

Technology Policy of Estonia: System Planning and Development of Implementing Agency

Final Report

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EXECUTIVE SUMMARY

Estonia is a country in transition. It is facing many challenges, both economic and social. Fast structural changes in the economy and the society that have taken place during recent years are still continuing. They have led to polarisation of regional development, labour markets, wage levels, etc. Political decision makers are faced with the difficult task of combining the goals to build a free market economy and at the same time develop the society towards the Nordic well-fare state.

The government budget is under pressure. High unemployment rate, low taxes and declining foreign direct investment affect the earnings. At the same time, costs are increasing because of EU and NATO membership, social safety net and other areas which are in need of additional public funding.

Estonia is a small, free market economy. Product markets are mostly open and competitive. Financial markets are still quite underdeveloped and mainly controlled by the banks. The size of the manufacturing industry is relatively small. Services play an important role in economic development.

The Estonian industry is mostly low value added manufacturing. Although especially exports are dominated by high-tech and medium high-tech industries, most companies are subcontractors or in contract manufacturing. Large part of the industry is foreign owned. There are only a few successful companies operating in international markets. Partly because of foreign ownership, many of the companies have stronger linkages outside than inside Estonia. This is also one of the reasons why networking between companies and between companies and research organisations in Estonia is not very common.

Overall and private research and development (R&D) investments are at a relatively low level. Public sector provides most of the national R&D investment. Competitiveness of many companies is based on low labour costs.

Political decision making is mainly focused on short term problem solving. More long term policies do exist, but typically at a general level. Linkages between long term policies and short term decision making are unclear. Horizontal policy co-ordination is mostly missing or at least unsupported by well defined policy processes. Policy processes are emerging, but they are still very much developing and unstable. The main policy process related to resource allocation is the annual budget process. There is a clear need to strengthen long term and horizontal policy processes.

The main long term policy papers related to innovation are the National Development Plan (NDP) and the R&D Strategy. Both of these outline the policy and the resource allocation. It is, however, not clear how the policies will be implemented and will the outlined resources be made available. Credibility of policy documents is not established.

Innovation has been identified in the main policy documents as an important area. Both NDP and R&D Strategy emphasise the need to enhance R&D activities in Estonia. R&D strategy identifies R&D and innovation as the keys source of economic growth and social well-being. The main goals are to boost the creation of new hi-tech business sectors and increase the competitiveness of existing companies through technological renewal. The NDP deals with innovation as an issue related to industry and commerce. There is a need among Estonian decision makers to understand innovation as a much wider concept that just something to do with technological development. Also traditional and low-tech industries should be more emphasised in policy documents, since their renewal is a major factor in economic growth in short and medium term.

During 2000 the government planned and decided to integrate all major government company support activities under one organisation. This new organisation, Enterprise Estonia (EAS), was established in the beginning of 2001. It integrates together five different agencies promoting exports, foreign investments, tourism, regional development and innovation. EAS is legally an independent foundation. The Ministry of Economic Affairs controls EAS through a board. Combining all agencies under one roof is an attempt to improve the co-ordination between different enterprise support activities and also to improve the efficiency of the support mechanism.

The prime minister has recently reorganised the Research and Development Council (TAN). TAN consists of 12 members, including 4 ministers and high-level representatives from key business and academic organisations. The ministries of economic affairs and education have their own advisory councils.

Estonian Technology Agency (ESTAG) started to operate as a completely new organisation in the beginning of 2001. It replaced the previous Innovation Foundation in the Estonian innovation system. ESTAG did not bring any of the people, practices or systems from the old Innovation Foundation. Instead, all of ESTAG activities were built up practically from scratch with completely new people.

This project was initiated by the Ministry of Economic Affairs of Estonia based on long term relations and discussions between the ministry and the Ministry of Trade and Industry of Finland related to innovation policy and its implementation. The objective of the project was to help establish ESTAG as an organisation, initiate and implement a strategy process to identify long term challenges for ESTAG and assist in designing and launching first ESTAG activities. The purpose of the project was also to help the ministry develop and establish management processes between the ministry, EAS and ESTAG.

The project was funded by the Finnish government, budget for the co-operation with the neighbouring areas of Finland, the north-west Russia and the Baltic countries. This budget is administrated by the Ministry for Foreign Affairs of Finland, who has transferred the funds for this project to be administrated by the Ministry of Trade and Industry of Finland.

The project was carried out in the form of consulting on average for 1-2 days per week from November 2000 to September 2001. The project was executed by Dr. Jari Romanainen, Executive Director (strategy) at the National Technology Agency (Tekes) for the Finnish Institute of Public Management (HAUS). The Estonian partners in the project were the Estonian Technology Agency (ESTAG) and the Ministry of Economic Affairs of Estonia.

The objectives of the project were met as follows:

Objective	Outcome
Establish Estonian Technology Agency strategy and institutional build up.	ESTAG strategy formulated.
Establish project selection process and develop financial instruments.	Terms of reference for ESTAG database. System for R&D project management, handling and evaluation in ESTAG. Main principles of ESTAG activities for facilitating industry-academia co-operation. Basic strategies for financing ESTAG projects. Consultation for ESTAG project managers on how to advise companies design R&D projects
Launch first national technology program.	Terms of reference for the strategic evaluation and launch of ESTSPIN ¹ programme. Segmentation of clients for the Awareness Programme and the design of the programme. Presentations in Tallinn and Tartu for decision makers and potential clients. Articles in Äripäev. Consultation on pre-seed and seed phase venture capital. First actual technology programme not launched.

¹ The name of the program was later changed to SPinno.

<p>Practical advice for implementation of government technology policy.</p>	<p>Consultation on the national R&D Strategy. Consultation on R&D Strategy implementation, monitoring and evaluation. Consultation on TAN and horizontal policy co-ordination. Consultation on the Competence Center programme. Discussions and presentations at the ministry seminars and meetings. Discussions related to Industrial Policy. Discussions concerning how the ministry should steer and monitor EAS and ESTAG.</p>
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In addition to the completed tasks related to the objectives set at the beginning of the project, the project consisted of consultation on the development of national R&D statistics and the design of the third Community Innovation Survey (CIS III) study in Estonia, advise to the ministry statistics working group, design of principles of network facilitation by ESTAG and the launch of the first pilot projects for network facilitation and technology auditing, consultation on EUREKA strategy and integration to ESTAG products and advice on integrating EU Innovation Relay Centre (IRC) activities in Estonia and ESTAG.

The full impact of the project will be realised in long term, but there is some early indication that the project will have a positive impact on the development of the Estonian innovation system. One of the key success factors was that this project was directly integrated into a local renewal process and day-to-day questions. Other sustainability factors were the consulting approach, participation to same international R&D collaboration platforms, similarities in national strategies and the close linkages between Estonian and Finnish economies.

The work in project was based on utilising the long term experiences on technology and innovation policy implementation in Finland and more precisely at Tekes. The project has created a good base for extending the existing co-operation between Tekes and ESTAG in the future. During the project contacts were also made to Statistics Finland and the Finnish National Fund for Research and Development (Sitra). The project fitted well with the strategic goals set for the co-operation between Finland and Estonia.

The critical factors in the development of ESTAG and the Estonian innovation system are political commitment, quality of policy design processes, quality of management processes, collaboration, funding resources, key people and trust. All these present a risk, but also an opportunity for the future development of the Estonian innovation system. These points are elaborated in Chapter 7 and provide some indication on how EAS and ESTAG could be developed. Contents of ESTAG strategy (Annex 1) will also indicate future development of ESTAG.

The selected consulting approach seemed to work. Full time presence has a tendency to lead into the consultant taking or having to take day-to-day or implementation responsibilities inhibiting knowledge transfer. A consultant is an outsider and implements only limited and well defined tasks in close collaboration with the locals. The success of this kind of a project relies heavily on the local actors. They must have identified the needs and be able to donate sufficient resources for the project. A more systematic approach to project implementation is needed among innovation policy actors in Estonia. Enough flexibility should, however, be maintained to allow projects react to changes in the operating environment.

Future collaboration between Finland and Estonia in the field of innovation policy and policy implementation could be focused on e.g. establishing horizontal policy coordination and processes, establishing evaluation systems and processes, launching the first technology programmes, providing training for policy makers, analysing R&D and CIS III statistics, establishing impact assessment systems and processes and developing innovation services.

