes. Estonia has set itself a goal of becoming a knowledge-based economy and society and the higher education sector has a crucial role if this goal is to be realised. The key role of the sector will be to produce highly trained graduates and postgraduates. But its research, and other skills, also need to be directly exploited, both by supporting existing businesses and by creating new ones through spin-outs and spin-ins. We make a number of recommendations for future funding rounds. These are organised in two sections. In the first section, recommendations are made on the basis that the current structure of SPINNO projects is retained. The second section recommends changes to the basic SPINNO structure.

Retention of the current structure

Funding

5. We have some concerns that the level of support for the SPINNO projects is too generous given the levels of activities. While we would recommend that levels of funding are carefully reviewed, in relation to the activities undertaken, we do not think this should be a major concern at present, mainly because the priority should be to achieve some early and high profile successes.
6. Current projects are funded at 75% of their costs and we would recommend that the share of EAS funding is reduced in future rounds. The rationale being to encourage projects to seek alternative sources of funding. However, decisions on levels of funding should be taken after consideration of proposed activities and their fit with national priorities.

Widening participation in SPINNO

7. The primary research universities are participating in SPINNO but there are other organisations which might contribute to Estonian businesses. These include the specialised universities and those institutions which offer vocationally oriented higher education courses. We recommend consideration be given to:
 - targeted promotion of the SPINNO programme to these organisations

- establishing a separate fund to support specific initiatives in such organisations. The rationale is that it may not be appropriate for such organisations to be awarded funding for the full range of activities but they may need support to launch specific initiatives, for example to develop a training course which could then be rolled out to a number of firms in a specific sector.

Application procedure

8. We recommend the introduction of a proforma application form requiring applicants to address specific issues. This will facilitate comparison between bids for funding and also the translation of project intentions into monitoring targets.

Project monitoring, performance indicators and targets

9. We recommend:
 - bidders for SPINNO funds should specify the targets they aim to achieve. They should also state how these targets have been arrived at and, crucially, identify key risk factors associated with achieving them
 - EAS would commit to funding successful projects for a three year period. Before awarding funding, however, there would be a dialogue between EAS and the bidder over the targets against which the project would be monitored
 - progress against targets would be reviewed annually, again involving a dialogue between EAS and the project. Failure to meet targets need not necessarily result in reduced funding.
10. Our recommendations, we believe, imply a closer relationship between EAS and the projects than currently exists. For this reason we recommend that formal progress reviews are held for each project on (say) a quarterly basis and that these are attended by an EAS representative.

A greater emphasis on people transfer mechanisms

11. We believe there may be more scope to involve post graduates and graduates with businesses and would recommend that consideration be given to two sorts of scheme. The first, would involve PhD, and possibly also Masters, students undertaking projects for businesses as the basis of their thesis. The second would involve graduates undertaking projects in a company.

Changes to the structure of SPINNO

Project types

12. We recommend that two sorts of projects are considered for funding:
- one aimed at strengthening university infrastructures which would fund staff to promote business interaction, provide training to staff and manage interactions, including the exploitation of IPR
 - the other would be based on a specific industrial sector and would aim to establish and/or consolidate networks between universities and companies.

Central/collaborative provision of services

13. TTU and Tartu are undertaking similar activities within their projects, albeit within different structures. Given the size of the two universities this raises the question as to whether some services could not be provided to both more efficiently, either by a separate organisation or by the two universities collaborating. Such services might include:
- an initial point of contact for businesses wishing to access university expertise, but without prior contacts
 - expert advice and information on a variety of topics, including: IPR management sources of funding; market intelligence; and training.
14. EAS should consider whether it should itself have a role as a central provider of such services.

New organisations

15. We recommended that small grants be made available to organisations not currently participating in SPINNO to allow them to undertake specific initiatives. However, there may also be scope to involve them in partnerships with the principal universities although we recognise the difficulties in securing such collaboration.

1 Introduction

1.1 This document presents a final report prepared by SQW Limited following a mid-term evaluation of the SPINNO programme for Enterprise Estonia (EAS). The SPINNO Programme was launched by EAS to strengthen the national system of innovation in Estonia and in turn, help to increase the competitiveness of the Estonian economy through the development of new science-intensive economic activity. More specifically it had the following objectives:

- to increase the exploitation rate of the results of research carried out in Estonian universities and R&D institutions
- to develop an environment favourable to entrepreneurial activities in Estonian universities and R&D institutions
- to develop co-operation between Estonian universities and R&D institutions in supporting knowledge-intensive entrepreneurial activity.

Aims of the review

1.1 As the Programme only began in 2001 and some of the projects experienced delays in setting up the required infrastructure, outputs generated so far have been fairly limited. It was therefore agreed that the main emphasis of the review would be to produce a forward look analysis. It was agreed with EAS that the main objectives of the review would be to provide advice on the following questions:

- should support to the SPINNO Programme continue?
- if so, what form should this support take and over what period?
- what form should the application procedure take?
- what performance indicators should be used and can these be quantified?

- how can an innovation culture be encouraged down to researcher level in universities?
- how can industry be encouraged to become more fully engaged in such schemes?

Methodology

- 1.2 The study team made a short visit to Estonia between 9th and 13th June 2003. Enterprise Estonia was most helpful in arranging a series of face to face meetings during this period and we held 22 interviews with staff from Enterprise Estonia, the Ministries of Economic Affairs and Communication and Ministry of Education and Research and with project participants based in two HEIs. These discussions were most helpful, but clearly do not represent an in-depth survey of the programme and its impacts. In particular, we have not consulted with many academic staff or businesses. As such we have relied on the views of those consulted, and some previous reports, in order to make an assessment of the need for SPINNO and its current position. The SQW team made a verbal presentation of findings and recommendations, on the morning of Friday 13th, before returning to the UK. We received some very useful feedback from the EAS and a representative of the Ministry of Economic Affairs and Communication.

Report structure

- 1.3 The rest of the report is structured as follows. Chapter two reviews progress in the three SPINNO projects funded to date. Chapter three presents the main findings of the SQW team. Chapter four presents recommendations for continued funding with various options for change. There are two Annexes to the report, the first supplies some commercialisation data for selected UK universities and the second a list of those interviewed.

