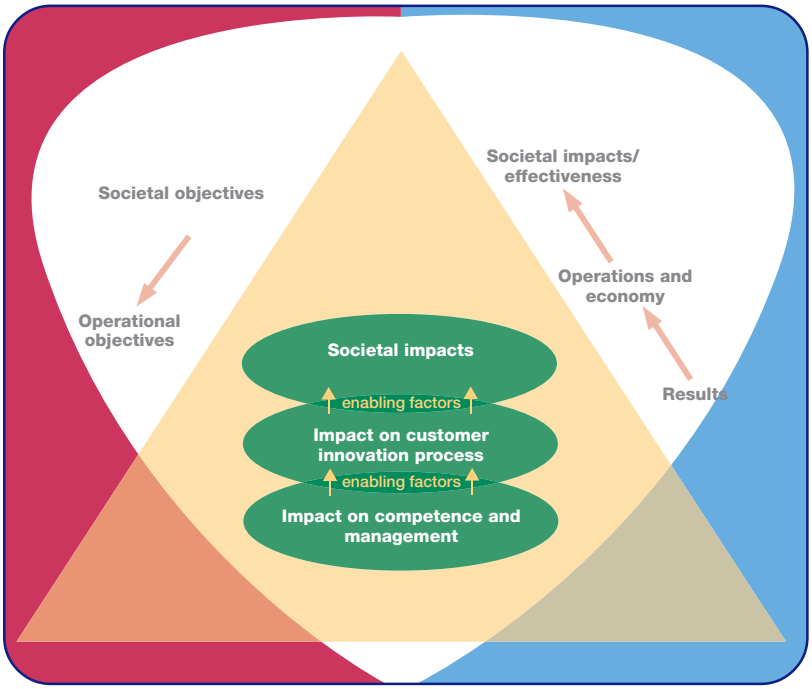
ESPOO 2006 VTT RESEARCH NOTES 2336



Kaisa Lähteenmäki-Smith, Kirsi Hyytinen,
Pirjo Kutinlahti & Jari Konttinen

Research with an impact

Evaluation practises in public research organisations

VTT TIEDOTTEITA – RESEARCH NOTES 2336

Research with an impact

Evaluation practises in public research organisations

Kaisa Lähteenmäki-Smith, Kirsi Hyytinen,
Pirjo Kutinlahti & Jari Konttinen

ISBN 951–38–6784–6 (soft back ed.)
ISSN 1235–0605 (soft back ed.)

ISBN 951–38–6785–4 (URL: http://www.vtt.fi/publications/index.jsp)
ISSN 1455–0865 (URL: http://www.vtt.fi/publications/index.jsp)

JULKAISIJA – UTGIVARE – PUBLISHER

VTT, Vuorimiehentie 3, PL 1000, 02044 VTT
puh. vaihde 020 722 111, faksi 020 722 4374

VTT, Bergsmansvägen 3, PB 1000, 02044 VTT
tel. växel 020 722 111, fax 020 722 4374

VTT Technical Research Centre of Finland, Vuorimiehentie 3, P.O.Box 1000, FI-02044 VTT, Finland
phone internat. +358 20 722 111, fax +358 20 722 4374

VTT, Kemistintie 3, PL 1000, 02044 VTT
puh. vaihde 020 722 111, faksi 020 722 7007

VTT, Kemistvägen 3, PB 1000, 02044 VTT
tel. växel 020 722 111, fax 020 722 7007

VTT Technical Research Centre of Finland, Kemistintie 3, P.O. Box 1000, FI-02044 VTT, Finland
phone internat. +358 20 722 111, fax +358 20 722 7007

Technical editing Anni Kääriäinen

Otamedia Oy, Espoo 2006

Lähteenmäki-Smith, Kaisa, Hyytinen, Kirsi, Kutinlahti, Pirjo & Konttinen, Jari. Research with an impact. Evaluation practises in public research organisations. Espoo 2006. VTT Tiedotteita – Research Notes 2336. 79 p.

Keywords evaluation, impact assessment, societal impacts, R&D, public research organisations (PROs), polytechnics

Abstract

This publication highlights the benefits of and the challenges faced in assessing the societal impacts of public research organisations, based on a research project (JYVA) focusing on the perceptions, practises and philosophies associated with the assessment of the socio-economic impacts of research and development. The JYVA-project was undertaken in a consortium between five Finnish public research organisations (PROs) involved in R&D activity: *Agrifood Research Finland* (MTT), *Finnish Defence Forces Technical Research Centre* (PVTT), *Helia University of Business and Applied Sciences* (HELIA), *Satakunta University of Applied Sciences* (SAMK) and the *Technical Research Centre of Finland* (VTT).

The main aims of the project were to develop the necessary methods and indicators needed to analyse the impacts in each organisation, and to test an analytical framework for impact assessment developed within VTT. The main findings and policy implications are discussed here on the basis of three related perspectives:

- objectives (as they relate to organisational perspectives)
- indicators (as they relate to the innovation process more generally)
- learning (both in terms of actors and policy).

The positive impacts that public research organizations generate originate in networks and with partners. Future competence development therefore requires an approach where organisational and cognitive needs relating to impact assessment are related specifically to the creation of new partnerships and network management, as well as to the role and "value added" of the organisation in these networks.

On the level of policies, the role of the R&D organizations is essential in providing a cognitive base for developing cross-sectoral and more broadly based policy initiatives. In this regard management by results and management by programming are mutually supporting processes, where PROs should play an active role.

Impact assessment helps to identify the strengths and weaknesses of organisational performance, as well as enabling us to focus on the key competences of the R&D organisations. By so doing it helps us to analyse the "additionality" of public R&D, from the point of view of current and potential customers, stakeholders and society at large. It is important to balance these external customer needs with the internal expertise development needs of the PROs however, and to do this in such a way that it does not jeopardise the creativity of individuals and institutional capabilities in expert organisations, as these are the core producers of continuous knowledge creation, acquisition, and transfer, ultimately ensuring continuing innovation into the future.

Preface

This publication breaks new ground in examining the societal impacts of public research organisations. Besides providing concepts and tools for impact assessment, it identifies both external and internal challenges in developing practices and indicators for impact assessment.

The origins of this book lie in the handbook "Impact Assessment of Public Research Organisations. Practices, experiences and challenges", published by VTT in 2004. Another source of inspiration comes from the research project "Societal impacts of public research organisations", conducted by VTT in collaboration with *Agrifood Research Finland* (MTT), *Finnish Defence Forces Technical Research Centre* (PVTT), *Helia University of Business and Applied Sciences* and *Satakunta Polytechnic* in 2004–2005. The main aim of the current project was to develop the necessary methods and indicators to enable us to analyse societal impacts in each organisation, while also testing a tentative analytical framework developed within VTT.

We would like in particular to thank the main contact persons in the above-mentioned organisations that provided us with invaluable support, both in terms of our substantive information needs and with essential encouragement during the interactive research process. These persons include Kari Tiilikkala, Erkki Kemppainen, Ilkka P. Laurila, Pasi Voutilainen and Noora Salmisto (born Koivurinne) at *Agrifood Research Finland*; Ilkka Jäppinen and Ari Virekunnas from PvTT; Seppo Pynnä and Matti Lähdeniemi at SAMK; and Ritva Laakso-Manninen and Lauri Tuomi at *Helia*, as well as a number of other persons from these organisations. In addition we owe thanks to the various active participants among the stakeholders of these organisations, including the representatives of the ministries, as well as to all those interviewed for the case-studies for giving us of their valuable time. The authors would also like to express their thanks to Chris Smith whose remarks improved the English text.

Espoo, April 2006

Kaisa Lähteenmäki-Smith, Kirsi Hyytinen, Pirjo Kutinlahti and Jari Konttinen

Contents

1. Introduction

1.1 Background and focus

The purpose of this publication is to present the findings of the (JYVA) research project focusing on the perceptions, practises and philosophies associated with the assessment of the socio-economic impacts of research and development. The JYVA-project was undertaken in consortium between five Finnish public research organisations (PROs) involved in R&D activity. The participating organisations were *Agrifood Research Finland* (MTT), *Finnish Defence Forces Technical Research Centre* (PVTT), *Helia University of Business and Applied Sciences* (HELIA), *Satakunta University of Applied Sciences* (SAMK) and the *Technical Research Centre of Finland* (VTT).[1]

The main aims of the project were to develop the necessary methods and indicators needed to analyse the impacts in each organisation, and to test an analytical framework for impact assessment developed within VTT. The background to the study will be presented in the Section 1.3. The project also aimed at promoting dialogue and co-operation between different organisations and sectors in developing the practice of, and methodological competence in impact assessment (IA), including the selection of indicators best suited to assessing societal impacts. In analysing the practises and experiences of these organisations the aim was to elaborate better conceptual understandings of the significance and relevance of impact assessment as a strategic and a foresight-based tool.

The following four questions were examined in the project:

1. What kinds of methods and tools do these R&D-organisations use in assessing their impacts?

[1] MTT, PVTT and VTT are all mission oriented public research organisations while *Helia* and SAMK are polytechnics or "universities of applied sciences", combining both educational and research tasks. The organisations involved are all publicly funded, though all have an increasing focus on securing external co-financing for their R&D-activity. Some have a long history of engagement in the R&D-process, with a specific role and/or mission in the national innovation system, while others are newcomers with a less well-established mandate in this area.

2. What are the major strengths, weaknesses, opportunities and threats projected and encountered in developing their R&D-operations in relation to the enhancement of their societal impacts?
3. How do the various stakeholders of these organisations perceive their own roles and the challenges faced in their innovation environment?
4. What kinds of conclusions and policy implications can be identified in the promotion of the societal impacts of R&D?

On the one hand this publication presents the basic concepts, tools and methods for analysing the societal impacts of PRO, while on the other, it summarises the main findings of the organisational sub-studies. It will not make comparisons between the studied organisations, although it will identify the development needs concerning impact assessment in public research organisations and different policy sectors.