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1 ESTAG strategy	4 pages
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1 THE CONTEXT

(Hankkeen toimintaympäristön analyysi)

A country in transition

Estonia is country undergoing a transition from a strongly government controlled economy into a free market economy. The transition has taken place rapidly. Most of the structures and policy processes have been developed since mid 1990's. Currently, there is a drive to link Estonia more strongly to the European context.

Quick transformation is typically not that easy. It usually involves problems in the form of polarisation in the economy and society. Selecting to become a free market economy and at the same time a Nordic welfare state is a big challenge. The society and economy are, as one might expect, currently struggling with several major issues related to this transformation.

The structures of the economy have changed. Old large scale production units have been partially replaced with smaller industries and services. Foreign ownership in industry and economy has grown rapidly. Transformation requires resources, some of which have been obtained from privatising government owned industries and other assets. The privatisation proceeded quickly during the last half of 1990's and is now at it's end as most of the assets have been privatised already.

Every major change results in winners and losers. Change will inevitably drive polarisation in the society. This polarisation might lead into serious social problems, unless controlled by the government.

The following text looks into the Estonian context more in detail. First, it analyses the situation the government is facing. Then it takes a look at the economy, its structures and major challenges. This is then followed by description of innovation policy, its processes and the relevant documentation. Finally the chapter ends with a look into the changes in the national innovation system structures and the role of the Estonian Technology Agency (ESTAG) in particular.

1.1 Government

Pressure to increase expenditures while income flows are declining

Government is currently facing a situation, where at the same time income flows are declining and there is a strong pressure to increase expenditure. There are several reasons for this and the following text tries to highlight some of them.

Increasing unemployment means less tax income and more expenditure in unemployment benefits and initiatives supporting employment. Foreign direct investments (FDI) are considered to be a solution for unemployment, but although it might ease the problem it will most probably not be able to solve it completely.

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Relatively fast privatisation has recently come to its end and the Privatisation Agency has been closed down. As a result, foreign direct investments are declining. Privatisation money has been important in allowing the government to launch a series of initiatives, which will have to be funded in the future through the government budget or some other sources. Attempts to attract foreign direct investments are continuing, but any single large investment can not solve the problem.

Estonia seeks both NATO and EU membership, both of which will require substantial investments from the government during the next few years.

Social safety net is gradually being built, including pension systems, unemployment benefits, etc. Increasing unemployment will create a strong pressure on the system and on the pace it is being built. In any case, building social safety net requires increasing amounts of government funding.

Fight to keep polarisation under control

Government is facing a situation, where various polarisation phenomena need to be addressed. Government control can either be direct or indirect. Direct measures are focused on issues, that are politically decided to be within the role of government. These typically include parts of health care, education, social safety net, balanced regional development, security and others. Indirect measures try to provide incentives for private market actors, such as companies and private persons to act in a way which solves the problems caused by polarisation. These typically include enabling legislation and incentives for private investors.

In the Estonian case, some of the major polarisation issues are increasing wage differences, quality of the social safety net, unbalanced regional development, increasing unemployment and quality of the educational system. Polarisation is typically easier to solve, if is identified and tackled early. Otherwise, controlling these problems will eventually require heavy public sector investments.

In Estonia, measures have already been put in place to tackle polarisation. Some of these try to use public sector investments and enabling legislation to leverage private investments, like in the case of pension funds or education and health care. Nevertheless, public sector will have to continue to tackle polarisation and this needs resources.

Typically for transition economies, economic growth is very concentrated regionally in Estonia. Tallinn, Tartu and Pärnu regions are benefiting from fast growth, whereas North-Eastern, Eastern and Southern parts of Estonia have more or less serious problems.

Differences in wage levels are growing. This is due to several reasons, like uneven regional development, public sector funding problems, etc.

Education system, especially vocational training needs reforming. Vocational training has an image problem. What makes it serious is that majority of manufacturing companies need skilled labour particularly with this level of education.

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Pressure on government budget is high

Government budget is going to be under serious pressure in the coming years. This means that there is a strong need to prioritise between and inside policy areas. How science, technology and innovation policies will be placed in this prioritisation will have a great impact on the development of the innovation system and, more seriously, a great impact on the fundamental factors of long term economic growth in Estonia.

1.2 The economy*Estonian economy is small, open and free*

Estonian economy has opened up relatively quickly, as the government has privatised and liberalised markets. Regulatory framework has been integrated largely with EU regulation. Domestic markets are small and have internationalised fast through foreign direct investments and foreign trade. Strongest linkages are to Scandinavia, especially to Finland and Sweden.

The business environment is one of the most liberal in the world. Corporate taxes are low and there are tax breaks for investing profits to Estonia.

Financial markets

Financial markets are still underdeveloped and largely controlled by the banks. There are only few institutional investors or venture capital investors. Most investments are focusing on services and large scale manufacturing. Investments by households are at a low level.

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Economic policy

Strong economic growth is needed to provide the necessary resources for the transformation. In a small open economy, this means that exports must be one of the major factors in economic growth. Globalisation and the resulting international competition is increasing and Estonian companies, like all companies in open economies, are facing it even in their local markets.

Currently, the strategy to tackle economic growth and unemployment is to attract foreign investments and especially large scale production units to Estonia. The main argument is still low labour costs. The potential problem related to this main strategy is, that once the low labour cost advantage is lost due to catching up, there is a risk that all these investments will begin to flow away from Estonia.

Sustainable economic development relies on a long-term systematic commitment on a chosen and well supported policy. Elements of a longer term policy are there, but policy design processes have not yet been able to find a wide enough commitment. Changes in political power might change the existing policies in a major way.

Basing the long term growth strategy on exports will require strong growth of the manufacturing industry and services. This can be achieved by through FDI and technology transfer in the short term, because of low production costs. Longer term competitiveness can not rely on low costs. Instead, it will have to rely on innovation. This is identified in the relevant policy documents, but the resource allocation will be eventually the real test of whether this has really been understood.

Culture

There are two distinct cultures within the policy domain and society in general. The old thinking emphasises government leadership and collective responsibility, whereas the recent free market economy thinking emphasises entrepreneurship and individual responsibility. Modern innovation policy emphasises the free market approach, although government is still seen to have role in certain areas.

Trust between organisations and people is at a lower level than in Scandinavian countries. This reflects in competition and difficulties in building collaboration between actors. On the other hand, there is a culture of collecting all major stakeholders to the discussion prior to decision making and implementation. This helps in building trust and awareness, which in turn creates a base for future co-operation and networking.

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Industry

Large scale industries are mostly foreign owned and concentrate on manufacturing. Main part of export industries are foreign owned and linked to international value chains at a low value added level. There are, however, a number of leading companies with strong global or local market share. Services are growing, especially the part that is related to tourism.

Currently, Estonian companies enjoy from low labour costs, which is the key competitive factor for many companies.

Export industry structures are dominated by subcontracting and contract manufacturing. More than half of exports is raw materials and intermediate products, roughly one fourth is investment goods and another fourth consumer goods. Main linkages of export industries are to Scandinavia, especially to Finland and Sweden.

The success of these companies relies mostly on technologies developed outside Estonia and the success of their main clients. This makes the industry and economy vulnerable, because it will react very quickly to any economic cycles in major global markets. Industry's ability to endure recessions is rather weak, since foreign owners are more likely to downsize or close down production outside their home countries in case of declining markets. The same applies to subcontractors in their relationship with major foreign customers.

All this means, that industry must find new factors of competitiveness to replace the low labour costs, which will eventually be lost as the catching up progresses. This does not, however, happen overnight. Time will soon run out, if necessary actions are not taken.

1.3 Innovation policy

Economic policy in Estonia is based on free market economy strongly integrated in Europe. Estonia has integrated most of its regulatory framework with EU in search for a quick membership in EU. Previously strong economic ties to East are currently almost non-existent.

In order to achieve more stability in the economic and political environment, decision makers have started to establish longer term policy outlines and national strategies. The existing strategic documents – the Government coalition contract, the Development Plan of Estonian Economy until year 2003 and its recent replacement Pre-accession Economic Programme (PEP) and the National Development Plan, all approved by the Government² - set supporting the technological development activity and innovation as a priority and as a precondition to achieving economic growth in a small country with limited resources.