2 The projects

Background

- 2.1 The SPINNO Programme began in 2001 and so far €2.2 million have been committed to three large projects. The main details of these are given in table 2.1 overleaf. The following sections give more detail on the content of these projects and their progress to date.

Tallinn SPINNO

- 2.2 Tallinn Technical University (TTU) is Estonia's leading technical university and has rapidly developed a new innovation support infrastructure based on the SPINNO project which has three main objectives:

- **Intellectual Property (IP);** to enhance the overall awareness of IP issues and create a support infrastructure to improve its management. The project also aims to provide complementary fundamental legal acts and develop an information system in the IP field. A main aim of the project is to create a competent support organisation – ensuring availability of necessary supportive services for scientists (patent research, services of patent attorney, patent protection)
- **Knowledge-intensive services;** to market and design services that are more appealing to companies and to rationalise the use of TTU's resources – research, development, laboratory, consulting, HR development services (recruiting and specialised courses). The SPINNO team also aims to create and develop additional financing options for TTU's R&D activities, and the unit will form the focus of the coherent marketing of TTU's resources directed towards enterprises. To facilitate these activities SPINNO staff will assist with such tasks as; proposal preparation, costing of projects, finding new customers etc. The unit will also attempt to introduce a more coherent pricing policy for the university's services in general, which will both maximise benefits to the university and limit the effects of the "shadow economy"

Table 2.1: Summary details of SPINNO projects			
Title	Participants	EAS Contribution	Comments
Tallinn SPINNO	- Tallinn Technical University (TTU)	€1m (2002-2003)	<p><i>Three main phases;</i></p> <ul style="list-style-type: none"> - preliminary analysis of situation in the university of requirements of a support system (complete) - implementation phase, awareness raising, training (current) - testing 2004 onwards <p><i>Target Groups;</i></p> <p>TTU, R&D Institutes, the rest of Estonia</p>
Tartu SPINNO	<ul style="list-style-type: none"> - Tartu University Technology Inst. - Estonian Agricultural University - Tartu Science Park - Tartu University Technical Institute 	€714k (2002-2003)	<p><i>Three main aims;</i></p> <ul style="list-style-type: none"> - development of R&D of TUs and commercialisation of results (increasing contract research, better use of IPR, creation of spin-outs) - promoting a culture of entrepreneurship (new legal structure, improved project management, awareness raising) <p><i>Target Groups;</i></p> <p>Universities, R&D Institutes, environmental agencies, unions, CoCs,</p>

Table 2.1 (cont.): Summary details of SPINNO projects			
BioSPINNO	<ul style="list-style-type: none"> - Estonian BioCentre (Leader) - Institute of Chemical and Biological Physics (Co-or) - Tartu Biotechnology Park and Estonian Gene Centre (Co-or) - TTU, Biotechnology and Gene Technology - Tartu University, Institute for Molecular Cell Biology - TTU, Institute of Gene Technology - Tartu University Technical Institute - TTU Centre for Biotechnology and Gene Technology 	€405k (2003)	<p>Sector based, three main aims;</p> <ul style="list-style-type: none"> - increased cooperation between participants and enterprises (in June 2002 there were 26, most less than 3 years old, average 6 employees, two had 20-30) - helping companies to acquire and use new knowledge - to facilitate transfer of new knowledge between enterprises and institutes <p>Also;</p> <ul style="list-style-type: none"> - establish support mechanisms in leader organisations - create new biotechnology spin-outs - more co-operation between partners to raise competitiveness <p>Target Groups; R&D Institutes, TTU, TU, potential enterprises, potential investors.</p>

- **Entrepreneurial spirit of employees;** to enhance the overall awareness of entrepreneurship and foster the ethos of the *Entrepreneurial University* throughout the organisation. The unit will aim to expand the general awareness of science-intensive entrepreneurship and where appropriate, encourage the formation of spin-outs or the granting of licensing agreements.

2.3 A wide ranging plan for the SPINNO program was drawn up for the years 2001-2003 and a successful application was submitted to EAS for 75% of a total of €1 million over three years. During 2002 the emphasis was on market research and promotion of the project within the university. The aim was to assess the demand for the services proposed, and refine them in the light of the feedback received. By the end of 2002 the basic support infrastructure was in place (a total of seven staff have been hired so far), and the emphasis had switched to implementation. Further seminars, conferences and special courses continue to be organised to promote the initiative within the university and beyond and to stimulate new collaborations and demand for the universities services. There is also continued development of legal services and the SPINNO information systems.

2.4 The project has got away to an impressive start and the expectation is that total contract research for TTU this year will be around €4 million which exceeds the targets given in the original proposal. The SPINNO unit has also been involved with establishing co-operation with around 20 new companies who are committed to paying realistic rates for the university's services, and two new licensing agreements are being finalised.

Tartu SPINNO

2.5 Tartu SPINNO is coordinated by the Tartu University Technology Institute and the two initiatives are closely entwined. Seventeen full-time staff are employed, with SPINNO funds, by the Institute and without SPINNO funding it is difficult to see how the Institute could have reached its current stage of development.

2.6 The Institute was created in 2001 in refurbished premises within the University precinct and several research groups have moved to the Institute building from elsewhere within the University. The overall objectives of the Institute are to:

- optimize the generation, protection and commercial use of intellectual property in Tartu University

- serve as an incubator for high-tech companies in the early stages of development
- be a partner for high-tech companies in the later stages of development
- be a center where local companies can get professional help, advice and collaboration in solving problems in the process of innovation.

2.7 These are closely aligned to SPINNO objectives. The SPINNO funded staff are organised into seven groups:

- facilitating cooperation between the SPINNO partners (University of Tartu, Agricultural University, Tartu Science Park)
- managing IPR
- promoting spin-offs and assisting with their early stage development
- developing regulations within the Universities which will encourage researchers to interact with businesses
- increasing contract research income, from businesses and sources apart from the Estonian Government
- education for researchers. The University of Tartu Faculty of Economics and Business Administration is delivering courses in entrepreneurship designed in the Netherlands
- events organisation which is a cross cutting activity supporting all the above.