Previous research has shown that the analysis of long-term impacts and the prioritisation of the main R&D indicators is a challenging task and the justifiable desire for developing a standardised "indicator tool-box" may not be compatible with the tendency to pursue increasingly complex policy goals (e.g. Kuhlmann 2003, 17, Smith & Kuhlmann 2004, Kuitunen & Hyytinen 2004), which require a long-term perspective. Besides the practical need for the development of better indicators to analyse and report upon societal impacts, as required by the current performance guidance models, the project has also identified the need for a better understanding of the role and significance of impact assessment relating to organisational development and competence-building.

The structure of the publication is as follows:

Chapter 2 describes the analytical and policy context of societal impact assessment, relating it to the main trends, ongoing processes and core rationales of innovation policy and management by results. Chapter 3 provides an overview of the framework for analysing societal impacts, which is then exemplified in some examples of evaluation tools and practices proposed in Chapter 4. Chapter 5 summarises our key findings across three main dimensions (organisational dimensions, indicators and learning).

1.2 Data and methodology

The JYVA-project covered three separate projects concerning individual R&D-organisations and produced three organisation-specific reports. All of the detailed information concerning the data and the methodology is illustrated in these organisational publications (Kutinlahti et al. 2006, Lähteenmäki-Smith & Hyytinen 2006, Hyytinen & Konttinen 2006). The main aim of this publication is to synthesise the main findings of these organisational reports and to discuss the challenges concerning impact assessment (IA) on a more general level.

Basic information about the organisations and their operational environment was collated from the documentary analysis, while interviews with both the personnel and the stakeholders of the case organisations were also undertaken. A total of 31 interviews were undertaken with organisational representatives, with a further 48 conducted with the central stakeholders.

Part of the data was collected in the interactive forums which were organised around four different themes: 1) Social responsibility and IA, 2) Indicators for IA, 3) Regional impacts and regional innovation capacity, 4) Future challenges to the development of IA.

The project began in August 2004 and ran until May 2006.

1.3 The historical background of R&D in the JYVA-organisations

The current circumstances of the organisations studied in the context of this project are necessarily determined by the sector and organisation specific paths which they have followed. Historical paths on the other hand have been influenced by both internal and external forces. Here the organisations themselves have provided the authors with a brief historical account of their development in this respect.

1.3.1 The direction of *Helia* activities in terms of social development

Helia, the Helsinki Business Polytechnic was established in 1992. The starting points for *Helia* have always been strongly linked to the business sector and to the needs of working life, particularly in respect of the promotion of a more specialised business culture as well as having a practical orientation and a pioneering spirit. In other words, a model institute.

The Polytechnic Act confirmed research and development activities and regional development in 2003, with the Act entering into force in 2004. Thus *Helia's* R&D activities are still in their infancy, and based on the enthusiasm of its teachers for research and development work. Initially, the regional development role was mainly to network with actors in the area, and to create opportunities for regional development projects.

2005 can be considered a turning point in *Helia's* research and development activities. *Helia's* new strategy was implemented at the beginning of 2005, making a complete reform of the research and development activities and regional development processes possible. Development activities were strongly focused on developing companies, working communities and the metropolitan area (including the Itä-Uusimaa region). Key strategic focus areas were defined as "chosen areas of emphasis" in conjunction with the reform of *Helia's* strategy. These included *Systems and operating practices that support business, Communications and digital media as part of business operations, Sales efforts* and *Vocational pedagogy*. R&D and regional development were reorganised and a new type of dialogue was initiated with the innovation environment in the region.

The fact that the Innovation Strategy for the Helsinki Region was simultaneously announced also supported the implementation of *Helia's* strategy. This provided the opportunity to expand upon *Helia's* regional development role. *Helia* was in fact the first organisation in the area to define its role as an executor of the Helsinki Region's Innovation Strategy. In addition to the above-mentioned strategies, the redirection of regional development was used as a tool, when *Helia* participated in the Finnish Higher Education Evaluation Council's centre of excellence application for regional development impact. *Helia's* operating area, regional development roles and targets were refined during this process.

In terms of the customer perspective, *Helia* has co-operated with its partners on working life issues in a close and active manner. *Helia's* most important partners are large, nationally significant companies from across the business world. The change in operating environment and the national focus on supporting SMEs – especially knowledge-intensive companies and growth companies – also reflects strongly on *Helia's* operations. The changed environment and the level of partner company expectations regarding increased co-operation has also influenced customer management.

A new target is the desire to achieve closer co-operation with large companies and SMEs operating in areas that are the focus of *Helia's* strategy. Co-operation with both public sector organisations and business associations is also growing closer. The

development of customer relationships has thus been aimed at customers and partnerships that support the strategy. Important development partnerships will also be created with intermediary organisations in the innovation environment.

The internationalisation and globalisation of business is a key social development trend, bringing new challenges in respect of future societal impacts. The internationalisation of business reflects an assessment of the impact of regional development. In future, the regional development impact of *Helia*'s activities will be assessed in the metropolitan area, the Baltic Sea operating environment, the EU area and globally.

In summary, *Helia* aims to inspire the teaching staff towards research activities and make the perspective more strategy-oriented within the context of a target focussing on broad research and development projects that correspond to the overall strategy focuses. The next step is intended to take the organisation toward process innovations and development platforms that will stimulate teaching and further action in the realm of continuous development activities. A networked innovation environment, deeper customer relations and the visibility of the strategy in everyday work are seen as the key factors in terms of the social impact of research and development in the near future.

Based on a Finnish text by Ritva Laakso-Manninen and Lauri Tuomi.

1.3.2 Developing agricultural research: *Agrifood Research Finland* and its history

MTT was founded in 1898 under the name "Maanviljelys-Taloudellinen koelaitos" ("Agro-economic test facility"). According to its founding documents, the tasks of its five departments included plant agriculture and tools testing, agricultural chemistry and swamp agriculture, agricultural physics and sub-zero temperatures research, bacteriology, plant physiology and plant diseases, and entomology. The MTT research mandate has from the beginning had a very practical and effectiveness -oriented basis.

Accordingly, effectiveness and in particular local effectiveness have always been central to the activities of the MTT, and the network of research stations has played an important role to that end. The first test facilities were founded in 1918 and 1919, and more were built in the 1920's and 1930's. The goal was to create local testing station regions according to the regional divisions of the farm control and information system. The stations were intended to examine local farming and manufacturing possibilities and to solve local problems. MTT and its local research stations in particular have always been important in informational terms. Examples here include informational events and "free to use" exhibition fields. The number of people visiting a station has, to some extent, been used as an indicator of the effectiveness of these informational activities.

The changes in question formulation arising from changes in the field can be summarised as follows:

- from a lack of foodstuffs to overproduction: attention diverted from the quantity of foodstuffs to their quality
- from a dearth of productive inputs to ampleness thereof: negative environmental effects of agriculture
- declining rural population
- decreasing importance of agriculture to the national economy
- increased attention to environmental values
- liberalisation of international trade
- internationalisation of agricultural policy (the EU).

Changes in the activities undertaken have meant that the effectiveness of these activities is now examined from a different point of view. Whereas previously, the issue of effectiveness was aspired to in particular through the farmer customer, today, MTT increasingly aspires to effectiveness in those matters nearer to the interests of the consumer (e.g. the quality and range of foodstuffs, pleasant environmental surroundings and the sustainable use of natural resources). To a greater extent then than ever before, MTT now aspires to effectiveness in those matters that are central to the interests of the foodstuffs industry, while previously, the closest industry partner was the ammunition industry. The importance of high quality scientific "know-how" as a source of effectiveness has also increased.

From a local perspective, the role of local stations in research has changed dramatically. The direction of the change has not however always been uniform, as solutions have been different from station to station. Stations have striven to specialise in the central problems of their region. However, there has been significant variation in how well stations have managed to take part in local R&D cooperation. The stations have not however all been successful in these attempts, with some remaining wedded to their traditional role as testing grounds (the resource role). The local activities of the MTT stations as they are today do not meet the challenge posed by the change in its working environment (indeed in the 1990's five stations were discontinued). Research can still be, and for political reasons perhaps still ought to be, regionally dispersed, but its quality must be improved. The combining of resources into larger units, cooperation with universities and other local research organisations and strong coordination within the research institution are seen to be crucial methods in achieving this end.

In January 2006 MTT gave up a number of research stations (in Pälkäne, Mietoinen, Tohmajärvi and Juva). The resources saved from the discontinued stations will instead be redirected towards strengthening the other research stations or the units close to them, with particular focus being placed on developing their high quality research "know-how". The strengthened stations will thus be better able to present themselves as inviting cooperation partners for the private sector, other research institutions and universities in their regions and even for international partners. From this perspective then the focus of local effectiveness has also changed.

The organisational restructuring that came into effect at the beginning of 2006 will, according to the plan, make the current local research stations part of research units based on particular fields of science, with the local unit as it is today ceasing to exist.

This change is intended to ensure that research in each field is carried out in a coordinated fashion and that it is always based on the best expertise in the field regardless of where in Finland the research is being done.

The aim of continuing with local activities in the new working environment is that although different regions have different strengths, MTT can continue to take advantage of those strengths and generate good results. Research is to be carried out as close to the customer as possible. Good examples of this in the MTT context include the investment in potato research in Northern Ostrobothnia and the concentration of ecological production research to the Southern Savo region. Continuing local activity is necessary for MTT. However, the organisation must be able to make the structural changes necessary to further develop, and ultimately to best take advantage of those activities.

Based on a presentation in Finnish by Director General Erkki Kemppainen at the JYVA-seminar in Jokioinen, 4th of October 2005.

1.3.3 Research in the defence sector over the years: *Finnish Defence Forces Technical Research Centre (PVTT)*

Technical and scientific research in the Defence Forces started in 1919, when chemist Bertil Nybergh began his work at the brand new Chemical Laboratory of the Military Supplies Department in the Ministry of War. By the mid-1920s, not only had the laboratory become independent but it had also been turned into the Chemical Testing Institute of the Ministry of Defence. By the end of the decade, the Institute had been relocated to its own facilities on the island of Harakka, in Helsinki.