² Except for the last update of the NDP, which was not approved by the government. This illustrates one of the main problems in the Estonian system. The government should be able to send clear signals to the markets, but how can this be done if the government can not agree on a long-term policy.

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The aim is to increase the national research and development (R&D) expenditure to 1,2% of the GDP by 2002, which requires a rapid increase in financing of research and development activities by the public sector. The core of the objective is to ensure technological development and innovation, which also means that the innovation system is to be improved in order to ensure the efficiency, transparency and socio-economic result of using essentially bigger provisions.

The National Development Plan

The most important of those is the National Development Plan (NDP), which was originally produced by the request of EU. It has been received well at EU. In the future, the NDP will focus only on EU pre-structural and structural funds identifying only the measures where co-investment from EU is foreseen. The National Development Plan includes national priorities and it is prepared at the ministries. The final document is prepared by the ministry of finance.

Analysing the National Development Plan from the economic and innovation policy point of view, the current plan identifies the following national priorities:

- Agriculture (open markets, free competition, no plans from systematic structural reform, low potential in economic development, strong regional approach, goal is to stabilise the development)
- Industry and commerce (competitiveness, entrepreneurship, foreign direct investments, internationalisation, innovation, research and development, goal is strong economic growth and internationalisation)
- Tourism (development of infrastructure, public private collaboration, service development and service innovation, goal is to increase by 50% from 1999 to 2002)
- Employment and education (reform of vocational training, unemployment, goal is to turn the current negative trends in unemployment and education to positive)
- Transport and communication (transit transport, infrastructure development in marine, air and road transport, goal is to improve the infrastructure and competitiveness)
- Environment (waste treatment, water and air quality, nature preservation, awareness, goal is to establish and enforce EU legal framework)

National Development Plan priority areas in Industry and business development are:

- Development of the business environment;
- Encouragement of innovation and introduction of new technologies;
- Stimulation of investments;
- Increasing internationalisation of enterprises.

According to National Development Plan, Estonia has the following long-term priorities in the field of R&D and innovation³:

³ These are the priorities listed in the last approved NDP. The last NDP not approved by the government describes a more developed approach to R&D and was used as a basis for ESTAG activities.

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- Development of an information-intensive society focused on knowledge, improving the research potential and skills of the society;
- Improvement of the quality of research in higher education, fundamental research and in strategically important areas;
- Approximation of the financing of the Estonian R&D to the respective average indicators of the EU countries, increasing to a substantial extent state expenditures on applied research and technological development activities;
- Development of the national innovation system, improvement of links between R&D and the business sector, motivation and encouragement of the private sector to participate in R&D and the innovation process;
- Fostering of business activities, with an emphasis on small and medium size enterprise (SME) development in the sectors generating high added value and technological sectors;
- Bringing the priorities of R&D and innovation in line with the respective priorities of the EU, active participation in international co-operation, incl. in the EU R&D programmes.

At the general level, the goals set in the National Development Plan are believable. The main problem lies in the fact that reaching these goals requires heavy public sector investments. Taking into account all the pressures towards government budget within the next few years, it is not likely that all these goals will be reached. This means that policy implementation should focus on selected areas, which must be communicated clearly to companies, research organisations and other actors.

R&D Strategy

The most important innovation policy outline is the National R&D Strategy. It is the first government innovation policy document prepared in collaboration between the ministry of economic affairs and ministry of education. Also key people from academy and industry have been involved in different ways and times in the process.

The R&D Strategy follows the Scandinavian model and defines an economy and society based on knowledge and skills as the long-term goal. The strategy emphasises the role of research, high-technology and internationalisation in developing the economy and the society. The strategy lists the following basic principles on which the actual strategy is based:

- The educational system and R&D ensure the creation and application of new knowledge and growth of general knowledge in the interests of Estonia's socio-economic and cultural development.
- Both the R&D related to Estonian national culture and environment and R&D focused on economic development are ensured.
- Financing of R&D is at least on the average level of EU.
- By political stands and legal regulation the private sector is created the necessary conditions for participating in R&D, particularly in innovation.

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- The results of Estonian scientists are part of the world science, as a result of international co-operation the know-how is efficiently transferred into the Estonian economy and society.

It is clear that science and academia are very strong in the Estonian innovation system. Thus, the existing university system provides a good basis for implementation of the strategy. Also the private universities/colleges have improved the educational system.

Perhaps the weakest point in the strategy is the lack of understanding the realities of the existing industries in Estonia today. The strategy pays less attention to existing companies largely with low technological capabilities than it does on new high-tech industries.

The R&D strategy identifies the following strategic objectives:

- renewal of the knowledge base and growth of education level;
- increased competitiveness of all businesses;
- improved quality of life and social welfare.

The key technology areas of Estonian R&D according to the R&D Strategy are:

- technologies of user friendly information society;
- biomedicine;
- material technology.

The strategy has a strong emphasis on high-tech and science. The key areas have been discussed further, which is necessary to have an understanding what they mean specifically in the Estonian context so that the strategy can act as a basis for allocating R&D funding. What creates a problem is the large existing population of companies which do not have the capabilities to absorb new technologies developed in the scientific sphere.

The situation in practice in this respect is not quite as problematic as the R&D Strategy would imply. Both the ministry of economic affairs and ESTAG have realised also the importance to identify the needs of existing companies and to create instruments to help them develop their competitiveness. This more balanced approach becomes evident as current ESTAG activities are discussed in more detail.

Industrial policy

The third major policy document related to innovation is an industrial policy outline that is currently being prepared at the ministry of economic affairs. It is going to include three main parts: competition policy, innovation policy and financial markets.

Innovation policy should be strongly based on the existing National R&D strategy. There should be no inconsistencies between these policies, although the innovation policy should focus more on the economic impacts of innovation and on the framework conditions enabling that.

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Competition policy and financial markets are currently not outlined in detail in any policy document, which makes the industrial policy outline a welcome addition into the policy documents.

Policy processes

Policy design processes are not yet well established in Estonia. Most of the main policy documents represent the first of their kind, at least considering the quality and practicality of content. Since the policy processes are new and not established, there are a lot of uncertainties related to the processes themselves and to the policy documents.

Credibility and trust in policy must be earned through repeating the processes in a transparent way, which shows that there is a commonly accepted policy and it is being implemented. There should be a clear attempt to establish key policy processes. Otherwise long-term policies will remain at the mercy of the annual budget process, which tends to favour short term issues over long-term policies.

One of the critical success factors in policy making is to ensure that the policy is not left on paper, but actually implemented. There are several ways of doing this, but one should primarily look for a change in focus of existing processes and structures instead of creating whole new processes or structures. Ministries should be made responsible for the implementation of policies and they should in turn set their agencies such goals which will ensure that the policies will be implemented. In the case of EAS this is possible because of the legal arrangement – EAS is the private entity with its own board responsible for budget distribution between different policy areas.

Some policies require horizontal co-operation between different ministries. This can also be achieved in various ways. Inter-ministerial councils or committees, joint implementation agencies between ministries, policy instruments delivered through agency networks are few of the possible tools to ensure horizontal co-ordination.

There should also be clearly defined methods to follow the policy implementation and to analyse its impact. Longer term policies reveal their true impact only after several years, so there must be ways of identifying early signals and monitoring the impact continuously. Policymakers should have the ability to adjust policies whenever there is sufficient evidence to suggest that a change is needed.

As a summary, transparent policy processes should define at least:

- the scope of the policy
- the ways in which policy environment is analysed before and during the process
- the roles and responsibilities for ministries, councils and committees and possible other organisations involved
- the principles on how various stakeholders and other possible interest groups are identified and can participate and provide their views into the process
- the rules for selecting priorities and decision making
- the ways in which policies will be taken into action

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- the ways in which policy implementation is monitored and evaluated

1.4 The national innovation system

The Estonian innovation system has been analysed in-depth quite recently by Hernesniemi⁴. The results of this analysis were further used and analysed during the project. The main strengths, weaknesses, opportunities and threats are listed here followed by a description of the main institutional and governance structures and their recent changes in the Estonian innovation system.

The main strengths, weaknesses, opportunities and threats

The main strengths of the Estonian innovation system are in the infrastructure and human resources. Human resources have a competitive quality-price ratio. Infrastructure has been put in place, but a lot of effort is still needed to get it to function properly.