2.8 There is an emphasis on the generation of spin-out companies in the Institute's strategy and five staff, each with specialist sectoral responsibilities, are dedicated to spin-off promotion and support. However, the Institute's policy is to license IPR, either within Estonia or abroad, if spin-outs are not considered feasible

BioSPINNO

- 2.9 BioSPINNO was the last project to start and was only notified of its success in January 2003. It is also radically different in its nature from the other two projects in two ways. First, as shown by Table 2.1 the range of partners involved in the consortium includes all of the main university departments, research institutes and companies actively involved in the biotechnology sector in Estonia. Secondly, the fact that companies are involved and are already effectively networked nationally, means that they are effectively further down the innovation cycle than the participants in the other projects.
- 2.10 The project was conceived as part of the activities of the Estonian Biotechnology Association (soon to become known as EBio). As the national biotechnology network is already well developed a major emphasis of SPINNO activities is to market the Estonian biotechnology sector internationally. So far the SPINNO funding (75% of €5 million) has employed ten members of staff.
- 2.11 There are three main pillars to the activities of BioSPINNO:
- ***IPR support;*** is principally centred at the Estonian BioCentre (Tartu) and the national Institute for Chemical and Biological Physics (Tallinn). The range of support on offer is intended to cover all aspects of IPR management, contracts, licensing, negotiation etc.
 - ***Development of the demand side;*** development of a range of support packages for consortium members, to assess demand for their services both nationally and abroad. Active marketing of the consortium's strengths will also be supported e.g. attendance at trade fairs overseas
 - ***Collaboration within the sector;*** the aim is the further integration of the existing strong contacts across the Estonian biotechnology sector and stronger links with governments departments and alternative sources of finance such as venture capital companies.

3 Key findings

- 3.1 In the opinion of those consulted there is no doubt that the rationale behind the introduction of SPINNO is sound. There is a definite need to strengthen the innovation infrastructure in Estonia and SPINNO has already made significant advances in this respect. As well as introducing support mechanisms for commercialisation activities, there is a need to alter the culture of innovation both within the universities and enterprises.
- 3.2 The universities' and institutes' ability to commercialise the results of their activities needs to be strengthened for two main reasons. First, the activities of the main Estonian universities and research institutes will play a pivotal role in achieving the aims of the national R&D strategy which highlights three disciplines as priorities; biotechnology, information technology and materials science. Secondly, marketing of services and commercialisation of ideas are new activities to most of the players within these institutions and they will need support from specialists to maximise the returns.
- 3.3 The traditional culture within the universities in Estonia has been centred on fundamental research and there are many who will wish to adhere to the old values come what may. However there is also a innovative culture evolving amongst staff who understand the need to attract outside funding if only to assist with the maintenance of the university infrastructure in terms of equipment, laboratories and basic facilities. There is a need to encourage and support these researchers and SPINNO provides one means of achieving this.
- 3.4 The industrial base in Estonia is not conducive to widespread university/enterprise collaboration. The vast majority of companies are very small and most operate in traditional low technology sectors. Although many of these have the potential to increase productivity through innovation there is no history or culture of collaboration with higher education institutes. Under the Soviet regime there was more interaction because academics' terms of employment were so poor it was the norm for them to have one or more other jobs in industry to subsidise their income.

3.5 However, lack of national expertise in technology management and a culture which does not value innovation as highly as it might, are not the only obstacles to more efficient exploitation of research, and two factors in particular were mentioned to us:

- we understand that funding for university research is virtually all project based. Proposals for funding are peer reviewed and track record in previous research is a key criterion. This creates a powerful incentive to continue with established lines of research an limited incentive, or opportunity, to explore new areas and approaches
- extra investment is required in research infrastructure, notably buildings and equipment, and this inhibits the scope to work with businesses even if partners can be found.

3.6 The previous section has shown that some impacts have already occurred as a result of the SPINNO Programme but the majority of outputs are yet to be realised. Even so some tangible benefits can already be seen:

- all projects have at least the basic support infrastructure in place to assist commercialisation and collaboration
- all projects have made advances towards standardised IPR agreements for their staff
- both the universities involved have a much clearer idea of what contract research is taking place and by whom
- both universities are moving towards more coherent and realistic costings for the services they provide
- TTU has some tangible achievements to date such as 20 new industrial contacts, licensing agreements and spin-outs, and a doubling of research contract research income since the start of SPINNO
- BioSPINNO though only just launched comprises a consolidated network covering most of the Estonian biotechnology sector, sharing costs and expertise.

- 3.7 A major benefit of the programme also lies in the *process* of establishing a SPINNO project. All three projects undertook extensive consultations within the consortium members when preparing the proposal. These consultations were strengthened by the ongoing dialogue with EAS at the proposal stage which all managers found useful. This process itself could have already gone a long way towards shifts of culture in some of the organisations involved.
- 3.8 It is also worth noting that both Tallinn and Tartu are planning seriously for the time when SPINNO funds are withdrawn. We did not examine these plans, but both projects told us they were actively seeking funding from other sources and that this was part of their business plans. There are, therefore, some grounds for believing that the projects are sustainable and will continue if and when SPINNO funding ceases. We understand the BioSPINNO has a different strategy and has avoided seeking to establish a permanent infrastructure, precisely because SPINNO funds are expected to end at some time.
- 3.9 Generally the expenditure to date appears to represent a good use of public funds. As we shall see later there may be a case for saying that some of the projects are over staffed (at least by UK standards), but given the difficulties of operating in the current Estonian context and the relative inexperience of many of the staff involved this may not be unreasonable.
- 3.10 The application process itself went well, the continuous dialogue playing an essential part in the process given the differences between the three projects and the newness of the initiative. The flexibility of the application process was appropriate in this first instance. However, it was felt that any subsequent calls, especially if they involve a greater number of projects, would benefit from the utilisation of a simple pro-forma which still allowed considerable flexibility.
- 3.11 As was mentioned above, all the project leaders are realistic about the temporary nature of the funding and are already making plans for becoming self sufficient when this provision ceases. However, it was felt that at least one transition period is required with continued public funding to preserve the benefits achieved so far and the next section reviews what form this might take.
- 3.12 In summary, the views of those consulted are that:
- the original *rationale* for SPINNO – a need to develop capabilities in the universities and change academic attitudes towards interactions with business – was valid when the programme was launched and remains valid today