Physics research began in the 1920's with the Institute receiving inspection assignments relating to the material acquisitions of the Army. For this purpose, the Reception Office of the Military Supplies Department of the Ministry of Defence was founded in Katajanokka. Inspections increased in number due to the expansion of physical research in areas such as materials testing, shooting tests, and electrical measurements.

During the Second World War, on two separate occasions, the Chemical Testing Institute relocated away from Harakka, with various units operating in Tampere, Vaasa, and Nokia. Physics research however continued to be carried out in Helsinki, throughout the duration of the war.

During the war years, tens of thousands of chemical and physical analyses and many war bounty examinations were performed. The work of the researchers also included the development and manufacturing of the materials and tools required at the front lines.

After the war, war bounty examinations and work relating to war materials were increasingly replaced by civilian assignments. Research continued to be undertaken in the light of the needs of the Defence Forces, though this was supplemented by the work done for other state purposes, as well as that done in conjunction with the universities and private companies.

In 1952 the National Defence Research Centre, which included the Chemistry Laboratory, the Material Testing Institute, and the Military Headquarters' Photography Office, was born. The NBC Defence School, which specialises in the protection of the Defence Forces from NBC attack, was made part of the Research Centre in 1958, and quickly thereafter, a radiation department was set up within the Chemistry Laboratory. This laboratory was to play an important part in the development of Finnish radiation monitoring.

In the 1960's planning began with a view to concentrating all research in one location. One reason for this was that the location of the Chemistry Laboratory near the centre of the capital had a negative effect on its possible activities. The Physics Laboratory also suffered from both the lack of basic facilities and their impracticality.

By the end of the 1960s, the municipality of Ylöjärvi had been selected as the new location. In 1966, the state of Finland bought the discontinued copper-wolfram mine in Lakiala from Outokumpu Ltd. In the following year, the management of the Research Centre and the Physics Laboratory moved to Lakiala. In 1974, the name of the Institution was changed to the Defence Forces Research Centre, while the Explosives Laboratory moved from Harakka to Lakiala. The NBC Laboratory moved there a few years later with the remaining parts of the chemistry department finally relocating in 1988, when the appropriate facilities were ready. Harakka was then turned over to the cultural department of the city of Helsinki.

On the development of electro-technical research

From 1918 to 1925, responsibility for repairing the radio equipment of the Defence Forces lay with the workshop of the Radio Battalion in Katajanokka, Helsinki. In addition to equipment acquisitions, this workshop also undertook testing and design work.

In 1925, the Radio Laboratory was founded under the command of the Ministry of Defence, with the workshop of the Radio Battalion being attached to it. It was soon however turned into the Electronics Laboratory of the Defence Forces, the tasks of which included communications and electro-technical research work, testing and examinations. The Electronics Laboratory here continued to design and manufacture radio equipment for army use throughout the 1930s and 1940s.

The repair shops in the radio and electricity fields, which were set up during the war years, were made part of the Electronics Laboratory, while in 1945, the State Electronics Workshop, which functioned under the command of the Ministry of Defence, was formed. It repaired equipment damaged during the war. Because of the state of society, the State Electronics Workshop was transformed into the machine workshop of the Postal and Telegraph Services at the end of the 1940s.

Electro-technical repair and research activities in the Defence Forces did not end there, however. In 1949, a temporary radar repair shop was founded in Helsinki, which began repairing radar equipment received from Germany during the war or acquired as surplus goods from the United States after the War. The repair shop worked in close cooperation with the radio department of the Technical Research Centre of Finland. It received technical and expert support and specialised equipment from the Centre.

The Radar Repair Shop, working under the communications department of the Finnish Military Headquarters, was set up at the beginning of the 1950's. A few years later, it was transformed into the Electro-technical School. Barracks freed from the use of the border guards in Kivenlahti in Espoo were acquired to provide it with much needed facilities. The school included a testing station, which only began operating in 1959, when the Electro-technical School moved to Riihimäki. The testing station remained in Kivenlahti, where the development of electronics was closely followed and knowledge regarding electronic warfare increased.

In 1974, the name of the testing station changed, becoming the Electro-technical Research Centre. Its most important project at that time was the construction of the long-range radar network and the communications centres related to it. At the end of the 1970s, its most important projects included the development of radar equipment and systems for air control, which was also designed to serve the civil aviation industry. Later, in addition to air control, the automation of the Coast Guard's regional and command centres was undertaken. Additionally, many systems relating to field artillery and electronic warfare were brought into production.

On the last day of 1998, the National Defence Research Centre and the Electro-technical Research Centre were disbanded, with the Defence Forces Technical Research Centre being formed in their place.[2]

Text based on a Finnish article by Elisa Pääkkönen, Kirsi Träff and M. J. Mäkinen.

1.3.4 *Satakunta University of Applied Sciences* and its regional dimension

Interdisciplinary research and development activities are some of the basic tasks of the Satakunta University of Applied Sciences (SAMK). Such activities together with the institution's general educational task generate continuous regional effects. Processes aiming at having regional impacts are pursued in an increasingly integrated fashion, whereas previously the may have remained fragmented in their nature.

Satakunta University of Applied Sciences recognized from an early stage the importance of seeking to serve and develop the business life of its region. This has been developed in line with certain principles, such as the idea that research and development activities and education belong together. Moreover, when performing research and development activities benefiting the business community, the criterion for their competitiveness must be national, and preferably international, quality.

[2] More information regarding the research activities of the Defence Forces may be found in the following works: *Kemian vuodet Harakassa* by Erkki Päiväläinen, 1988, and *Puolustusvoimien Tutkimuskeskus* by Pentti Toivonen, 1994.

In developing such research and development activities, the development of both the staff and the activities base has been central. As the institution grew from the roots of the temporary polytechnic, activities were even then being designed in various teams, e.g. the R&D team. The goals of this team were numerous: finding and putting together new service products, projecting, developing services through research activities, taking advantage of interdisciplinary 'know-how' and integrating new experts into the activities. This was done in order to ensure the transmission of the latest information into teaching and to increase the institution's "critical mass". In analysing the research and development activities of polytechnic schools, the aforementioned phase can be recognized as part of the cumulative development process of polytechnic schools, with individual R&D projects and the development of commercialised products within the service sector (e.g. Terveyspiste Punaomena and the accredited calibration laboratory) as the baseline.

Through strengthening the expertise base, the transition into a project-based working mode was accomplished, and the importance of a strategic approach strengthened. In this context, it was necessary for the Satakunta University of Applied Sciences to have an active role in the strategic planning of the region and for it to be able to follow through with those strategies. The Satakunta Technology Strategy, the Satakunta Vision 2005/1020, the Satakunta Services Vision, the Satakunta Higher Education Institutions 2008 and Satakunta 2030 are all examples of visions and strategies in which the Satakunta University of Applied Sciences has taken part. The strategy of the Satakunta University of Applied Sciences may have affected the strategy of the region; while on the other hand, the strategy of the region may also have guided the strategy of the University. Thus a situation has been created, in which the Satakunta University of Applied Sciences is taking part in an organised fashion in further developing the liveliness and appeal of the region and in having a regional effect.

Focus areas of the research and development strategy of the Satakunta University of Applied Sciences, which was affirmed in January 2005, consist of both shared, as well as branch-specific focus areas within its three areas of operation. The University is at its best in ensuring the competitiveness of its region through education, research and entrepreneurship. The updated strategy is also a clear indicator of interdisciplinary work at its best, recognizing those changes that are happening in the surrounding society.

Charting the future requires continuous vigilance, controlling changes and evaluating processes, and the Satakunta University of Applied Sciences must then in its regional effect processes pay attention to the following perspectives:

- to help understand the working environment in which it is acting
- to support general agreements on research and development activities and to help define its own key technologies and key fields of expertise
- to facilitate the focusing of its own applied research and the development of its own competitiveness and profile
- to improve the "hit-to-miss" ratio of research and development activities and to accumulate expertise in selected fields of technology and expertise
- to help focus resources and investments in relevant projects

– to decrease the need for detailed guidance, to make easier the combining of applied research and teaching and to improve internal cooperation.

Achieving the status of "centre of excellence" in regional effectiveness and that of (twice) a "centre of quality" in education with the IBML training programme and with the Satakunta University of Applied Sciences entrepreneurship programme have been the crowning moments thus far in the University's results-based activities. Taking part in the JYVA process and taking advantage of the results are then a fundamental part of the societal responsibility and regional effectiveness of the Satakunta University of Applied Sciences.

Based on a Finnish text by Seppo Pynnä and Matti Lähdeniemi.

1.4 The experiences of VTT in impact assessment

The starting point for conducting the JYVA-project was the previous work done at VTT. In addition to undertaking general and unit-level evaluations, VTT has, since the late 1990s, systematically developed the impact and effectiveness evaluation practices of its R&D operations. This has been done through internal development projects (e.g. the VASKI task force), as well as through separate undertakings focusing in particular on VTT's impact from the client, stakeholder and societal points of view (e.g. Oksanen 2000). Here the strategic choices and set targets have been compared to the final benefits, effects and impacts identifiable among the clients and among the stakeholders more broadly.

Table 1 below presents a list of all VTT projects that have involved the evaluation of VTT's impacts and the development of evaluation practises and the framework for impact assessment of PROs. The framework was further elaborated and subsequently published in the handbook, "Evaluation of Public Research Organisations. Practices, experiences and challenges" (Kuitunen & Hyytinen 2004).

Table 1. VTT projects within Impact Assessment.

Project reviews	1997–2004	Public reports	VTT's role in the EU's framework programmes
The impact of VTT R&D activities	2001	Public research project	VTT's R&D projects (n = 162) economic impacts from the company partner perspective.
Perspectives on VTT's impact evaluation and monitoring activities	2001	Internal report	Procedures on monitoring evaluation activities. Indicators to assess VTT's impacts.
Impact monitoring and reporting in VTT. Recommendations for action.	2002	Internal report	Recommendation for assessing and monitoring VTT's impacts at the organisational level.
Societal impacts of VTT	2002	Public research report	The societal impacts of VTT's R&D activities on Finnish society and the activities through which VTT has its impact on society.
Regional role and impact of VTT	2003	Public research report	VTT's role and impact from the regional perspective.
Impact evaluation of public research organisations – practices, experiences and challenges	2004	Public research report	The motives, methodology, concepts of impact evaluation in public research organisations. Synthesises the experiences of VTT studies by presenting the dimensions and indicators of impact for public research organisations.
VTT Sfinno	2004	Public research report	VTT's significance and role on the different phases of the firm's innovation process.