The other main weaknesses in the Estonian innovation system – in addition to the infrastructure not functioning well – are related to awareness and the level R&D investments. Level of awareness of R&D and innovation is low among policy makers and companies. This is reflected in low investments in R&D and innovation, especially by the private sector. Public sector investments in R&D are unbalanced favouring basic sciences. There is a lack of venture capital, especially in early phases. Awareness of innovation also results in lack of collaboration between industry and universities. The real customer orientation is missing.

Major opportunities of the Estonian innovation system are linked to fast catching-up processes and closeness to Scandinavian innovation systems. Catching-up allows for a fast development, especially since there is little or no existing infrastructure or processes hindering the pace. Estonian companies and universities are linked to Scandinavian countries and their innovation systems. Strong Scandinavian industrial clusters can drive the development of Estonian companies and pull them to international markets. A strong university base and basic science support should allow for increasing number of New Technology Based Firms (NTBF). The culture of including all stakeholders in preparing decisions is a good base for building trust.

The main threats in the Estonian innovation system are related to establishing long-term development processes and co-operation. Once catching-up is over, current low labour cost based competitiveness is lost. Without widely accepted long-term strategies favouring innovation, resources might be misallocated and short-term problem solving might cloud all long-term decision making. Estonian companies might remain at low-end of the value chain and brain-drain of educated people might escalate. Without co-operation Estonian innovation system might not function efficiently. Lack of competitiveness might lead into decline or even economic crisis.

⁴ Hannu Hernesniemi, "Evaluation of Estonian Innovation System", ETLA 2000 (ordered by the Estonian Ministry of Economic Affairs, financed by Phare)

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Institutional structures

On the government side, the most important ministries in the innovation system are the Ministry of Economic Affairs, the Ministry of Education and the Ministry of Finance. The co-operation between the Ministry of Economic Affairs and the Ministry of Education has been developing positively especially during the last years. The Ministry of Finance is perhaps the most powerful ministry having a strong influence on innovation related funding.

During 2000 the government planned and decided to integrate all major government company support activities under one organisation. This new organisation, Enterprise Estonia (EAS), was established in the beginning of 2001. It is a merger of five previously independent agencies: Estonian Trade Promotion Agency, Estonian Technology Agency (ESTAG), Estonian Tourist Board, Estonian Regional Development Agency and Estonian Investment Agency.

EAS is legally an independent foundation governed by a board. The EAS board consists of members from Ministry of Economic Affairs, Ministry of Education, Ministry of Internal Affairs, Ministry of Finance and industry associations. EAS takes care of all financial, legal and other issues, while the agencies prepare and implement activities in their respective fields.

Combining all agencies under one roof is an attempt to improve the co-ordination between different enterprise support activities and also to improve the efficiency of the support mechanism. The structure is copied to some extent from Ireland (Enterprise Ireland). The structure facilitates co-operation between agencies in a more efficient way than previously, which is important especially in an environment where there is a lack of trust and fierce competition of resources. The structure creates a platform, where innovation can be better integrated into regional development, tourism, internationalisation and foreign direct investments.

Funding for basic research is channelled through the Science Foundation and the Science Competence Foundation. These foundations are controlled by the Ministry of Education.

The prime minister has recently reorganised the Research and Development Council (TAN). The idea was to link this Council firmly to the Ministry of Economic Affairs and the Ministry of Education, like in Finland. In addition to TAN, both ministries have an advisory council of their own. The work of these advisory councils is integrated into the work of TAN. TAN consists of ministers and high-level representatives, whereas the advisory councils include more practical level people. The first meeting of the reorganised TAN was on October 4, 2001.

The highest decision body at EAS is the board. EAS board makes all funding allocations to the agencies. Biggest allocations go to ESTAG and the Regional Development Agency. EAS board also makes decision regarding funding principles and instruments and programmes. ESTAG and the Regional Development Agency both have funding committees, who make funding decisions for individual projects. They

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also have advisory committees, where agency activities are discussed with the most important stakeholders.

Because of the governance model, the EAS board is one of the key decision bodies in the Estonian innovation system on the level of policy implementation. The structure of the board combines policy makers with practitioners, which makes sense. It is vital that the EAS board is able to function well and make even the more difficult decisions whenever necessary, since all implementation activities are enabled by it.

The board should focus on the innovation system and how it works, industrial and service structures and the needs of companies and the impact of various EAS activities. The board should have a systemic view of the whole Estonia economy and its development. This is necessary for allocating EAS funds to the Agencies, fostering collaboration between Agencies and for finding solid argumentation for additional funds for EAS activities.

In the beginning, the board has been forced to concentrate on a lot of practical issues, which must be solved in the early phases of EAS development. However, the board should gradually move the focus on more longer term and strategic issues. If the EAS board does not have a good overall picture of the development needs of the Estonian economy and an understanding on how the needs can be met through various activities implemented through the agencies (alone or in collaboration with each other or in collaboration with other public and private actors), the board decisions (made without a long term strategic understanding) can lead into adding uncertainty instead of clarity among companies on how the innovation and business environment is going to change resulting in declining investments.

The large number of committees and councils might cause confusion, but are important at this stage of development to ensure interaction and discussion between different actors in the innovation system. Time will eventually show which of these councils and committees will become important for policy making and implementation. The most important thing is to get the work at TAN started and make that a strong body in policy design, because the role of TAN will eventually reflect also to the role of other committees and councils. What is also important is to show that new policy outlines are closely followed and implemented. Otherwise the credibility of these policies will remain questionable and their impact on the behaviour of companies and other organisations is low.

1.5 ESTAG – The Estonian Technology Agency

Estonian Government decided to establish national technology agency. In the framework of transformation of foundations for supporting entrepreneurship, the Estonian Innovation Foundation (IF), with a limited scope of activities, was transformed to the Estonian Technology Agency (ESTAG). During 2000, the main emphasis in the context of Estonian Technology Agency was to ensure the preparedness to effectively use the bigger state budgetary provisions from 2001. This included the introduction of modern procedural system of projects, approval of agency's structure and staffing, involving a foreign expert and introduction of new areas of activity.

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The main tasks of ESTAG were defined to be technology monitoring, establishment of scientific co-operation networks, training of technology and product development specialists, and supporting innovative enterprises. Acting this way the agency is to develop Estonian industrial sector, which directly influences Estonian economic growth.

Even though ESTAG inherited the reformed role of the former IF in the innovation system, it practically started as a completely new organisation. All people at ESTAG were new and practically nothing was adopted from the old IF operations or systems. This meant that everything at ESTAG from everyday practical operations to long term strategies had to be built up from scratch.

ESTAG started its activities officially in the beginning of 2001, but it has also the responsibility to take care of the remaining projects funded by the previous Innovation Foundation. This causes a lot of work, since several of the IF customers have problems with existing loans. On the other hand, a lot of the previous IF customers are also potential customers of ESTAG.

Practical project application and handling procedures have been mostly copied from Tekes. They have, however, been adopted to fit the Estonian situation and ESTAG quite well. The biggest differences in project assessment compared to Tekes are more thorough analysis of companies financial situation and the use of network of external experts in the assessment of technological and business potential. The latter is quite common in a number of other European countries and quite reasonable in the Estonian context, especially allowing for the limited experience of ESTAG personnel. The external expert network has been built by using a co-nomination methodology, which has been successfully used previously in e.g. the UK foresight exercise. ESTAG has licensed a technology rating methodology (TechRate) for assessing technology based companies from Tekes. This methodology has been developed in co-operation with several innovation agencies and banks in Europe. It is currently being implemented also at Tekes.

First funding decisions were made during the first half of 2001 and the project flow is increasing all the time. The main funding instruments are grants and soft loans. Smaller grants are also provided for feasibility studies. There are also plans to encourage pre-seed and seed funding and to come up with a new collaborative instrument for supporting technology transfer including investments with Kredex.

ESTAG participates in international co-operation in two main ways, through EUREKA and through the Innovation Relay Centre (IRC) network. Estonia became a full member of EUREKA in 2001. There have been discussions at ESTAG also to join The Agencies For Technology implementation in Europe (Taftie), of which Tekes is also a member.

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2 THE PROJECT

(Hankkeen saavutukset)

The project was implemented between November, 2000 and September, 2001.