- the more specific *objectives* of SPINNO are appropriate given its rationale. It is, however, too early to assess whether objectives have been met and given the nature of the current study it was not possible to judge the likelihood of success. There are, however, some encouraging signs, especially in relation to the first established project (TTU)
- the programme appears to have been *efficiently* managed. All the main research centres are participating and we understand that delays in involving Tartu University cannot be attributed to SPINNO management. We believe that the resources devoted to some projects may be over generous given the likely levels of activity but, for the reasons given in this report, we do not consider this a major concern at present
- it is too early to assess the *effectiveness* of the programme
- two of the projects are considering actively how their projects might be *sustained* without SPINNO funding. The third, on present plans, will not continue post-funding
- *additionality* is very high with the universities claiming that they would not have been able to fund the staff without SPINNO support. Given the general shortage of funding for universities, and the fact that SPINNO activities have so far generated little if any financial returns to the universities, these claims are credible.

4 Recommendations

Introduction

- 4.1 The first question this evaluation needs to answer is should SPINNO continue? Based on the, albeit limited, consultations we have undertaken we believe the answer must be yes. Estonia has set itself a goal of becoming a knowledge-based economy and society and the higher education sector has a crucial role if this goal is to be realised. The key role of the sector will be to produce highly trained graduates and postgraduates. But its research, and other skills, also need to be directly exploited, both by supporting existing businesses and by creating new ones through spin-outs and spin-ins¹.
- 4.2 Those consulted were unanimously of the view that cultures and attitudes within the universities need to change if the higher education sector is to actively reach out to businesses. The expertise and resources to market university skills and manage interactions with businesses also need to be increased. SPINNO has already achieved much in this respect, but there is still a long way to go. Furthermore, those we consulted involved in projects were adamant that the universities would not be able to fund activities at anything like current levels from their own resources. If SPINNO funding was to cease after the current projects we therefore believe that much of the recent effort would be wasted as resources and individuals were withdrawn from SPINNO activities. This could be especially unfortunate because we think it likely that at least some of the projects will start to achieve successes in the near future. We have no direct evidence to support this but the early stages of the projects have inevitably been concerned with establishing teams and infrastructures, which they appear to have done successfully. We expect this groundwork to bear fruit in the near future and a few, high profile, successes could do much to change attitudes amongst academic staff.
- 4.3 While we therefore recommend that SPINNO continues we make a number of recommendations for future funding rounds. These are organised in two sections. In the first section, recommendations are made on the basis that the current structure of SPINNO projects is retained but that some modifications are made to programme management and activities. The second section recommends changes to the basic SPINNO structure. *All the*

¹ By spin-ins we mean external individuals, or businesses, creating new companies based on university intellectual property as opposed to academic staff themselves forming a company.

recommendations made on the basis of retaining the current structure would also apply to a new structure.

Retention of the current structure

Funding

- 4.4 We do have some concerns that the level of support for the SPINNO project is too generous given the levels of activities. This is mainly based on a comparison of number of people employed by the SPINNO project with similar activities in UK universities². However, such comparisons between two different systems are problematic. While we would recommend that levels of funding are carefully reviewed, in relation to the activities undertaken, we do not think this should be a major concern at present. This is mainly because we believe the priority should be to achieve some early and high profile successes. At the current time the universities have only recently established their SPINNO infrastructures and the individuals involved are evolving ways of working and developing their expertise. In this context, seeking to fund provision at minimum cost may be counter productive.
- 4.5 Current projects are funded at 75% of their costs and we would recommend that the share of EAS funding is reduced in future rounds, perhaps decreasing on an annual basis for projects which extend over a number of years. The rationale being to encourage projects to seek alternative, both public and private, sources of funding. It is not possible, in this report, to be prescriptive about the most appropriate levels and rates of SPINNO funding. These will depend on a number of factors, in particular:
- the extent to which interactions with business become self-funding. This will depend on the demand from businesses and the capabilities of the universities, neither of which we have assessed in any depth
 - the potential for universities to generate funding from other sources, including CEC and public (non-SPINNO) sources in Estonia
 - policies by other agencies, notably the Ministries of Economic Affairs and Communications and of Education and Research, which will impact on the demand and supply of university services for business.

² See Appendix A for data and a discussion of this issue.

- 4.6 It is not possible to predict how these factors will develop but, based on EU experience, we can outline some of the key considerations. We deal first with the possibility of activities becoming self-funding. This is a complex topic and it is essential to distinguish between different types of business interactions.
- 4.7 **Contract research** encompasses a wide range of activities. At one extreme is research projects where the business sponsor defines closely what they require, will insist that only it has access to results and expects to commercialise results quickly. At the other extreme, the research may be more open ended and the sponsor less concerned about dissemination of results. In the UK these different types of research are typically treated differently. In the first case, the university may derive limited academic benefits and the sponsor is likely to insist on full ownership and control of any IPR arising from the research. Where this is so, the university is likely to charge the full costs of the research, including overheads. In the second case the university may retain some IPR and may also generate conventional academic publications. As such it may undertake the research at below full cost since there is a direct contribution to academic aims. Whether or not contract research can be self-funding therefore depends on the nature of the research and the policies of the university towards full-cost recovery.
- 4.8 It is likely that, in the UK, the university sector as a whole does not cover the full costs of the contract research it undertakes. In part, because of a resistance by businesses to pay the full costs but also because of perceived academic benefits from such research. Some universities also have difficulties in implementing full cost recovery policies even when these are clearly stated. Most universities will, however, undertake some contract research on a self-funding (full-cost) basis.
- 4.9 All the evidence from the EU, and also the USA, is that few universities generate significant revenues from the **exploitation of IPR**, either through licensing or spin-outs, and even less generate a surplus over the costs of exploiting IP. Taking UK universities as a whole, there is a surplus of IP revenues over costs but this reflects some very large surpluses generated by a handful of institutions, with most making losses. This general picture reflects some key points:
- there are high levels of risk and uncertainty attached to the exploitation of IPR. Typically high returns are generated by a small number of inventions with the vast majority generating little or nothing³. This means that IP portfolios need to be large in order to contain the major revenue generators and this is obviously correlated with the volume of research undertaken within a university