On the one hand, these evaluative exercises have focused on the direct impacts and outcomes of VTT's own operations, such as spin-off companies, patent approvals, new certification services as well as scientific publications, while on the other, the evaluations have paid attention to VTT's societal impacts, i.e. the benefits produced for clients, industry and the community on a broader level, as well as those resulting in societal changes. Examples of such societal impacts include the use of expert input in decision-making, the success of companies that have acquired new patents, and VTT's role in promoting networking within the innovation sector, locally, nationally and in an international context.

It is nevertheless clear that the mere investigation of results, outcomes and impacts is not enough from the point of view of impact assessment. Impact assessment is also very much about comparing produced impacts with set objectives. (Nagarajan & Vanheukelen 1997, 71.) In VTT's case, impact assessment started from the in-house utilisation and development of expertise in this field, as well as in relation to clarifying the role and strategic position of the organisation within the national context.

2. New rationales for innovation policy-making

This chapter sets out the main arguments for policy intervention in innovative activities and the rationale for analysing societal impacts. Drawing on the recent literature on the contextual and societal influences of innovation policy rationales, we propose here to complement the market and system failure approach. This we do by adopting an "evidence-based decision-making" and "horizontal-driven innovation" approach, which are of relevance to reforming government organisations and to improving the efficient use of knowledge produced in public research organisations.

We thus argue that a paradigm shift may be occurring; namely that which places the societal impacts of R&D in a more systematic context and allows for the actors within these policy sectors and organisations to place their own strategic choices (and perhaps even more importantly the choices of their clients) on the line when it comes to using impact assessment as a tool in strategic policy-making. This entails a major change in understanding, managing and evaluating horizontal innovation across traditional sector boundaries.

2.1 The role of innovation policy

The issue of the rationale for public intervention in innovation systems has recently received increasing attention among scholars and practitioners (Koch et al. 2003, OECD 2001). The main questions here are those relating to why public intervention and government funding for R&D is needed, how innovation policies are implemented and what the major outputs and outcomes of such public activity are. To discuss the rationales, reasons and criteria of innovation policy design is however also very much a question of the division of labour between the actions and operations of private firms and public organisations.

Policy-makers often evoke notions of "market failure" or "system failure" when seeking to justify their innovation policy interventions. The traditional "market failure" legitimacy for national policy-making and related public R&D funding in innovation is based on the perceived existence of imperfect markets

(companies under-invest in R&D because of the high risks and costs), the promotion of competitiveness contributing to economic growth and welfare, and also on government and system failures innovation. According to these "system failure" arguments, the goal of public R&D is to create an infrastructure and to compensate for wider market failures. The role of public intervention is to facilitate competence building, coordinating the activities and dynamics of innovation structures.

The practical legitimacy from granting public research funding thus comes from a realisation of the socio-economic benefits emerging from public research investments. Table 2 below summarises some of the issues relating to the present-day approaches and their relationship to the study of impact assessment.

Table 2. Intervention rationales.

Policy priority/market failure based intervention *rationale*	**Content**	**Relation to the socio-economic impact assessment study**
Market failure in socio-economic problem-solving	Areas where important public goods are produced, e.g. health-care, environmental protection, defence, education, research…	Main focus of the activities funded through public intervention, seen as nationally strategic areas of innovation activity
Infrastructure development needs	Areas where important public goods require infrastructure that does not have private actors sufficiently involved, e.g. transport, energy, science and research…	Only indirectly relevant
Science and innovation infrastructure for equal access to higher education	As above, but also maintenance and financing of "innovation system" supporting education, basic or fundamental research or (re-) training	Particularly relevant for the polytechnics, through (re-) training and R&D in more peripheral (both geographically and in terms of the research content)
Necessary long-term perspective	Areas with imperfect markets and a longer time-perspective than in business activity, e.g. environmental and sustainability issues	Of particular relevance, also because the societal impacts are necessary discernible only in the long-term perspective
Critical mass	Research areas where exceptionally large infrastructure required (e.g. aeronautics, space research, some areas of environment)	In some testing activities relevant for the R&D organisations involved
Welfare through competitiveness	Boosting economic growth in order to boost national competitiveness and by extension improving employment, social welfare etc.	Particularly relevant in the area of service innovation and new business activities related to this
Promoting SMEs	Majority of businesses are SMEs and they have limited R&D resources and flexibility required for risk-taking. Due to the centrality of SMEs in national business systems however they also provide a certain legitimacy to public interventions that support them and are seen as part of creating a "business friendly environment"	Horizontal theme relevant throughout the innovation area, of particular relevance for the polytechnics, also for the rural entrepreneurship in the agriculture and food sector

(Based on Loikkanen & Kutinlahti 2005, 5.)

Although the performance and effectiveness of policy interventions are widely evaluated, these intervention approaches often fail to tackle the broader societal impacts and the cognitive interactions, the division of labour between private and public actors and also the interaction between different actors and functions, in respect of innovation systems. In addition to the characteristics of the system and its constituent parts, attention is also increasingly being paid to the cognate processes by which the information is processed, communicated, and shared understandings created. Here the communities of practice perspectives are crucial, in addition to the more mainstream innovation systems analysis (e.g. Edquist & Johnson 1997 and Malerba 2004). Communities of practice are perhaps more successful in addressing the critical role of actors that share common functions while situated in different organizations for effectively interacting in knowledge production, and their "sense-making functions" are crucial to renewing the understandings related to innovation. (See for instance Gustafsson & Autio 2006.) These perspectives have also emerged as clear areas for further research in relation to the IA practice.

The framework in Figure 1 illustrates the main phases of innovation policy-making. Innovation policy-making is based on (1) the definition of rationale(s) of public intervention for innovation (why public policy is needed), (2) the formulation of policy strategy with a consequent action plan or government programme (what policies are implemented), (3) the implementation of policy by applying different policy instrument and measures (how policies are implemented?), the assessment of socio-economic impacts of policies and policy measures (what are the outcomes).

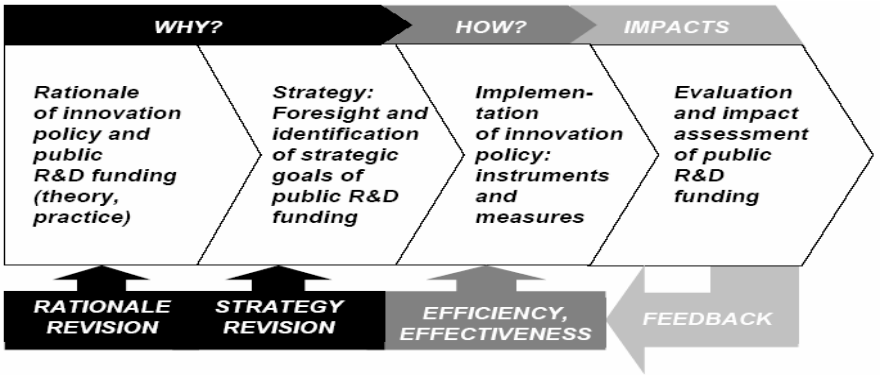


Figure 1. Innovation policy-making framework (Loikkanen & Kutinlahti 2005).

While the focus in assessing the implementation of public policies has been on evaluating the intended and direct effects and effectiveness of public actions, impact assessment aims at focusing on intended and unintended consequences within different timelines (short term, mid term, long term). The feedback loops of impact assessment provide new information on the relevance and appropriateness of policies. Impact assessment may thus generate new information essential to developing different phases of policy-making; revising the rationale, determining an overall financial scheme for R&D and establishing more concrete guidelines for R&D and innovation.

2.2 Motivations for evaluating societal impacts

There are a variety of motivations for evaluating public interventions within the R&D sector, be it programmes, policies or organisations. These reasons and motives can in the main be classified as either external or internal (cf. Mickwitz 2002):

1. External motives originate from factors such as result-driven planning, a weakening economic climate or the general shift to a more service-oriented culture.
2. Internal motives include the need to develop the ability to develop one's own activity, programmes and organisations.

Of the external motives, the most important are clearly the demand for results and increased effectiveness, as well as accountability and transparency, thereby merging different and at times even contradictory influences from the private and public sectors. The influence of the New Public Management "philosophy" is also pervasive and widely documented; though it tends to take different forms depending on the national culture and the administrative traditions in place. In some cases the emergence of an "accountability agenda" has been associated with the continuing expansion of the public sector, resulting in a growing tax burden, as well as in a deterioration in the general economic climate. In countries with a still extensive and interventionist public sector, such as those in the Nordic area, this has become an issue of some importance.

In addition to reasons of accountability and transparency, evaluations are also often undertaken to justify policy already made and actions already taken, and

thus can have a legitimating function. Evaluation information and results are often needed to prove that policy and policy measures have been correct or to indicate that policies need to be changed. Evaluation is thus both about empowerment and about responding to external pressures and needs. The equation works in both directions here, as government departments can also utilise the impacts of the research activities under their auspices as an indication of their own societal relevance or even more so as an indication of the centrality of their sector within the wider societal or international context.

The spread of a results-driven culture and management by results has popularised the viewpoint that scarce resources are channelled to where they offer the best rewards. With the curtailment of the size of the public sector and research funding, it has increasingly become clear that publicly funded R&D spending must be shown to be beneficial and justified as a good investment (Georghiou 1998, 37). This has also entailed a specific challenge in respect of legitimacy maintenance for publicly funded research organisations: how do we justify the public investments made on our activity in a situation where resources are increasingly scarce and investing in the R&D sector in mainly seen as the responsibility of the private sector?