General goal of the project was to improve efficiency of Estonian Innovation System. The objectives of the project were:

- a) To form Estonian Technology Agency strategy and advise institutional build up
- b) Improve project selection process and advise development of financial instruments of the agency
- c) To advise preparing of first national technology program
- d) Advise implementation practice issues of government technology policy

The tasks of the expert were defined as:

- a) Analyse of innovation system with objective to form the agency strategy according to EU regulations and economic development
- b) Segmentation of potential technology agency clients. Analyse of specific support instruments and evaluation of development needs of support schemas.
- c) Evaluation of needed improvements in procedural system of project evaluation and improvement of the system
- d) Analyse and setting guidelines for launching first national technology program and further programming
- e) Evaluation and analyse of implementation principals of government technology policy

The following outputs were defined for the project:

- a) Long- term Estonian Technology Agency strategy formed
- b) The base of the technology agency as an organisation established
- c) Update procedural system of project introduced
- d) First national technology program launched
- e) Basic principles of implementation issues of government technology policy formed
- f) Midterm report and final report with conclusions (incl. all elaborated documents in annexes) from the expert.

2.1 General observations

A lot of the work at ESTAG and at the Ministry of Economic Affairs has been ad-hoc and directed to acute issues. This has resulted in problems in trying to move forward with the more long-term processes. It is quite understandable why the work is more ad-hoc than systematic. ESTAG and Ministry of Economic Affairs suffer greatly from lack of human resources and to some extent also from lack of experience, especially related to the tasks set for them.

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The role of consulting on average two days a week, however, has suited well with the situation. A more full time presence might in the current situation have lead into the consultant taking too much implementation responsibility, which might have resulted in less knowledge transfer and learning at ESTAG and Ministry of Economic Affairs. This way the consulting resources could be easily focused on the most important and currently active issues, which meant that the knowledge transferred could be directly employed in the on-going processes.

Establishing more long-term processes has, on the other hand, suffered from the lack of systematic working practices and planning. Although one should keep in mind, that when an organisation is starting from scratch the organisational culture and the way of thinking is largely built up through solving day to day practical problems. At this early stage of ESTAG development, this has probably been one of the most efficient ways of transferring the fundamental thinking and practical experiences related to innovation policy and policy implementation that is characteristic in Finland and other countries with a longer history of innovation policy.

2.2 Estonian Technology Agency strategy and institutional build up

Tasks: Analysis of innovation system with objective to form the agency strategy according to EU regulations and economic development

Segmentation of potential technology agency clients. Analysis of specific support instruments and evaluation of development needs of support schemes.

Outputs: Long- term Estonian Technology Agency strategy formed

ESTAG strategy represents one of the main long-term process included in the project. The original schedule made at the early stages of the project had to be delayed, but the otherwise the work has proceeded mostly according to plan.

The process started with an analysis of the innovation and economic environment, proceeded through brief scenario work to identify ESTAG mission statement and vision. These were then analysed against the current situation in a gap-analysis to identify main challenges and objectives for ESTAG for the coming years.

The strategy work also included the segmentation of ESTAG clients and an analysis of current and planned instruments.

Later, there is a plan to extend the strategy discussion to include also key people from Ministry of Economic Affairs, EAS and possibly from other organisations in the second phase.

This task included the following activities:

- Design of the strategy process.
- Consultation and participation during the strategy process.
- Documentation of the process at early phases and preparation of related material.

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Output was delivered (Annex 1). A more comprehensive strategy document has been compiled at ESTAG and is available from there.

2.3 Project selection process and development of financial instruments

Tasks: Evaluation of needed improvements in procedural system of project evaluation and improvement of the system.

*Outputs: The base of the technology agency as an organisation established.
Update procedural system of project introduced.*

Procedures for project assessment and handling were discussed throughout the project as the methods, procedures and systems were being developed. This included providing material from Tekes and consulting how they could be applied at ESTAG. Also experiences and knowledge from other innovation agencies in Europe were utilised in developing some procedures, methods and systems.

This task included the following activities:

- Terms of reference for designing a project database, especially the structure and data security issues.
- Design of a system for R&D project management, handling and evaluation in ESTAG
- Formulation of main principles of ESTAG activities for facilitating industry-academia co-operation
- Formulation of basic strategies for financing ESTAG projects
- Consultation for ESTAG project managers on how to advise companies design R&D projects

Currently, ESTAG is a small organisation with less than 10 employees. It is thus not necessary to establish any formal structures within the organisation. However, ESTAG strategy has been helpful in identifying priorities, dividing responsibilities, focusing collaboration with other agencies and other key actors in the innovation system and future resource needs.

Output was delivered.

2.4 First national technology program

Tasks: Analysis and setting guidelines for launching first national technology program and further programming.

Outputs: First national technology program launched.

At early phases of the project, technology programmes were not considered to be the main task. This was due to the fact, that the National R&D Strategy under preparation was to identify key areas where efforts should be focused on. At the time the National R&D Strategy was finalised, the ESTAG strategy work had revealed that

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there were other programmes that were needed more urgently than technology programmes. It was decided that the work should concentrate on these other programmes, instead of technology programmes as planned in the beginning.

The first technology programmes will most likely go into design phase early 2002. The design phase will – according to Tekes experience – typically take from 6 to 9 months, which means that the first programmes will be launched towards the end of 2002 or at the beginning of 2003.

The work concentrated on two programmes: ESTSPIN⁵ and Awareness.

One of the first programmes designed at ESTAG was the ESTSPIN programme. It is directed to universities and research institutes to establish and develop services and structures for spin-off companies. The programme was designed in during spring and summer of 2001.

The design phase included a strategic evaluation of the existing and future needs in the programme target area. The evaluation was executed using international experts and it concludes with an assessment of proposals and launch of programme towards the end of the year.

One aspect of the programme is the development of pre-seed and seed phase venture capital funds integrated into spin-off activities.

In the Estonian context, one of the main problems in innovation is the general awareness of innovation and its benefits. This applies to companies, decision makers and the general public alike. Also universities need to be made aware of benefits arising from collaboration with industry. One of the next programmes that will be launched by ESTAG will be the Awareness Programme. It is currently being designed and will be launched before the end of 2001.

During the project, ESTAG has arranged several seminars and presentations related to innovation at Tallinn and Tartu. The audiences have included decision makers, business people, researchers and key people from innovation infrastructure organisations.

This task included the following activities:

- Terms of reference for the strategic evaluation and launch of ESTSPIN programme and the selection of international experts to perform it.
- Segmentation of ESTAG clients for the purposes of the Awareness Programme and consultation on the design of the programme.
- Several presentations at seminars and meetings in Tallinn and Tartu for decision makers and potential clients.
- Articles in Äripäev on the importance of innovation and R&D.

⁵ The name was later changed to SPinno

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- Consultation on how pre-seed and seed phase venture capital could be introduced into the innovation system.

Output was not delivered as planned. Instead two other programmes were designed, one of which was also launched.

2.5 Implementation practice issues of government technology policy

Tasks: Evaluation and analyse of implementation principals of government technology policy.

Outputs: Basic principles of implementation issues of government technology policy formed.

At the beginning of the project, the only policy document defining any technology policy was the National Development Plan. Thus, the work here concentrated on one hand on consulting in the preparation of the National R&D Strategy and on the other hand on several other issues related to policy design and implementation at the Ministry of Economic Affairs.

This task included several discussions at the Ministry of Economic Affairs with key people responsible for innovation policy. The discussions ranged from widespread policy issues to details of policy design and implementation processes and documents. However, no explicit single documentation has been produced as a result of these and other discussions.

This task included the following activities:

- Consultation in the preparation of the National R&D Strategy.
- Consultation on how the new R&D Strategy should be implemented, monitored and evaluated.
- Consultation on the principles on how to establish the new TAN and horizontal policy co-ordination in the innovation policy domain.
- Consultation on designing the Competence Center programme.
- Discussions and presentations at Ministry of Economic Affairs seminars and meetings.
- Discussions related to the preparation of the Industrial Policy outline currently under preparation.
- Discussions concerning how the Ministry of Economic Affairs should steer and monitor EAS and ESTAG.

Output was not delivered in an explicit form, although a set of activities was performed.

2.6 Other activities not foreseen in the project plan

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In addition to the planned activities, the project included a number of other activities related to the project overall goal.