³ BTG (British Technology Group) is the largest organisation in the world dedicated to the exploitation of IP. Amongst others inventions it held the patents relating to the hovercraft, NMR technologies, cephalosporins and pyretherides. The majority of its revenues have often derived from only five or six inventions

- related to the last point, major revenues often come from collections of patents rather than one invention and a single university is unlikely to generate complementary IP
 - university generated IP often requires very substantial development before it can be commercialised. This is high risk, and expensive, and requires a commercial partner. The eventual return to the university will reflect the allocation of risk and development investment and if a commercial partner has provided these funds the share of returns to the university must be diluted
 - it takes time to develop the research portfolio but also the expertise to manage this portfolio effectively. Even in EU members states many universities have only started to develop this expertise comparatively recently.
- 4.10 None of this is meant to suggest that Estonian universities should not ensure that IP is managed effectively, nor that surpluses cannot be generated. However, it may take a long period to approach this position, perhaps ten years, and any surpluses are likely to be very small in relation to the total university budget.
- 4.11 The universities will also provide a range of *other services* to businesses, such as consultancy, training and analysis and testing. The indications from the EU are that these services can be provided on a self-funding basis but with some caveats:
- they need to be properly costed, including overheads, and priced accordingly. This implies systems for controlling the supply of activities and the vetting of contracts
 - academics may have an incentive to avoid university structures and deal directly with businesses since this reduces bureaucracy, reduces the price they can offer services at and may increase their personal financial gain. In the UK this is a particular issue in relation to consultancy and again implies that systems need to be established to protect the university's interests
 - full cost pricing will inevitably reduce the demand for services.
- 4.12 This last point is the key issues. There will be some sections of business, typically some but not all SMEs, for which it is virtually impossible to provide services on a self-funding basis. This is because their ability to pay is restricted and the costs of delivery are high because a single SME will not be a major customer. If, for policy reasons, it is decided that universities should work with such organisations than we believe a continuing subsidy will be necessary. However, as is discussed below, this need not be through the SPINNO programme.

4.13 The second set of issues concerns the ways in which public support for business interaction is provided. SPINNO provides support for developing capabilities within the universities, that is to say it acts on the supply side. But EU countries also provide subsidies to companies, i.e. stimulating the demand side. Estonia, of course, also has such programmes, but the availability, and nature, of demand side funding will have a crucial influence on the extent to which university business interactions are self funding and therefore the extent to which SPINNO type subsidies are justified. The kinds of programmes we have in mind are:

- subsidies, typically at 50%, for precompetitive collaborative research. EU State Aid rules usually prohibit closer to market research unless the programme is restricted to SMEs
- support for graduates/post graduates undertaking projects for companies, for example the TCS scheme discussed below
- tax credits and other incentives for firms to undertake R&D, including sub-contracting R&D to universities and other organisations
- a wide range of schemes to support networking between business, universities and other R&D organisations. These programmes may also support R&D undertaken by the universities on behalf of the businesses
- specific schemes to assist universities to develop their IP to the point where external investors may become interested.

4.14 Given these issues we do not think it is feasible to recommend rates of subsidy and the time period for which subsidies should remain. Instead we would recommend the following:

- we understand that a significant part of existing project grants has gone towards equipment and building refurbishment. The presumption should be that these institutions would not receive grants for similar purposes in the future unless there are exceptional circumstances
- later in this chapter we recommend that EAS should enter into a dialogue with institutions to agree objectives and targets for SPINNO projects. The rates of subsidy SPINNO will provide should be part of this dialogue. The key considerations should be the extent to which a proposed activity fits with national priorities and the constraints to achieving self-financing. We recognise the difficulties in making such judgments, but we believe it is essential if SPINNO is to reflect other developments

and therefore maximise its effectiveness. Given the relatively small number of institutions which are likely to be involved in SPINNO we consider such dialogues to be feasible.

Widening participation in SPINNO

4.15 At present, SPINNO projects only include three universities, and a number of institutes and companies (in BioSPINNO). The primary research universities are participating and this should have been a priority for the programme. Nevertheless, we believe there are other organisations in the higher education sector which could, in principle, contribute to Estonian businesses. We have not been able to explore this issue in any depth but we have two types of institution in mind. The first is the specialised universities, for example, art and design, music. While these organisations may not be able to contribute to the technological development of businesses they may still have a role in supporting innovation. Art and design colleges, for example, are working with creative and media industries in the EU, US and elsewhere.

4.16 The second group is those institutions which offer higher education courses, typically vocationally oriented, and sometimes at sub-degree level⁴. Although the precise role varies most EU countries have organisations such as these and we understand that they also exist in Estonia. Such institutions may not undertake significant, if any, research but they can contribute to businesses by providing training courses, consultancy and analysis and testing services. Again we would emphasise that we have not explored this issue in any depth in the Estonian context but we believe effort should be made to bring such institutions into the SPINNO programme. Accordingly we recommend consideration be given to:

- targeted promotion of the SPINNO programme to these organisations
- establishing a separate fund to support specific initiatives in such organisations. The rationale is that it may not be appropriate, given their size and research capabilities, for such organisations to be awarded funding for the full range of activities as TTU and Tartu have. However, they may need support to launch specific initiatives, for example to develop a training course which could then be rolled out to a number of firms in a specific sector.

⁴ For example, Further Education Colleges in the UK, Fachhochschulen in Germany

Application procedure

4.17 This appears to have worked well and we have few comments to make. The SPINNO Programme document seems to have been understandable to those consulted with and this was facilitated by ongoing dialogue with staff at EAS. However, we would recommend the introduction of a proforma application form requiring applicants to address specific issues. This will facilitate comparison between bids for funding and also the translation of project intentions into monitoring targets.

Project monitoring, performance indicators and targets

4.18 This is a complex area and it may be helpful to set out the purpose for which performance indicators are collected:

- to assist project managers (within the universities) to decide whether project aims are being met and whether some activities are proving more successful than others
- as targets for the projects in order to assist EAS to decide whether the project is meeting its aims and whether public money is being spent well
- to evaluate (ex-post) the impacts of SPINNO as a whole, and thus to assist judgements about future programmes.