The external motives of evaluation activity do not, however, solely derive from the requirement for the necessary burden-of-proof of effectiveness, efficiency and accountability. R&D organisations are increasingly under inspection also due to other trends, such as the emergence of a stronger service-oriented culture and the fostering of a client-based perspective within the public sector. The public sector, too, has discovered that it should adopt practices and operating methods that pay due attention to client service and thus better cater to the needs of a more clearly identifiable client-base. In the case of at least partly publicly financed R&D organisations, questions such as, who is the client, how are different client relationships maintained and serviced and how are new clients and their needs identified, have thus become all important. While public financing traditionally implied a clear ownership/client perspective, this is no longer the case, and as such, R&D organisations across the board need to identify external financing sources, as well as legitimising their role in society and in the innovation system through the development of a broader client-base, thus not only servicing their "owners" in terms of the government departments in question. Financing is increasingly competitively allocated and even when a

certain percentage comes directly from the government this does not imply that the research activity should solely benefit this department, rather the broader societal environment is increasingly included as the "final beneficiary" of all types of R&D activity.

The internal motives for evaluation activity essentially relate to the need to develop R&D operations and organisations. For example, certain policy instruments have been used in connection with R&D activities for such a long time that it is possible to look back and learn from these experiences, identifying areas for further development. Evaluations can also help decision-makers identify sources of competitive advantage as well as areas where public funding can stabilise market fluctuations. (Venetoklis 2002, 5.) One of the most central internal motivations for impact assessment is connected to the need to develop the organisation, its expertise-base and its learning capacity in line with the new challenges identified in its working environment. Thus a cyclical model of learning from previous experience, mistakes and successes, as well as making this learning process systematic, is needed. This model builds on a continuous assessment cycle, with self-evaluation and monitoring of the R&D activities undertaken thus contributing to the systematic identification of needs and tensions within the organisation and its environment. It also helps the organisation and its management to take difficult strategic choices and to better prioritise. Thus evaluation and impact assessment are not ends in themselves, but are rather instrumental to developing practice that is indicative of accountable management and good governance, as well as having societal benefits for a broader set of stakeholders.

Yet what we also argue is that at any given time these impacts may be elusive at best, as well as being both contradictory and mutually exclusive, which makes the task of co-ordinating sector policy goals even more critical. In the Finnish case, the default answer here has been "management by programming", be it under broader policy themes (participation, Information Society, and productivity are among the most often highlighted themes of cross-sector governmental programmes) or within technology development (the programme structure of the main technology financing organisation Tekes (Finnish Funding Agency for Technology and Innovation), which encompasses at any one time over 20 programmes seeking to promote technology development and applications under industry-specific themes. The pros and cons of this model are

discussed and assessed as a means of utilising the information gained through organisational learning processes such as those described in the context of the cross-sectoral project reported here.

The challenge of facilitating positive societal impacts on innovation ability are seen as particularly acute in light of the longitudinal patterns involved and the patience that this necessarily requires from researchers, funding organisations and policy-makers. The issues surrounding the learning processes required and the organisational learning involved are also particularly acute, in light of the need to identify the impact chains that often do not respect organisational or sectoral boundaries. This type of learning is often hampered however by the organisational inertia of public institutions and traditional sector-boundaries, which remain difficult to transcend.

It might very well be that the desire for more rational ("evidence-based") decision-making, (i.e. based on costs and benefits), is also at work in the background. It has been argued that the growing demand for impact and effectiveness evaluations is generally attributable to the above-mentioned factors (Wimbush & Watson 2002, 302).

2.3 "Management by results" and "evidence-based decision making"

"Management by results" and "evidence-based decision-making" have in recent years become buzzwords in public sector management, in Finland as elsewhere. Establishing practices, measures and indicators for societal impacts and interaction have been developed ever since the 1980s, when public sector effectiveness and accountability became core themes of "good governance" (e.g. Tiihonen 2004) in the national innovation sphere.

This has also had repercussions on the public management cultures and practices in the field of R&D, in particular in countries such as Finland where the public sector plays an active role in this area. Influences from international organisations (the OECD in particular; e.g. OECD, 1997, "Issues in the Evaluation of Innovation and Technology Policy in the OECD"), as well as governments and even domestic stakeholders have gradually steered Finland

towards an extensive reform of its budgetary and accounting practices within government. This reform has included new evaluation practices and methodologies for government R&D programmes and interventions across the OECD. In the United States, the enforcement of the Government Performance and Results Act of 1993 (GPRA) has driven the federal R&D programmes to evaluate their performance and this has also had an influence on the management and budgeting of current and future R&D investment. There is undoubtedly a relatively extensive universal consensus, that the best way to develop policy is by using academically reliable research and independent and critical public scrutiny as a basis for decision-making and policy-development. Divergent views however exist in respect of the values and normative connotations associated with research. Even the most optimistic positivist would probably agree that within the social sciences, truth is indeed relative, while a number of sources of knowledge are available using valid methods that do not necessarily point to the same policy implications. The New Public Management inspired optimism associated with "evidence based policy" is thus at times criticised for its lack of history and context (e.g. Davies & Nutley 2001, 86). As professional practice is usually heavily contingent on both local and institutionally determined client needs and local contexts, "health warnings" may thus be required.

The objectives of "management-by-results" have consisted of seeking to improve the accountability and performance liability of the Government and of its subordinated agencies and institutions, to render performance management more effective and to ensure that information is made widely available concerning central government finances, administration and effectiveness (Pöysti et al. 2003, 8). For the purposes of establishing performance targets and of reporting on the effects of an activity the basic criteria of effectiveness should be defined in law in new terms. In steering and guidance and in reporting a clear distinction should be made between, on the one hand, extensive social impacts (outcomes) and on the other, the direct operative effects (outputs), which can be achieved by the management of an agency, an institution or some other activity. Social impact, operative efficiency, quality management and the management of human resources should constitute the elements of effectiveness. (Ibid.) These pressures have entailed a renewed role for the Ministries, whose responsibility has been strengthened as managers of their respective administrative branches and policy sectors and as the bodies implementing the performance liability in

practice. For the Ministries this has entailed a renewed concern with transparency and accountability as to the sector organisations, including publicly funded research organisations under their responsibility. Each government department has been only too acutely aware of the need to show results and impacts across their entire sector and to make visible the links and connections that exist (and should been promoted) both between organisations in any given sector, as well as across sector boundaries.

2.4 Horizontal innovation policy

Despite the increasing internationalisation of R&D, the domestic governance of innovation and technology development maintains a range of instruments at its disposal, from the vertical to the horizontal level, and from control to inducement. The cases we present here are typical or representative of both extremes, as they reflect the governmental steering functions through the new more results-based auditing and monitoring practices, as well as reflecting voluntary and organisationally based modes of inducement (innovation through internal motivational factors) and culture-building (accountability as a motivational factor for the R&D organisations and their staff). The fact that we emphasise the need to avoid a mechanistic way of implementing the new accountability practices across the Finnish R&D sectors and seek also to identify ways in which societal impacts can be developed as a means of improving R&D working environments needs however to be emphasised here.

The change in steering, management and public sector rationales is evident within innovation activities and the policies that seek to influence them. The re-drawing of boundaries between previously relatively well delineated science and technology policy (sectoral, institutionally determined) and innovation policy (cross-sectoral, problem-based) is a political debate where the boundaries are both conceptually, functionally and institutionally shifting. Despite the assumed horizontalisation of innovation, a strong reliance remains on sectoral resources in the R&D sector, as has become apparent in the analysis undertaken in connection with the policy areas included in our study. A brief summary of the key dimensions of industrial specialisation and role of the policy sectors represented by the PROs participating in this study is provided in Table 3 below.

Table 3. Relevant policy sectors with R&D organisations included in the study: some key aspects.

	Institutional specialisation	**Industrial specialisation**	**National innovation (policy) systems**
Innovation policy sector	Horizontal policy area, key role for the intermediary institutions, Administratively multi-/cross-sector	Horizontal concerns, innovation increasingly promoted through interaction at the interfaces rather than within branch-specific and disciplinary sectors	From correcting market failure to a more pro-active and targeted policy approach, "national agenda for innovation"
Trade and industry sector	Trade and industry, increasingly equated with innovation (and thus increasingly linked to other policy sectors, in particular research and education)	Traditionally central clusters with high R&D intensity including ICT, paper and machinery, energy, but also less branch-specific new innovation sectors such as KIBS	Key instruments within its disposal, e.g. Tekes with its technology programmes, agenda-setting organisations such as the national science and technology council
Defence and security sector	Tradition of closed systems and self-deficiency	Increasingly competitive and varied industrial sector, predominately small-business dominated, traditionally relatively low R&D intensity	Increasing interaction with the whole innovation system, though still the stable prioritised national client-base
Agriculture and food production	Ministry of Agriculture and Forestry central, the R&D side more varies with a wide range of institutions of relevance, more interaction and interfaces vis-à-vis more societal (environmental or consumer issues), though also trade and industry etc.	From traditional protectionism and strategic national production to a more open market-orientation and emphasis on quality, food safety and client-perspective as elements of competitiveness	One of the nationally prioritised key clusters

Table 3. Continues…

Higher education sector	Institutionally, Ministry of Education in a leading role within education in particular, research more varied with the sector institutions playing a part Educational institutions not traditionally particularly specialised – universal, publicly funded and regionally based university system, polytechnics since the late-1990s Increasing debate on the need to specialise and concentrate the resource-base	In most cases not a particularly clearly articulated connection to the industrial system/structure. Some exceptions (polytechnics with a close connection to local business community, emphasis on societal interaction and "third task")	Strategically key role for the universities through academic research, though within the R&D sector applied research institutions and business R&D more central within the innovation system Financially external funding and commercialisation late-comers
Environment (and sustainable development)	Ministry of the Environment with its own decentralised structure of research centres and regional authorities	Industrially not particularly central, though through the increased attention on horizontal connections, increased expectations and involvement, also in business innovation through new energy sources and innovation processes	Horizontal role, increasing potential though lack of "ownership" within the national innovation system (?)