One problem in setting national targets for R&D has been the quality of national R&D statistics. During 2001 Ministry of Economic Affairs has worked together with the Statistics Estonia and other users of statistics to improve the R&D statistics. The ministry has also launched for the first time the collection of innovation statistics. This is done according to the third EU Community Innovation Survey (CIS III) framework, which makes the results comparable to other European countries.

Discussions have also taken place with Statistics Finland consultation, especially in developing the analysis capability at Statistics Estonia regarding innovation and R&D statistics. Previous strong linkages to Statistics Sweden in this area and lack of resources at Statistics Estonia have probably been the main reasons why these discussions have not lead into more concrete collaboration at this time.

Networking is an important aspect in business and innovation. Particularly smaller and medium sized companies do not collaborate enough, although they usually can get the biggest benefits from it. There are several reasons for this, including lack of awareness, lack of competence, lack of knowledge of other companies interests, etc. The collaboration between companies and research organisations in research and development is not widespread or very developed in Estonia.

ESTAG has initiated the first pilot projects, which intend to lead into finding good practices in encouraging collaboration and facilitating networking. The project has had a major contribution from appreciating the importance of networking and it's policy implications to practical advice on how to plan and implement network facilitation activities.

One of the first pilot projects has focused on the oil shale cluster. The need to enhance research and development activities and also the money to invest in the development of the oil shale cluster was already there before the project. However, a clear insight on how to proceed was still missing. During the project, the networking approach to the oil shale cluster development was formulated and adopted. It included e.g. technology auditing of the key companies, transferring technology auditing knowledge from Finland, approaches to industry-academia collaboration and practical experiences on how to use evaluation and outside expertise to help negotiate jointly accepted goals for a network.

Estonia has started to integrate to the European research area through such formal platforms as EUREKA and IRC network. Both of these were originally quite separate activities from the basic project based funding activity at ESTAG. During the project and the strategy process, both of these have been better integrated into the other activities at ESTAG.

The following activities were implemented:

- Consultation on the development of national R&D statistics and the design of CIS III study in Estonia. Analysing possibilities for collaboration between Statistics Es-

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tonia and Statistics Finland in the area of R&D and innovation. Advise to the Ministry of Economic Affairs statistics working group.

- Design of principles of network facilitation by ESTAG and the launch of the first pilot projects for network facilitation and technology auditing (ESTAG networking initiative, oil shale cluster project).
- Consultation on EUREKA strategy and integration to ESTAG products.
- Advice on integrating IRC activities in Estonia and ESTAG.

3 IMPACT ASSESSMENT

(Vaikuttavuuden arviointi)

The impact of a short project into the development of a large and complicated system is always difficult to assess. Impact of the project on the local economy and society will be realised in the long-term as the programmes and other activities of ESTAG are launched and start to produce results. At this point there are indications that the project has been useful and has contributed to the overall goal set for it. Some of the indications are:

- Practical procedures and systems at ESTAG are now in place and used.
- ESTAG has a strategy, which helps focus its activities, develop its instruments and communicate its thinking to other agencies in order to collaborate with them.
- First programmes have been launched or are at launching phase.
- ESTAG resources are gradually improving.
- First policy documents are ready and new ones are being prepared.
- Awareness among policy makers is gradually increasing.
- The collaboration between Ministry of Economic Affairs and Ministry of Education is gradually improving.
- TAN has recently begun its work.

4 LINKAGES

(Hanke suhteessa sidosryhmiin / paikallisiin uudistusprosesseihin / Suomen lähialueyhteistyön strategiaan)

This project was directly integrated into a local renewal process. The starting point was the establishment of a totally new public support governance structure and a formation of a new agency. Thus, all work in the project was directly linked to the local processes.

During the project there were contacts to Statistics Finland and the Finnish National Fund for Research and Development (Sitra). The discussions with Statistics Finland have not yet resulted in further collaboration. The discussions with Sitra were linked to their interests in Estonia and possible future Sitra activities in Estonia. During the

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project there were also some contacts to the Finnish Embassy in Tallinn and some Finnish consulting companies.

The project was closely linked to the following strategic goals set for the co-operation between Finland and Estonia:

- Focus on the Nordic dimension (as the Estonian innovation system is closely linked to Scandinavia)
- Development of the accession countries capabilities towards the EU membership (by improving the efficiency and effectiveness of the innovation system)
- Support to the transition process by developing governance structures and processes (by focusing and integrating the activities directly to on-going renewal processes)
- Development of the structures and processes for enhancing economic and industrial co-operation (by developing the innovation system capabilities)

5 IMPACT SUSTAINABILITY

(Tulosten kestävyysvaikutteet vaikuttavat tekijät ja missä määrin ne on voitu varmistaa)

As stated in Chapter 3, the impact of this project will be realised truly only after a long term. The final impact depends strongly on how the policy environment and the implementation resources develop during the next few years.

One major factor in sustainability has been the characteristic way in which the project was implemented. The project consisted of consultation on average two days a week, which meant that local actors had to take responsibility in day-to-day implementation of these activities. Knowledge has therefore been transferred in an efficient way. Also the flexibility of planning during the project has ensured that all consulting has been directed into existing and current activities, where the knowledge has been utilised instantly.

Furthermore, sustainability can also be ensured through continuous interaction with the key actors. There are several platforms through which this can naturally take place. Tekes and ESTAG are both members in EUREKA and IRC network. If ESTAG also becomes a member of the Association for Technology Implementation in Europe (Taftie), this provides yet another platform for exchanging experiences.

The Estonian economy is strongly linked to the Finnish economy. This also applies to the innovation system, since a lot of companies from both countries are linked to same industrial clusters and value chains. This means that also innovation networks extend over the boarder between these two countries. Technology programmes can in future be used as a natural platform for networking the customers of these two organisations.

The basic model for ESTAG is more or less a combination of Tekes and Enterprise Ireland, which also gives a good basis for future collaboration.

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6 FINANCIAL REPORT

(Talousraportti)

This information is not for public use

7 RISKS AND CRITICAL FACTORS

(Riskit & kriittiset tekijät)

The critical factors in the development of ESTAG and the Estonian innovation system are political commitment, quality of policy design processes, quality of management processes, collaboration, funding resources, key people and trust. All these present a risk, but also an opportunity for the future development of the Estonian innovation system.

Political commitment

There is a more or less common understanding of innovation policy between ESTAG, EAS and Ministry of Economic Affairs. However, this is not enough. More widespread political commitment must be achieved if Estonia really wants to benefit from innovation driven economic growth. ESTAG, EAS and Ministry of Economic Affairs interaction with Ministry of Education and especially with Ministry of Finance must be strengthened. Also interaction between EAS agencies must be improved. At the highest policy co-ordination level, it is important that TAN is able to gain a strong position. TAN has to gain a strong position, if it intends to support horizontal policy co-ordination.

One of the constant challenges for ESTAG, EAS and TAN is to ensure that policy-makers are aware of the role and importance of innovation in economic growth and the development of the whole society.

Key policy documents, like the National Development Plan, the Pre-accession Economic Plan, the R&D strategy and the Industrial policy must have credibility. Otherwise they don't mean anything. There must be both political commitment behind the documents and a transparent follow-up of implementation. Policy documents should act as statements of political commitment. The ministries and TAN have the key role to play in establishing the credibility of policy, but also EAS and ESTAG must communicate how various activities are linked to policies and what the impact of these policy implementation activities are.

Policy design processes

As stated earlier, innovation policy processes are just emerging in Estonia. Policy processes must be transparent and developed systematically. Policy documents must have a strong role and they must contain a clear path from higher policy goals into practical level implementation. All ministries as well as the government will eventually decide the direction policy processes are to be developed in the future.

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The annual budget process is one of the main policy process. However, it should be complemented with equally strong long-term policy processes. Long-term policies are not alternatives to annual planning. They are the tool to ensure that long-term goals will be reached. The prerequisite is, however, that long-term policies are not too general, but go further into setting practical and understandable goals. Currently, e.g. the strength of NDP, PEP or R&D Strategy has not been proven in resource allocation.

Management processes

ESTAG and EAS are in a process of building up management processes within the organisations and with the Ministry of Economic Affairs. It is important that clear and transparent planning and reporting procedures are established between the agencies and the Ministry of Economic Affairs. The Ministry of Economic Affairs' role should focus on setting long term objectives for EAS and the agencies. EAS and the agencies should concentrate on selecting the proper instruments and activities to reach these long term objectives. Annual or other more short term planning should be based on long term plans. It is also very important to ensure that there is enough informal and formal communication between EAS, ESTAG and the Ministry of Economic Affairs.