4.19 So far as is possible the same indicators should be used for all purposes in order to minimise data collection costs and to promote a shared understanding of goals. However, the ways in which they should be used differs. This is most obvious in relation to ex-post evaluations where indicators are used solely as a measure of what has been achieved rather than as a guide to what should be done.

4.20 To give a concrete example of the difficulties we will consider spin-out companies. Given the aims of SPINNO, its success in creating spin-outs is an important consideration. Any ex-post evaluation will need to assess the number of spin-outs but also the employment they have created and, ideally but difficult, their future prospects. It would also, of course, be sensible for project management to monitor spin-outs *and* for EAS to include this as a *target* against which it would monitor project progress. However, progress in meeting such a target would need to be very carefully considered by EAS for the following reasons:

- the number of spinouts which can realistically be expected from any single university is small (perhaps five to ten each year). Failure to meet the target by even one or two translates into a significant proportionate undershoot
- success will depend on factors beyond the control of the university, notably the willingness of external investors to provide early high risk funding. The availability of such funds can change quickly in response to global and local economic conditions and what may have appeared feasible at the time a plan was drafted may later turn out to be impossible
- setting up a spin-out is easy, the difficulty is establishing spin-outs with sound commercial prospects. If the number of spin-outs is a target there is a danger that companies with no realistic prospects of success will be established, but this may not be obvious during the period within which the project is being monitored by EAS.

4.21 Similar comments could also be made in relation to many other indicators which might be used as targets. Nevertheless we think it is important that targets are set for projects and their performance measure against these targets. As such we recommend the following procedures:

- bidders for SPINNO funds should specify the targets they aim to achieve, both on an annual basis and over the full life of the project. They should also state how these targets have been arrived at and, crucially, identify key risk factors associated with achieving them
- EAS would commit to funding successful projects for a three year period. Before awarding funding, however, there would be a dialogue between EAS and the bidder over the targets against which the project would be monitored
- progress against targets would be reviewed annually, again involving a dialogue between EAS and the project. Failure to meet targets need not necessarily result in reduced funding. However, the reason for failure would be jointly identified by EAS/project and agreement would be reached on targets for the remainder of the project. We assume, however, that EAS would retain the right to reduce (or cease) funding if the project was demonstrably using funds ineffectively.

- 4.22 We would emphasise that we are not proposing any role for EAS in the management of projects. However, our recommendations do, we believe, imply a closer relationship between EAS and the projects than currently exists. For this reason we recommend that formal progress reviews are held for each project on (say) a quarterly basis and that these are attended by an EAS representative.
- 4.23 Table 4.1 shows numerical indicators of activity. They are divided into ‘external’ which refers to activities with businesses and ‘internal’ which refers to activities directed at university staff. For each activity we note outcomes and impacts. Outcomes are measures of activity, for example number of patents, impacts is the results of that activity, for example licensing income from patents. In many cases it is not practically possible to derive measures of impact. For example, delivering a paper at a business oriented conference might provide useful information to businesses but it is not feasible to trace through the actual uses companies may have made of this information. In all cases we would expect projects to provide evidence on activities if required by EAS. Thus, for example, a register of those attending entrepreneurship training should be maintained should EAS wish to audit activities on a selective basis.
- 4.24 New and/ or continued collaborations with other academic research institutes could provide a good indicator of technology transfer, particularly, if enterprises are also involved. However care must be exercised in analysing the type of activity involved distinguishing between collaboration in basic science and that which is at least in some part application driven.
- 4.25 Table 4.1 shows numerical indicators some of which act as proxies for the quality of services provided, for example the value of contract research income. However, EAS may also wish to monitor other aspects of project activities. As examples of what might be possible we would note the following:
- an underlying aim of SPINNO is to change attitudes amongst academic staff to working with businesses. Attendance at seminars, entrepreneurial training and enquiries to project staff are proxy measures of this but direct investigation is also possible. Staff could be surveyed on a regular basis to ascertain their views on business interactions and whether they have actually worked with industry in any way. However, we would note that if the survey is recognised as being undertaken for an external agency then this may promote more positive responses

Table 4.1: Numerical indicators

Internal / External	Activity	Outcome	Impact	Comment
External	IPR (Patents, copyright, trademarks)	Number applied for Number granted	Income from sale/licensing of IPR	Distinguish between Estonian/foreign organisations
	Spin-outs	Number established External investment	Turnover Employment Income from sale of equity stakes	
	Business sponsored research Collaborative research with business	Number & value	Number & value	
	Collaborative research with other universities	Number & value	Number & value	Distinguish SMEs from others?
	Consultancy	Number & value	Number & value	
	Analysis and testing services	Number & value	Number & value	
	Training courses for businesses	Number of businesses & value	Number of businesses & value	
	Student placements/projects for business	Number	Number	
	Temporary staff movements (both directions)	Number	Number	
	Enquiries received from businesses	Number	Number which translate into business	Distinguish between Estonian/foreign
	Articles in trade journals	Number	Number	
	Papers at business conferences	Number	Number	
Other: • Participation in business networks • Policy advice/committee membership	Number	Number		
Internal	Seminars to promote interactions with business	Number of staff & time	New staff engaging with business	
	Entrepreneurship training	Number of staff & time	Number of staff & time	
	Enquiries from within university	Number	Number which translate into action	

- the quality of work with industry could also be addressed through a survey although there are similar problems of promoting a positive response and response rates from businesses may also be low. A more objective measure may be the extent to which a university wins repeat business from the same company. It may also be possible to trace whether collaborations with business lead to published papers although this is problematic: the numbers are likely to be small and business sponsored research may not be suitable for publication. Businesses may also wish to maintain confidentiality of results.