The necessity of sharpening the strategic focus and the need for increased specialisation are issues of relevance for the emergence of IA thinking, but also for clarifying the role of the various R&D organisations in both national and regional innovation systems. How these changes relate to the development of IA methodologies and practice is the issue for discussion in the next section.

3. Framework for analysing societal impacts

This chapter introduces the framework of and concepts used in analysing societal impacts based on previous studies (e.g. Kuitunen & Hyytinen 2004) and the handbook on performance management produced by the Ministry of Finance. The framework presented in this chapter formed guidelines for developing IA tools in JYVA-organisations.

3.1 Concepts of societal impacts

The concept of "effectiveness", its impact and their systematic evaluation has been previously outlined in the handbook on impact evaluation (Kuitunen & Hyytinen 2004). This aimed to set out the conceptual framework for the Finnish context of impact evaluation, while providing some conceptual and theoretical inspiration from international sources. The contested nature and the definitional gaps were discussed, while some of the basic concepts of a less contested nature were outlined within the context of a systematic framework. A number of rather straightforward analytical dimensions relating to evaluation practice more generally exist however that can be usefully highlighted here. The evaluation of R&D activity makes use of the same basic concepts as evaluation activity in general. These are output, outcome, impact and effectiveness. It is clear that the borderlines between these concepts and their contents are not absolute, but rather are flexible. Nevertheless, they are often inconsistently or wrongly used. It is common, for example, to regard impact and effectiveness as interchangeable. The concepts, and their contents, are further delineated below.

1) Output: the concrete outcome, or research result, of a research undertaking
2) Outcome: the concrete products arising from the research result, e.g. a research report describing project outcomes
3) Impact: the products, events, conditions and/or changes that follow from the direct outcomes, and prior R&D impacts

4) Effects/effectiveness: broad, general societal changes that indicate, for example, the extent to which the impacts of a programme, policy or organisation have promoted the achievement of set goals, either general or specific (Nagarajan & Vanheukelen 1997, 71).

Figure 2 uses an example to illustrate the similarities and differences between the term effectiveness and terms closely related to it.

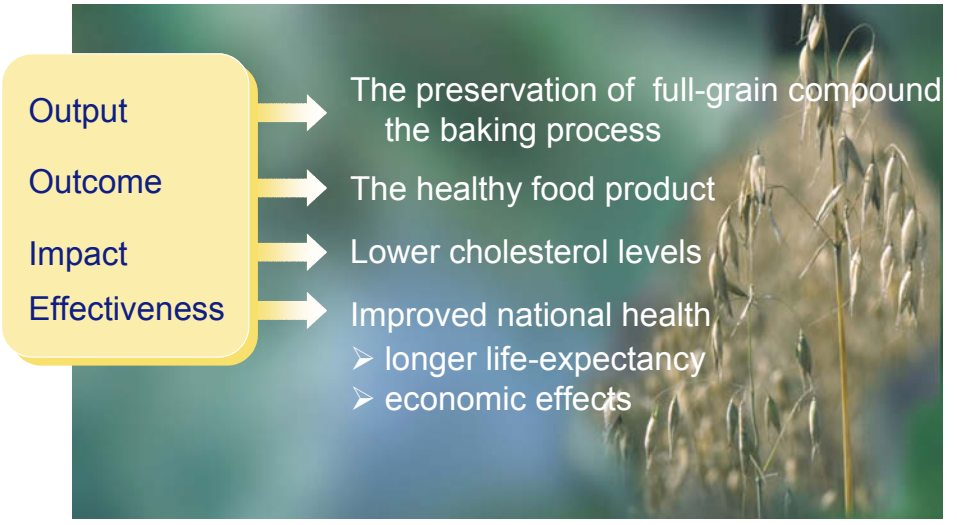


Figure 2. Exemplifying the impact chain of research.

In addition to differentiating between output, outcome, impact and effectiveness, another dimension for analysis is that of temporal scale. We can thus differentiate between immediate, intermediate and ultimate outcomes. This indicates the temporal expectation in achieving impacts, i.e. the expected time required for the achievement of impact and effectiveness. (See Figure 3.)

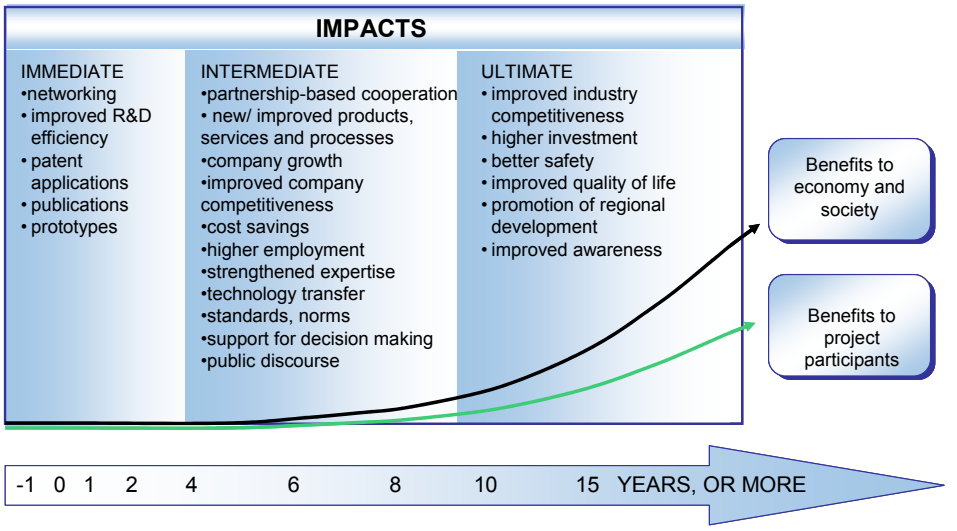
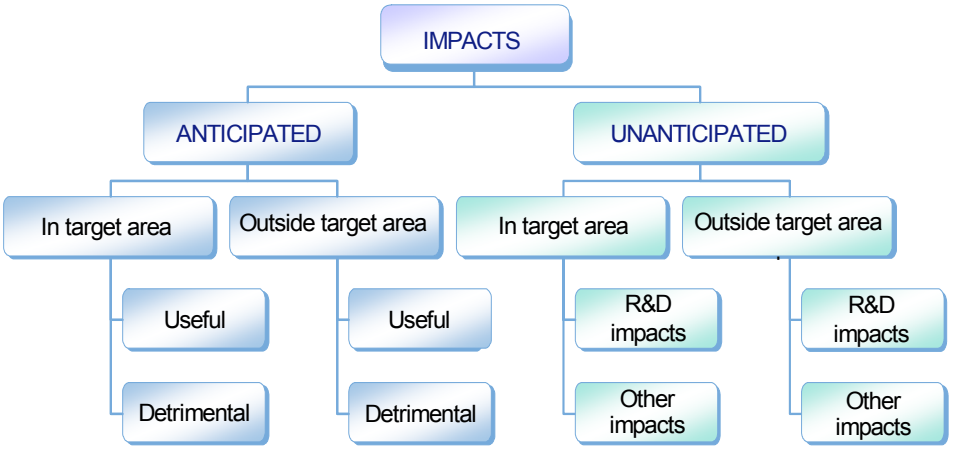


Figure 3. Expected time perspective of impacts.

Impact and effectiveness evaluation differs from goal achievement evaluation in that the latter does not take into account those side effects or unanticipated effects that a programme or organisation, or similar, may have. Goal achievement evaluation moreover does not take into account the relevance of objectives or the costs arising from the activity. In this light, it is useful to divide impacts as follows:

- anticipated and unanticipated
- inside and outside the target area (or relevant or irrelevant)
- productive and detrimental (or neutral in impact).

Using the above categorisation, R&D activities or policies can be classified as presented in Figure 4.



(Mickwitz 2004)

Figure 4. Types of impacts according to degree of expectation and target area.

3.2 Model of performance management as defined by the Ministry of Finance

The control of public research organisations is today undertaken according to the principles of the performance management model. The objective of performance management is to clarify the roles and functions of actors within the system. The aim here is to strengthen the linkages between strategic management, including the management of expertise and resource development, and resource allocation. Different kinds of procedures have been developed to enable the embedding of this new model takes place as part of the performance management system as a whole.

As part of the model, basic criteria for performance have been redefined and included in legislation. These basic concepts of performance management make a distinction between policy effectiveness (as "societal impacts"), which is broader and operational performance, which the management of a government agency and institutions can influence directly. Operational performance has been divided into three basic criteria: operational efficiency, outputs and quality management; and management and development of human resources. Thus the basic concepts of performance used to evaluate and report on public-sector operations involve four basic criteria: policy effectiveness (or societal impacts),

operational efficiency, outputs and quality management, and the management of human resources. Figure 5 presents the basic performance criteria outlined by the Ministry of Finance.

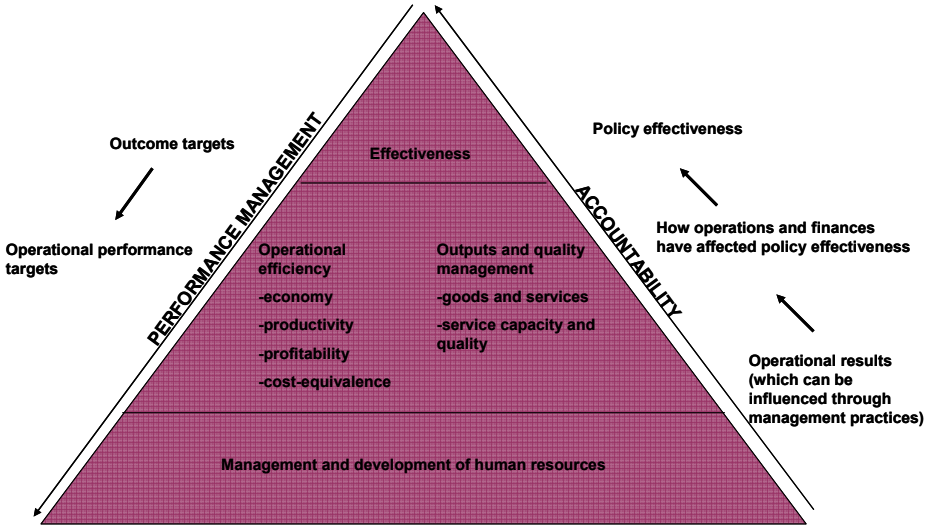


Figure 5. The prism of performance management.