It is also very important to establish clear and transparent planning and reporting procedures within ESTAG and between ESTAG and EAS. Key management processes should be defined, described and documented. Planning and reporting processes should be systematic and continuous with clearly defined responsibilities and schedules.

Finally, all management processes within ESTAG and EAS and between ESTAG, EAS and the Ministry of Economic Affairs should form a one system, where the schedules and document structures and content are agreed so that duplicate work is avoided.

As a small organisation, ESTAG does not need to concentrate that much on internal management processes. However, it is important to start building the organisational culture to support knowledge management. Knowledge management is especially important for ESTAG, because the knowledge is concentrated on a very small number of key people. It is vital, that efforts are taken to document key activities and practices. It is also important that systems and practices are developed to support knowledge management.

Collaboration

Innovation is always a result of a combination of different kinds of knowledge and skills. Innovation policy and it's implementation relies also heavily on collaboration. To develop an environment conducive for innovation requires a good regulatory framework, functioning financial and product markets, incentives, good quality innovation services and processes, which support innovative activities. Building all this

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requires, in addition to political commitment and long term strategy, interaction and collaboration between different public and private actors.

It is essential that public actors responsible for implementing innovation policy act together. Policy measures should support each other and form a system, which is easy to approach, helps identifying the right services, where proper funding is available and which encourages companies and research organisations take on innovative activities.

The key to all this is collaboration. ESTAG and EAS have a major role in building collaboration, since they are key organisations implementing innovation policy. The first challenge is to establish collaboration within EAS, between the agencies. The other important direction in collaboration is organisations that already identify and deal with common interests among companies and other potential and existing client organisations, like industry associations or other public funding organisations.

Lack of collaboration between agencies can lead into competition, which is negative both in relation with convincing the political decision makers and in relation with the companies and research organisations. Unnecessary competition would also waste a lot of the agencies resources. On the other hand, lack of collaboration with industry associations and other such organisations would risk getting their support, which is important for building up trust and credibility.

The need for collaboration is not limited to the organisations mentioned above. Collaboration and networking should be one of the major factors in all activities and interaction on regional, national and international level.

Financial resources

A lot of the ESTAG impact depends directly on the financial resources it has in its disposal. At the current situation, the government budget is under serious pressure and difficult political decisions have to be made. Furthermore, the situation is not likely to improve dramatically within the next few years. This means that all depends on how high political decision makers prioritise R&D and innovation. Current EAS governance structure gives a lot of flexibility, which can be used as a buffer to cope with smaller changes. The Ministry of Economic Affairs together with TAN have the main responsibility for ensuring that innovation policy implementation is given priority and sufficient resources. EAS and ESTAG must support this by providing information on the impact of their activities and on the role of innovation in economic growth and development of the society.

Since innovation policy financial resources are limited in Estonia, measures should be taken to use it as a leverage to get more private financial resources to innovation. Various private-public partnerships and mixed funds can be used to encourage private investments to innovative activities. Revolving funds, soft loans, guarantees, venture capital investments or subsidies on interests can also be used. However, it should be kept in mind that direct grants are the most efficient instrument for encouraging companies to invest in R&D. Because of the different needs of companies and research organisations, it is also important to have a selection of different instru-

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ments instead of relying on just one or two general instruments. Especially EAS and its agencies should encourage and foster public-private partnerships.

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Key people

A lot of knowledge has been transferred during the project. Most of that has focused on a limited number of key people. If these key people leave ESTAG or the Ministry of Economic Affairs for any reason, a lot of the transferred knowledge will disappear with them. ESTAG and the Ministry of Economic Affairs should take steps to ensure that key people stay with the organisation, so that this does not become a problem.

Trust

One of the underlying factors behind any innovation agency impact is the knowledge it has of its customers real current and future needs. To get this knowledge vital to business success and therefore kept in secret, requires trust. It also requires sufficient and continuous interaction with key companies and researchers.

Building trust is a long delicate process, where one single failure can cause serious drawbacks. This means that the quality of all ESTAG activities must be high and confidentiality protected at all times. ESTAG image will be built during the next few years, so they are very critical. In the eyes of decision makers, customers and partners alike, trust is built with quality and impact.

8 RECOMMENDATIONS

(Suositukset tulevia hankkeita ja ohjelmia varten)

Lessons learnt

First of all, the consulting approach selected in the project seemed to work. Full time presence has a tendency to lead into the consultant taking or having to take responsibility for day-to-day implementation of some activities, thus not allowing for the knowledge to be transferred. A consultant is always an outsider and should implement only limited and well defined tasks and even these in close collaboration with the local people.

The success of this kind of a project relies heavily on the local actors. They must have a clear picture of their needs. Not only in the project planning stage, but also during the project at all times. They must also have the necessary resources to put on the day-to-day implementation locally. One of the key success factors in this project was the commitment and enthusiasm put into the project by the Estonian partners.

A more systematic approach to project implementation is needed, but one should not go to extremes. Enough flexibility should be allowed, because environments are always changing and something that was originally planned might not make sense later.

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Recommendations for future collaboration

Estonia has gradually integrated to the European context. Most of the legislation is presently in line with EU regulation and EU membership negotiations have proceeded well. Development processes have been initiated and are running in most important policy areas. This opens up possibilities for many forms of future collaboration. The following highlights some possible areas, where co-operation and Finnish experiences might prove useful in developing the Estonian innovation system.

Policy processes are still very much developing in Estonia. The work of TAN is just beginning and mechanisms for horizontal policy co-ordination are yet to be built. Ministry of Economic Affairs and TAN could benefit from consultation related to how policy processes and horizontal policy co-ordination are designed and implemented.

The recent R&D Strategy and the Industrial Policy under preparation are both policy documents that should be put in action through systematic planning, launching, implementing, monitoring and evaluating a set of well defined activities. Responsibilities for following up and reporting the implementation and impact of these activities should be established throughout the system. Decision makers need to have continuous feedback from implementation and from independent sources evaluating the impact of policy measures. Feedback ensures that future policy decisions are based on the best available knowledge. TAN should take a key role in making sure that these systems, processes and maybe even institutional structures are put in place. The main actors are naturally all ministries dealing with innovation and it's funding. EAS and the agencies should develop their management capabilities and funding processes so that they are able to provide the necessary information needed by the ministries, TAN and eventually political decision makers.

Practical collaboration could be related to establishing the working practices for TAN, establishing the processes for implementing, monitoring and evaluating the R&D Strategy or the Industrial Policy, establishing policy and policy implementation evaluation practices at the national or at the ministerial level.

The design of first technology programmes is estimated to begin early 2002. ESTAG could benefit from experiences in designing and implementing technology programmes as was already identified in the original project plan. Technology programmes have proven to be a very efficient tool in enhancing collaboration and networking. They also provide a processes and a platform for identifying common interests and needs more efficiently than many other measures. Technology programmes is one of the main innovation policy tools used everywhere.

Practical collaboration could best be related to the design and launch of the first technology programme. This could also include building linkages to corresponding Finnish and other Scandinavian technology programmes and possibly European R&D co-operation platforms, like EUREKA, COST and various EU activities.

The awareness among policy makers is gradually increasing. However, it is generally not at a high level and the Ministry of Economic Affairs, EAS, ESTAG and TAN could benefit from organised training of policy makers. In Finland, Sitra organises this kind

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of training. Practical approach could be to organise Estonian decision makers participation to Sitra training or to establish similar training activities in Estonia. This is an issue that should be discussed at TAN.

National R&D and CIS III statistics are currently being collected. Whereas the basic statistics will undoubtedly be produced, the analysis capability could be enhanced. This would serve the Ministry of Economic Affairs, EAS, ESTAG, TAN and other actors by providing a better understanding of innovative and R&D activities in Estonia.

Practical level collaboration should take place between Statistics Estonia and Statistics Finland. The natural timing for this co-operation would be the analysis phase of the next R&D statistics and/or the first CIS III statistics. Also users of these statistics in both countries could benefit from interaction on issues related to the reliability and use of statistics in policy making.

The Ministry of Economic Affairs and ESTAG could also benefit from experiences related to impact measurement and evaluation, which are important in showing the impact of funding to decision makers and to the public.