A greater emphasis on people transfer mechanisms

- 4.26 Although now a cliché, it remains true that people transfer is often the best method of technology transfer. Both Tallinn and Tartu are receptive to (temporary) movements of staff between universities and business but such movements are difficult to arrange given the technological sophistication of most Estonian businesses. We believe there may be more scope to involve post graduates and graduates with businesses and would recommend that consideration be given to two sorts of scheme. The discussions are based on UK programmes, but similar schemes exist in other EU countries, and the details would need to be customized to the Estonian context.
- 4.27 The first, would involve PhD, and possibly also Masters, students undertaking projects for businesses as the basis of their thesis. In the UK this programme is known as Cooperative Awards in Science and Engineering (CASE). The research councils provide funding for a PhD student to undertake a project defined by business. The award may be made to a company (Industrial CASE) which then recruits a student or to a university, which then identifies a company which will define the project. The aim is for the company to obtain industrially relevant research but it also provides an opportunity for the student to gain experience of, and relevant skills for, the business environment.
- 4.28 The second would involve graduates undertaking projects in a company⁵. The graduate would be supervised by a university academic but be based in the company for most of her/his time although university facilities may be used during the research. The project would be below the level which would be required for a PhD and, in the UK scheme, the project does not lead to the award of a higher degree. The UK government pays the basic salary of the graduate (often “topped up” by the company) and also fund the costs to the university.

⁵ The “Teaching Company Scheme” was introduced into the UK in the early 1970s and has since been adopted in many other countries. It has subsequently been renamed “TCS”.

4.29 The scheme has been very successful in the UK and we think might have particular advantages in the Estonian context. In particular, it could be an excellent way for the universities to interact with companies which are not highly technologically sophisticated. The projects would be concerned with introducing new technology⁶ into the firm but it need not be unproven technology or otherwise of very high risk. As such some companies which would not consider sponsoring research may participate in such a scheme. As well as the direct benefits of the project to the firm, a number of less direct, but still important, benefits can be expected:

- the project can enhance the company's interest in new technology and their ability to access new technology. In the UK scheme a significant number of companies have not employed graduates in a technical capacity prior to participation in TCS. The graduate placement both directly enhances the company's technical capabilities and can demonstrate the value of employing graduates. This may be especially valuable in the Estonian context
- it provides an opportunity for the university to demonstrate what it can do for a company and may form the basis for further interactions
- the placement provides very useful business experience for the graduate.

Changes to the structure of SPINNO

4.30 We believe there is also scope for more radical changes to SPINNO which we outline in this section. There are three areas in which we recommend changes:

- an explicit recognition of different project types
- central or collaborative provision of some services
- bringing in new organisations.

⁶ In the UK graduates in business studies and other social sciences also participate in TCS

Project types

4.31 There are marked differences between the three current projects. The TTU and Tartu projects aim to strengthen the infrastructure for business interaction within the universities⁷ whereas BioSPINNO is focused on networking between the research base and businesses. As was described in Chapter 2, BioSPINNO in fact has companies as members. We believe there is scope for both kinds of approaches and would recommend that this is made explicit when calling for bids for SPINNO funding. We have in mind two kinds of project:

- one aimed at strengthening university infrastructures which would fund staff to promote business interaction, provide training to staff and manage interactions, including the exploitation of IPR
- the other would be based on a specific industrial sector and would aim to establish and/or consolidate networks between universities and companies. It would not normally fund staff at the universities but would support activities designed to bring universities and businesses closer together. Business members could include final users of university research outputs but also other companies in the supply chain. These could include discussions groups but also research clubs within which companies jointly sponsor research at one or more universities. We would expect this stream of funding to be smaller than the first one. ‘Sectoral’ SPINNO projects would need to develop close links with other SPINNO projects. There could also be synergies with the proposed Competence Centres and care would need to be taken that duplication of activities is avoided and, indeed, that businesses do not become confused by overlapping initiatives.

Central/collaborative provision of services

4.32 TTU and Tartu are undertaking similar activities within their projects, albeit within different structures. Given the size of the two universities this raises the question as to whether some services could not be provided to both more efficiently, either by a separate organisation or by the two universities collaborating. This issue assumes greater importance if, as we have recommended, other organisations are brought into the SPINNO programmes. We have considered which services need to be provided by a university itself and believe these are largely those which either relate directly to a university’s commercial interests or those which staff might resist participating in if provided by an external organisation. These would include:

- monitoring grants and contracts
- increasing awareness and promotion of the concept of working with business
- actual selling of university services, i.e. doing deals with companies
- some aspects of staff development
- managing the exploitation of IPR, either through spin-outs or licensing.

4.33 This leaves a range of services which could be provided by a central organisation or through collaboration between the universities. The first, is to provide an initial point of contact for businesses wishing to access university expertise, but without prior contacts. Universities are structured to deliver academic outputs and it can be difficult for external organisations to know where to approach them for help. We have in mind a simple help-desk, and probably also a web site, which would sign post enquirers to the most appropriate contact points within the universities. It would not attempt to identify relevant individual academics, must less broker a solution, but simply direct to the relevant enquiry points within the universities.

4.34 Second, it could become a source of expert advice and information on a variety of topics, including:

- IPR management including drafting contracts and valuing IP. Any such organisation would need to develop close links with the universities, and other organisations, in order to become familiar with the kinds of deals which have been made in the past, both in Estonia and elsewhere
- sources of funding
- market intelligence
- training, both for commercialisation offices and also entrepreneurship training for researchers and students. We do not envisage the organisation itself delivering the training but it should keep abreast of relevant developments, and materials, and also sources form which such training might be accessed.

⁷ The two projects, however, differ in the approaches taken.

- 4.35 EAS should consider whether it should itself have a role as a central provider of such services.

New organisations

- 4.36 In the previous section we recommended that small grants be made available to organisations not currently participating in SPINNO to allow them to undertake specific initiatives. However, there may also be scope to involve them in partnerships with the principal universities. We recognise there may be difficulties in securing collaboration between the main universities and other organisations, especially if the latter are vocationally focused at sub-degree level. However, it could be mutually beneficial. The ‘vocational colleges’ could learn from the approaches adopted by the universities. At the same time, we understand that the ‘vocational colleges’ have good links with businesses because their students undertake placements in industry. These links might be used by the universities to provide other (research-based) services to companies.