The limitations of this model have been discussed; e.g. in relation to functionality and the suitability of the model as a control element of the organisations in general, and of R&D activity in particular. The most detailed applications for defining the policy objectives and measuring the outputs have been perceived as overly detailed and biased. (Salminen 2005.) In assessing the question of operational efficiency and policy effectiveness there are differences between these two approaches, e.g. in relation to their timeframes. Operational efficiency can be measured annually, while impacts and societal benefits normally only appear within the context of a longer timescale. In order to set broader policy objectives and strategies we need other kinds of information than that provided by the indicators selected for measuring operational efficiency.

Performance management also provides insufficient tools for assessing and illustrating the impacts and benefits of R&D. This is due to the fact that it does not pay any attention to the nature of strategic development at the level of the R&D organisations or within government departments. Indicators for assessing input and output, used to assess achieved goals, rarely pay attention to the

unexpected impacts, or to impacts beyond the target area. Another weakness in relation to performance management is that operational performance targets may become too strictly limited to the sectors, thus preventing cooperation and increase unnecessary competition between different administrative sectors, each reporting performance in their own sphere of activity.

Policy effectiveness (as assessed in societal impacts) forms the basis for operational target-setting within the public institutions, which are expected to report their societal impacts. One important issue here is the division of tasks at the policy sector level, the main question being, who is responsible for promoting policy effectiveness and whose "value added" is then reported? It may be challenging or even unrealistic for an individual organisation at the organisational level to communicate its policy effectiveness because the target of policy effectiveness relates to broad societal issues at the governmental programme level. Individual organisations and authorities can however contribute to overall policy effectiveness through their own operations and by achieving their own objectives (specified in terms of performance management control). The main point to emphasize here then is that individual PROs may improve their policy effectiveness by linking their organisational targets to overall policy targets. In the Ministry of Finance model, individual organisations are responsible for outcomes and impacts, as they relate to their own strategies, while the main responsibility for improving policy effectiveness lies at the sector ministry or governmental level. In this new model of performance management the divided responsibilities concerning policy effectiveness (societal impacts) have been specified between PROs and their owners (Ministries). In Table 4 we illustrate the diverse responsibilities and roles of different actors in producing and communicating their impacts. The typology is based on the new model of performance management, as well as on the experiences of the JYVA-project.

Table 4. Policy impact roles.

Government platform and other national policy objectives o Promoting the "common good" and producing "public goods" o Linking the sector-specific targets to broad policy target in the society as a whole (e.g. by policy programmes or other horizontal policy tools)
Ministries o Promoting the sectoral policy targets o Setting the strategic focus/objective for the sectoral organisations
Public research organisations o Promoting the effectiveness "by doing the right things" o Impacting on their own policy sector and its various stakeholders

Summing up the previous conceptions on the terminology of IA then, and taking into account both the rationale discussion in the previous chapter and the experiences of the JYVA-project as a whole, Table 5 presents the key elements of the conceptual framework relating to societal impacts and how R&D organisations go about evaluating it.

Table 5. Identifying change and its sources and directions.

Doing the "right things", as identified based on the targets and goals set by the organisation itself, as well as by those programmes, projects and institutions which it has committed itself to, while effectiveness is doing things "correctly".
Achieving goals and satisfying needs, with goals and targets based on the strategic goal-setting of an institution/organisation/policy intervention as the point of departure.
The achievement of both positive and negative impacts, as well as expected and unintended effects and impacts, also including impacts that may hinder the achievement of positive impacts in the future.
The achievement of impacts within and outside the target area (and the ability to steer these).
The achievement of effects and impacts among the client groups and in respect of the wider society. In our view the achievement of societal impacts is seen as being dependent of the ability to satisfy or meet the needs of the customer base: the ability to meet clients' needs, expectations and objectives is the initial step to achieving societal effects and impacts.
Identifying and clarifying the division of labour between public and private actors. Here the question of the function, role and value added of each of these within the innovation process is of interest.
Clarifying the roles concerning performance management. Ministries are in charge of collecting and communicating information about impacts on the level of sectoral policy targets, whereas PROs can collect impact information on specific policy targets, as they relate to their strategies.

Instead of using the term "effectiveness" we suggest instead "impact" as meaning outcomes at organisational level while also using "societal impacts" meaning broader, cumulative and sectoral outcomes (i.e. at ministerial, governmental and national level).

3.3 Evaluation steps

Consideration of the various evaluation steps allows us to better assess the different questions that need to be answered along the way, within the context of making choices as to what kind of indicators to use, what elements to monitor

etc., in order to best reach an understanding of our core activities, with the most important expected impacts being the essence of the strategic management of any R&D organisation (Table 6).

Table 6. Steps in an evaluation process (Kuitunen & Hyytinen 2004).

1) The setting and definition of evaluation objectives • Why is the evaluation being made? Why do we need it? • Who and whose needs are intended to serve by the evaluation? Who sets the evaluation goals and needs? • What questions does the evaluation seek to answer? • Who is doing the evaluation?
2) Choice of evaluation methods • What points of view guide the choice of methods? • How will the evaluation data be collected? • With what methods will the evaluation data be analysed?
3) Specification of goals of the policy, programme, organisation or similar to be evaluated? • What are the basic tasks of the policy, programme or similar? Who defines them? • What does the policy, programme, organisation or similar aim to achieve? What assumptions can be formulated from these objectives?
4) Identification of the evaluation target's impact and effectiveness mechanisms • What makes the policy, programme, organisation or similar function? • What are the presumed key effects of the policy, programme, organisation or similar? • What other effects are to be anticipated, e.g. intended and unintended, positive and negative, relevant and irrelevant? • To what extent are there differences among actors in different sectors, e.g. research, technology and industry sectors, with regard to impacts and impact mechanisms? • How, and through what mechanisms, are the impacts expected to arise? • What factors enable, and hinder, the achievement of impacts?
5) Identification of contextual issues • What contextual factors enable and hinder the achievement of impacts? What hypotheses can be derived from these? • How do external conditions and the environment (e.g. the existing innovation environment, policies, cooperation, infrastructure, funding) affect the production of impacts?

6) Reviewing objectives in relation to observed impacts • To what extent do observed impacts relate to the objectives of the evaluated policy, programme, organisation or similar? • What is required in order to improve the complementarity between the objectives and impacts?
7) Utilisation of evaluation information in setting the goals and future needs • Are evaluations and their findings utilised? • Who makes use of evaluations and their findings? • How, and by what means, are evaluation results utilised? • Why and for what purposes are evaluations and their results utilised? • What factors hinder the use of evaluation findings? What factors promote their use? • Is the future perspective taken into account sufficiently when completing evaluations? • Do evaluations help to delineate and direct future actions, policies, operating strategies, programmes or similar? • How are evaluations utilised in the formulation of future scenarios and strategic planning?

These steps entail various challenges, some of which are outlined in Table 7.

Table 7. Challenges of evaluation.

Challenges during the process stages	**How to meet the challenges**
Setting of evaluation objectives	Determine what kinds of questions the evaluation seeks to answer. Also determine for whom, and for what purpose the evaluation is being produced (important for communicating).
Choice of evaluation method	Choose the methods of the evaluation. Use a variety of source materials and methods – triangulation is the ideal in impact assessment. While quantitative indicators are often called for, being economical and easily comparable in nature, in some cases it is more informative and useful to assess the impacts qualitatively instead of artificially transforming them into quantitative indicators and indices.
Determining the organisation's tasks and operating goals	Begin with the official, jointly agreed upon goals, expressed in the organisation's mission and other relevant strategic documents. Investigate stakeholder conceptions and interpretations of the organisation's basic tasks, their changes over time, etc.
Identifying the organisation's causal mechanisms	Investigate the relevant stakeholder perceptions (e.g. interviews) and by using this information and official documents, formulate a hypothetical impact model that includes impact dynamics, and factors that are likely to enable and inhibit the achievement of such impacts. Determine the timeframe through which impacts can be charted and analysed. Impacts usually become apparent only in the long-term: annual result objectives do not necessarily tell the whole truth about the success and impact of operations. The prerequisites for the achievement of impacts and effectiveness can be studied in the short-term, however.
Identifying the contextual factors	Identify factors outside the organisation that may affect the organisation's impact (e.g. intervening variables in the form of impacts of other organisations, the effects of cooperation, time lags...).
Reviewing objectives in relation to impacts	Investigate impacts and effectiveness from diverse angles. Focus on the most salient and crucial impacts, which can also be investigated in practice. Investigate impacts by sector, e.g. by technology or industrial sector.
Utilisation of impact evaluation and addressing the future	Identify the groups that will receive evaluation reports. Choose the tools and methods via which evaluation results will be communicated to the different target groups. Identify the benefits of the evaluation with future policy measures, programmes etc., in mind: determine how the evaluation can contribute to further action, strategic planning and development etc.

This model is largely generic, i.e. applicable to all impact assessments. There are however a number of challenges that are specific to the societal impact evaluation of R&D, which provide us, as researchers and evaluators, with challenges, but are also indicative of the challenges that these R&D organisations and their staff face in their daily work. Here also the question of how different organisations may participate in evaluation activities may be of relevance. Some of these dimensions have been further elaborated in Chapter 4.

3.4 Selecting the indicators

It is possible to illustrate the impacts and benefits that R&D generates in different ways. The most important thing is to find the means and the indicators that are most appropriate to illustrate both the achievement of objectives and the shifting demands that emerge from the environment. For the purposes of both brevity and clarity this can be reduced to the statement that *prioritising the indicators is essential for achieving comprehensive and clear picture of the impacts and benefits*. The indicators should be carefully and economically selected (i.e. limited number of indicators, in order to avoid over-stretching the resources available for gathering and monitoring of the information). Indicators are intended to assess the most central strategic objectives and should therefore be re-assessed when strategies are renewed. Indicators can be qualitative or quantitative. They can be (1) permanent and constant or (2) varying indicators or a combination of the two. It is important also that they are transparent and verifiable across time.