Practical measures could include ESTAG joining Taftie (The Association For Technology Implementation in Europe) and participating in the Taftie Evaluation Network, joint studies and evaluations with Tekes or Sitra or establishing impact measurement practices at ESTAG, EAS and the Ministry of Economic Affairs.

Also there are several areas of innovation services, where collaboration could be beneficial. During this project first contacts were made and first pilot projects launched. However, this is an area which needs a further looking into as the private innovation services are not that developed in Estonia.

Practical level co-operation could include consultant training in Estonia, adapting and developing innovation services from Finland or elsewhere, developing internet based sign posting and other services or analysing and establishing packaged innovation services for selected customer segments. The main actors could be EAS and ESTAG.

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VISION FOR

SOCIETY, INNOVATION SYSTEM, BUSINESS ENVIRONMENT AND INDUSTRY

KNOWLEDGE BASED SOCIETY

The Estonian society has a positive attitude towards technology & science and openness towards cross-cultural co-operation. Knowledge-based society fosters the application of new technologies. The impact is realised in the awareness of nature preservation, the quality of health care, the rate of job creation and balanced regional development.

MARKET ORIENTED INNOVATION SYSTEM

Estonian innovation policy is systematic with a long-term orientation. The policy is accepted among key actors in the innovation system. The resources allocated for policy implementation are in accordance with policy goals and the allocation is based on strategic analyses. Developed regional, national and international networks allow the innovation system to be adaptive to market needs.

BUSINESS ENVIRONMENT CONDUCIVE TO INNOVATION

Estonia is a liberal and open economy with a developed and well-enforced legal framework, which is mostly harmonised with EU legislation. Financial markets support innovation and technology-based businesses creating a business environment conducive to innovation. Majority of companies have realised, that innovation is crucial for competitiveness. The competence for conducting R&D activities is high.

COMPETITIVE AND NETWORKED INDUSTRY

Estonian industrial base is stronger and networked with international industrial clusters. The industry has made a shift towards a higher level of value creation. This has resulted in an overall growth of exports, especially in the domain of high-tech products and knowledge-based services. The number of competitive high-tech SME-s has increased. Traditional industry sectors have been integrated with new knowledge intensive industries. Collaboration between academia and industry are well developed.

VISION & MISSION

VISION

ESTAG is a respected source of innovation related knowledge and funding. ESTAG enables companies to create added value through the development of new technologies.

ESTAG actively interacts with industry, academia and policy makers. As a key actor in the national innovation system ESTAG drives the development of the innovation environment.

ESTAG is a dynamic organisation with skilled and motivated people. Pleasant working atmosphere creates the basis for a learning process within the organisation.

MISSION

ESTAG has the mission to promote the competitiveness of the Estonian companies and the economy by supporting technological development.

The impact is realised in increasing exports, creation of new jobs, sustainable development and social well-being.

29.11.2001

THE MAIN CHALLENGES

Better awareness of innovation

- raising the awareness of innovation and it's contribution in economic and social development (general public)
- improve the awareness among companies and universities of the importance of innovation (customers)
- increase the global awareness of Estonia innovation environment (global) (inward FDI, international collaboration)
 - ⇒ *more investments into R&D – private companies, government priority, FDI*
 - ⇒ *better supply of qualified human resources for R&D*
 - ⇒ *enhanced networking between companies, universities and institutes*

Stronger policy and implementation capability

- clearly focused strategy and activity plan at ESTAG
- more active participation in policy design
- stronger argumentation based on better policy and impact analysis
- stronger policy and implementation analysis activity at ESTAG
- more analysis and studies
- propose improvements to the legislation (e.g. R&D law)
- training of ESTAG (and EAS) personnel
- Improved collaboration with ERDA, EIA, ETPA
- Improved collaboration with innovation support structures
 - ⇒ *more investments into R&D - government priority, private companies*
 - ⇒ *clear and right messages to customers*
 - ⇒ *better services for customers*
 - ⇒ *better support structures for innovation*
 - ⇒ *credibility and trust – improved understanding of real customer needs – better services*
 - ⇒ *more integrated and efficient innovation system*

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Encouraging R&D funding

- supply funding for R&D (companies, universities and institutes, service providers, financial markets)
- enhance networking activities (e.g. collaborative programs, technology transfer activities, technology centers, etc.)
- social and environmental issues must be taken into account in the funding criteria
- the use of EU structural funds by ESTAG for innovation
 - ⇒ *more investments into R&D - private companies, universities, FDI*
 - ⇒ *enhanced networking between companies, universities and institutes*
 - ⇒ *better innovation capability at companies, institutes and universities*
 - ⇒ *better absorptive capacity at universities, institutes and companies*
 - ⇒ *better institutional and support structures for innovation*

Promoting managerial competence in R&D

- build and support infrastructure and services for Spin-off businesses
- design an approach for supporting knowledge intensive services
- provide funding also for training in relation to R&D
 - ⇒ *more investments into R&D - private companies*
 - ⇒ *better innovation capability at companies*
 - ⇒ *better absorptive capacity at companies*
 - ⇒ *better institutional and support structures for innovation*

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FINAL ASSESSMENT OF THE PROJECT BY THE BENEFICIARY CO-PROVIDED BY KITTY KUBO (MINISTRY OF ECONOMIC AFFAIRS) AND ALAR KOLK (ESTONIAN TECHNOLOGY AGENCY).

Dr Jari Romanainen acted as a councillor at ESTAG from November 2000 to September 2001. The overall aim of the project was to develop ESTAG, the National Technology Agency, as an implementer of governmental innovation policy.

At the outset of the project, the objectives for the consultancy work at ESTAG were defined as follows:

- a) To form the Estonian Technology Agency strategy and advise institutional build-up
- b) To improve the project selection process and advise development of financial instruments of the agency
- c) To advise the preparation process of the first national technology program

In addition to the above-mentioned major focus of the project, it also included advising the Ministry of Economic Affairs in day-to-day matters regarding technology policy and implementation.

In the opinion of the beneficiary, all the objectives of the project were met. The results of the tasks carried out matched or even exceeded our expectations. In some cases, the objectives of the project were changed according to the circumstances, e.g. instead of an actual technology program, a spin-off program was launched. In our opinion, these changes were justified and well implemented. The beneficiary highly approves of the results.

The outputs of the project were defined as following:

- a) A long- term Estonian Technology Agency strategy was formed
- b) The base of the technology agency as an organisation was established
- c) An update procedural system of the project was introduced
- d) The first national technology program was launched
- e) The capacity to deal with the technology policy at the ministry was increased

The project outcomes included recorded deliverables such as the ESTAG strategy document, the SPINNO program, the project handling system approved by the Board of Enterprise Estonia, and the terms of reference for the project database and segmentation of clients for the awareness program. We consider the formulation of ESTAG's long-term strategy as the most important achievement of the project, where Dr Romanainen co-ordinated the strategy formulation process.

A substantial part of the consultancy work resulted in the knowledge transfer. The consultation and training of ESTAG and respective staff at the ministry focused on the most crucial issues in developing its activities. These encompassed the strategies for financing ESTAG projects, project appraisal principles, advising companies on the design of R&D projects and facilitating national and international industry-academia R&D co-operation.

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Utilisation of the extensive knowledge and experience of Dr Romanainen proved to be crucial in reaching the highest priority objectives of ESTAG in the operating year 2001. Moreover, apart from the achieved direct outputs of the project, a long-term impact through the capacity building should be considered even more profound, although less measurable.

The long-term involvement of an experienced foreign expert to the creation of ESTAG facilitated remarkably both the organisational and capacity build-up of the young organisation and enabled to benefit from the transfer of the respective knowledge from Finland. As a result, the ESTAG today is considered as a most systematically developed executive sub-agency of Enterprise Estonia.

The final report of the project adequately summarises the situation and the challenges Estonia faces today, thus constituting a good base for prioritising and planning further activities to overcome the gaps and create a sound policy process. Moreover, it also provides a sound input to the Ministry of Trade and Industry of Finland for planning and deciding about the further co-operation lines and projects under the bilateral co-operation with Estonia.

To conclude, the critical factors of success of the project could be outlined as follows:

1. Right timing and high involvement by the beneficiary
2. Long-term involvement of an expert with extensive knowledge and experience
3. Consulting approach of the project
4. Flexibility of the project to adopt according to the changed circumstances