Appendix A

Commercialisation data for selected UK universities

16. Table A.1 shows information on commercialisation activities in selected UK universities. The data has been obtained during the course of other projects undertaken by SQW and the universities listed must remain anonymous. Most numbers have been rounded. The universities are not a random sample but they do reflect the broad spread of UK universities ranging from large research intensive organisations to small universities undertaking relatively little research. Data is for one year only, in almost all cases between 1999 and 2001. There are many caveats to the data but we would note the following in particular:

- consultancy income is almost certainly underestimated since not all consultancy projects are reported to central offices, even when this a requirement
- some universities may have included in commercialisation staff officers processing research grants and contracts. In other cases, this number will only include officers working on the promotion of the university to businesses and the exploitation of IP
- the figures are for one year only and in some cases, notably licensing, a single deal in one year can significantly affect income reported.

17. We have not sought to make comparison between the UK and Estonia. The HE systems are different (and we would not claim to have detailed knowledge of the Estonian system) and there are also substantial differences between the business sectors in the two countries. Nevertheless we feel the information may be of interest to EAS and would draw attention to the following points:

- the numbers of commercialisation staff are, with a few exceptions, relatively modest even for the largest organisations
- industry sponsored research is a relatively small proportion of total research. The figures for total research incomes in Table A.1 include the “block” grant which the UK higher education funding councils provide for research infrastructure. Industry sponsorship typically accounts for between 10% and 20% of project grants
- patenting and licensing is of significance only to those universities with large research budgets. This reflects global experience that very few research ideas will be commercialisable (via licensing) and a small proportion of these will have substantial value. It is therefore necessary to develop a large research portfolio in order to generate significant returns

Table A1: Commercialisation data on selected UK Universities (annual data)													
University	Academic Staff (full time equivalents)	Commercialisation staff	Total ⁸ research income (€000s)	Industry sponsored research (€000s)	Number of new UK patents filed	Number of UK patents granted	Licenses ⁹	Revenue from IP (€000s)	Consulting income (€000s)	Revenue from training for companies (€000s)	Revenue from analysis & testing services(€000s)	Spin-outs Established	Spin-outs which have survived at least 3 years
1	250	1	2,000	200	0	1	1	0	50	70	193	1	3
2	200	4	3,000	600	1	1	1	0	15	NA	58	1	1
3	550	21	4,500	350	3	0	0	0	30	NA	NA	1	0
4	500	4	2,500	50	2	0	0	0	20	900	155	2	1
5	800	8	5,000	400	7		1	0	40	NA	NA	1	1
6	650	7	4,000	300	2	0	NA	0	110	1,100	51	3	5
7	2,800	39	161,000	7,500	11	3	20	NA	NA	NA	NA	7	14
8	2,400	12	128,000	9,500	14	0	15	1,600	350	5,500	1,498	2	7
9	1,400	23	50,000	6,250	10	4	37	1,600	250	40	725	4	17
10	1,300	7	58,000	6,000	14	3	8	1,400	400	2,100	53	1	10
11	700	7	24,000	4,000	13	0	5	0	50	3,000	513	3	2
12	1,350	24	64,000	5,717	19	17	14	2,000	350	10	416	6	4
13	900	6	31,500	1,000	6	0	5	140	80	250	33	5	4
14	600	3	16,000	500	1	0	0	0	40	NA	751	0	1

⁸ The UK higher education funding councils provide block grants for research infrastructure not tied to specific projects. This figure given includes the block grant and project grants

⁹ License deals signed during the year. This includes deal for patents granted in previous years.



- the converse of this is that other services (training, analysis and testing, consultancy and contract research) are far more important than licensing and sale of IP
- related to the point concerning IP, the absolute number of spin-outs in any one year is low, even for those universities with large research budgets. The last column shows the number of spin-outs (at the time the data was provided) formed at any time, which had been in existence for at least three years. This suggests a high failure rate for spin-outs.

Appendix B

List of those Interviewed

Name	Organisation
Ms Kitty Kubo	Ministry of Economic Affairs and Communication
Mr Anti Kuiv Director of ESTAG	Enterprise Estonia (EAS)
Mr Ilmar Pralla Program Manager	Enterprise Estonia (EAS)
Ms Tiiu Evert Program Manager	Enterprise Estonia (EAS)
Mr Alar Kolk Member of the Board, EAS	Enterprise Estonia (EAS)
Ms Riin Ehin TTU Centre of Biotechnology and Gene Technology Beneficiary organisation	ESKO Training
Mr Raul Malmstein Vice-Chancellor, Ministry of Economic Affairs and Communication (MKM), Member of the Financial Committee of EAS	Ministry of Economic Affairs and Communication
Mr Rein Vaikmäe Advisor of the Ministry, Member of the Financial Committee of EAS	Tallinn office of the Ministry of Education and Research
Mr Andrus Tasa Tartu Biotechnologypark Beneficiary organisation	Tartu Biotechnologypark
Mr Peep Sürje Vice Rector of R&D Chairman of SPINNO council	Tallinn Technical University (TTU)
Mr Marko Kivilo SPINNO Programme Manager Manager of knowledge intensive services field	Tallinn Technical University (TTU)
Mr Ardo Kamratov Head of R&D Department Manager of employees' entrepreneurship field	Tallinn Technical University (TTU)

Name	Organisation
<p>Ms Kiira Parre Deputy Head of R&D Department Manager of intellectual property field</p>	<p>Tallinn Technical University (TTU)</p>
<p>Mr G Valge Head of Information Systems Department</p>	<p>Tallinn Technical University (TTU)</p>
<p>Mr Olari Vaarmann Member of the Board Volta Plant</p>	<p>Volta Ltd</p>
<p>A Renzer PWC TTU SPINNO project expert</p>	<p>Tallinn Technical University (TTU)</p>
<p>Ms Hele Everaus, Ex Vice Rector of R& D Tartu University (TU)</p>	<p>Tartu University</p>
<p>Mr Mart Ustav, Director, Mr Erik Puura,</p>	<p>Tartu University Technology Institute</p>
<p>Mr Ain Heinaru Vice Rector R & D</p>	<p>Tartu University</p>
<p>Mr Richard Villems Director of Estonian Biocenter</p>	<p>Estonian BioCenter</p>