No matter what the indicators selected, undertaking an impact assessment requires systematic data collection, which provides measurable information on results. Particularly when measuring abstract and opinion-based information, continuous measuring, e.g. with time series, is necessary. With exact and quantitative information, cross-sectional measuring results can provide better data for impact assessment than abstract information, although it also requires continuous measuring. These circumstances can be observed in the following examples:

Example 1. A research organisation wants to measure how their research projects benefit their customers. After the finalisation of the project in question, the organisation sends a survey to their customers, focussing on the 'value added' effects of their cognitive resources (knowledge and expertise) i.e. asking

what were the benefits of the actual expertise and knowledge of the organisation. The customers provide an estimate e.g. within a 1–5 scale. From the given estimates it is possible to count an average (e.g. 3.5), which illustrates the assessed impacts of the research organisation in knowledge creation. While the figure may seem random out of context, this type of information is accumulated as all projects are contacted in a similar fashion. On the other hand, this indicator does not indicate the significance of this new knowledge, or the specific role of the research organisation in generating this knowledge, or how significant this knowledge increase was compared to inputs. Still, when the measuring result is compared to previous results with time scales, it provides a window into the ways in which the knowledge creation process is, in the long run, influenced in the projects carried out by the research organisations.

Example 2. A research organisation wants to measure the impacts of their projects on employment – after the ending of the project, the organisation enquires from their customers: how many employees did the customer hire as a consequence of the research results? According to information received from the customers, the research organisation can indicate that they have increased overall employment e.g. 20 persons annually by their actions. This cross-sectional information illustrates well the positive impacts that the research organisation generates but when this information is gathered continuously, it is possible to gain a better picture of the development and direction of the emerging impacts.

Often however simple numeric measurement does not in itself give an adequate picture of the impacts and benefits. Naturally there are also many opportunities for manipulation, e.g. when selecting the indicators, determining the scales and reporting the results etc. One of the characteristics of research activities is that the results and impacts often cannot be ascertained and measured simply by numeric indicators. Accordingly, utilising qualitative and descriptive information alongside numeric data is necessary when seeking to illustrate the impacts and overall effectiveness of the activities of R&D organisations. Information on research projects, research results and the benefits gained from it can be communicated in different medias e.g. in annual reports, exhibitions, customer magazines, journals and so on. Reporting the "success stories" (e.g. successfully commercialised product) is another way in which an organisation can illustrate its positive impacts to customers and to society at large.

Another relevant issue in impact assessment concerns the question of to whom this information is targeted, who is utilising it, and with whom are the means and the indicators for assessing the impacts defined beforehand. The owner of the public research organisation (e.g. the Ministry) can often have very different opinions on the assessment indicators and objectives that the organisation itself. The present *management-by-results* practise in Finland requires research organisations to annually report primarily on output-related matters and other aspects related to operational efficiency. These aspects do not however pay attention to the long-term characteristics of research activities. As such, the steering organisation is not necessarily interested in the information gathered via abstract indicators, while the effectiveness of the research activity itself is more or less based on abstract results (e.g. knowledge creation). Therefore it is important to interpret the information from the perspective of the organisation's own strategy. A research organisation can produce information on the impact assessment in question by developing its own methods and indicators which can help to illustrate in a more realistic fashion the impacts and benefits it generates. It can then use this to communicate this information within its own organisation, as well as communicating it to its customers, owners, stakeholders and other relevant actors, thereby ensuring its own continuing legitimisation. With this discussion it can affect the attitudes and feelings that the organisation itself and the relevant actors in the operational environment have on the organisation's objectives, and the actions and changes needed to meet these objectives.

Impact assessment and the information it produces can also be used as an organisational management tool. As noted previously, impact assessment is about assessing the generated impacts and comparing them to set objectives. When the indicators are set to follow the objectives and after the data is collected, it is possible to examine its analogy to the set objectives. If some disparities between the realised impacts and objectives are detected, this usually illustrates how to re-direct the organisation's actions in the future. Therefore the assessment information functions as a learning tool; it reveals the operational areas where it is doing the right things and the areas it should be more closely focusing on in the future.

Adopting the impact assessment methods and utilising them in the organisational management of an institution also has positive outward effects, particularly in the eyes of the owner. Showing that the organisation is systematically assessing the impacts it generates thus gives a certain strategic and operational freedom to its actions.

3.5 Dissemination and utilisation of information generated by impact assessment

How evaluation information is used utilised can be categorised into three basic types of use. These are the instrumental, conceptual and political. (Cf. Leviton & Hughes 1981, 525–548.)

Table 8. The utilisation of evaluation information: types of use, purposes of use and examples.

Type of use	Purpose of use	Examples	Examples of users and user situation from the perspective of R&D
Instrumental	– Straightforward and planned use of evaluation information; directly linked to solving societal concerns – Evaluations usually supplement other available information	– For resource allocation and reorganisation of specific operating areas	– To indicate the need for a new R&D programme, policy or similar – To reorganise an R&D organisation
Conceptual	– No direct or definite connection between evaluation information and decision making – Evaluation information can affect decision making indirectly	– Clarification and definition of basic concepts, for conceptual clarity, the establishment of causal relationships, the acquisition of new knowledge etc.	– Use in classification of causal mechanisms in an R&D programme, policy or similar
Political	– Use of evaluation information to defend existing and/or chosen policy stance; selective use of information, i.e. those bits supporting the user's political objectives	– To legitimise chosen actions and decisions, and to attain publicity.	– Generally applies to all R&D evaluations

More generally, evaluation information is primarily used in four different ways:

1) to improve joint understanding
2) to strengthen the commitment of participants
3) to support and solidify R&D programmes through tailored evaluations varying by intervention type
4) to develop a programme or organisation (Patton 1997).

R&D evaluations can be used to establish and solidify joint understanding about the nature, effects and causal mechanisms of an R&D programme or policy. By participating in the evaluation process, different actors (including stakeholders, ministries and representatives of financing institutions) can gain more knowledge and promote learning, and by so doing become more committed to shared objectives. Evaluations also have a number of other effects, such as the promotion of networking, morale and transparency. (See e.g. Forss et al. 2002.) They also serve internal development needs; by indicating those key challenges and areas of difficulty that PROs should tackle in order to develop its operations to better serve society.

The challenges of evaluation also involve the question of how to use the information once it is produced. This means that attention must be paid not only to the nature of the information, but also to whom this information is produced and with what tools and methods it is distributed. The following table (Table 9) lists the key entities that make use of VTT evaluation information, their primary information needs, the nature of the information produced, as well as the tools with which information about operations, its outcomes and its impacts is distributed. The table also points to the challenges involved in the utilisation of evaluation information. The table is based on empirical data obtained from stakeholders and VTT management in connection with various impact studies and reviews.

Table 9. Users of evaluation information, information needs, nature of information, distribution tools and challenges.

User	Need	Nature of information	Tools of distribution	Challenges
Ministry of Trade and Industry	– indication of productivity – indication of VTT's role and significance in the entire innovation system – transparency of operations – to support allocation of public funding	– accurate productivity indicators – qualitative impact information – research examples – key concepts	– annual reports – impact reports – research reports	– direct results vs. impact > attention to time-lag of R&D activities – many-sided information
Other stakeholders and decision makers	– indication of productivity – transparency of operations – to support funding decisions	– accurate productivity indicators – qualitative impact information – research examples – key concepts	– annual reports – impact reports – research reports	– direct results vs. impact > attention to time-lag of R&D activities – many-sided information
Customers	– to become aware of VTT's operations – description of customer benefit	– qualitative impact information – research examples – productivity indicators	– customer occasions – research reports – impact reports – brochures – media presence	– many-sided information – equal spread of info to customer groups
Potential customers	– to become aware of VTT's operations – description of customer benefit	– qualitative impact information – research examples – productivity indicators	– customer occasions – research reports – impact reports – brochures – media presence	– many-sided information – equal spread of info to customer groups
Society (the public + interest groups)	– improved awareness of VTT's operations – transparency of operations – promotion of technology awareness	– qualitative impact information – research examples – productivity indicators – key concepts	– research reports – media presence – impact reports	– many-sided information – taking society's need for information seriously – also description of operating challenges
Own personnel	– transparency of operations – discussions on where to focus resources – internal development of operations	– key concepts – qualitative impact information – impact indictors	– impact reports – internal seminars	– many-sided information – variable tools – better information flow – open dialogue on important matters pertaining to VTT
Administration and management	– internal development of operations – discussion of where to focus resources, in relation to other players	– key concepts – qualitative impact information – productivity indicators – research examples	– impact reports – research examples	– utilisation of different kinds of information for development of operations

How organisations disseminate and utilise IA information remains an open question. This relates to the organisations' own strategic planning, process of performance management, as well as to the customer activities. During the JYVA-project for instance, increasing awareness of the utility of IA in adjusting activities in ways better suited to meeting different kinds of customer needs, was achieved in some participating organisations. Further studies will however be required to achieve a more systematic understanding of the best ways in which to communicate and utilise IA results.

4. New tools and concepts for impact assessment

This chapter further develops a general framework for analysing societal impacts based on the findings of the JYVA-project. It summarises the main factors concerning the internal development of impact assessment on the organisational level. It also draws attention to the issues that should be taken into account when developing impact assessment practises and promoting their impacts.

Based on JYVA-study, the main objectives in respect of developing IA fall into the three categories: 1) emphasizing the strategic objectives (strategic level), 2) prioritising the indicators to illustrate the objectives (operational level), 3) combining organisational competence with the strategic targets (learning). Figure 6 illustrates these objectives and questions relating to them. The questions pinpoint the main internal challenges concerning the development of IA and the promoting the effectiveness of PROs.

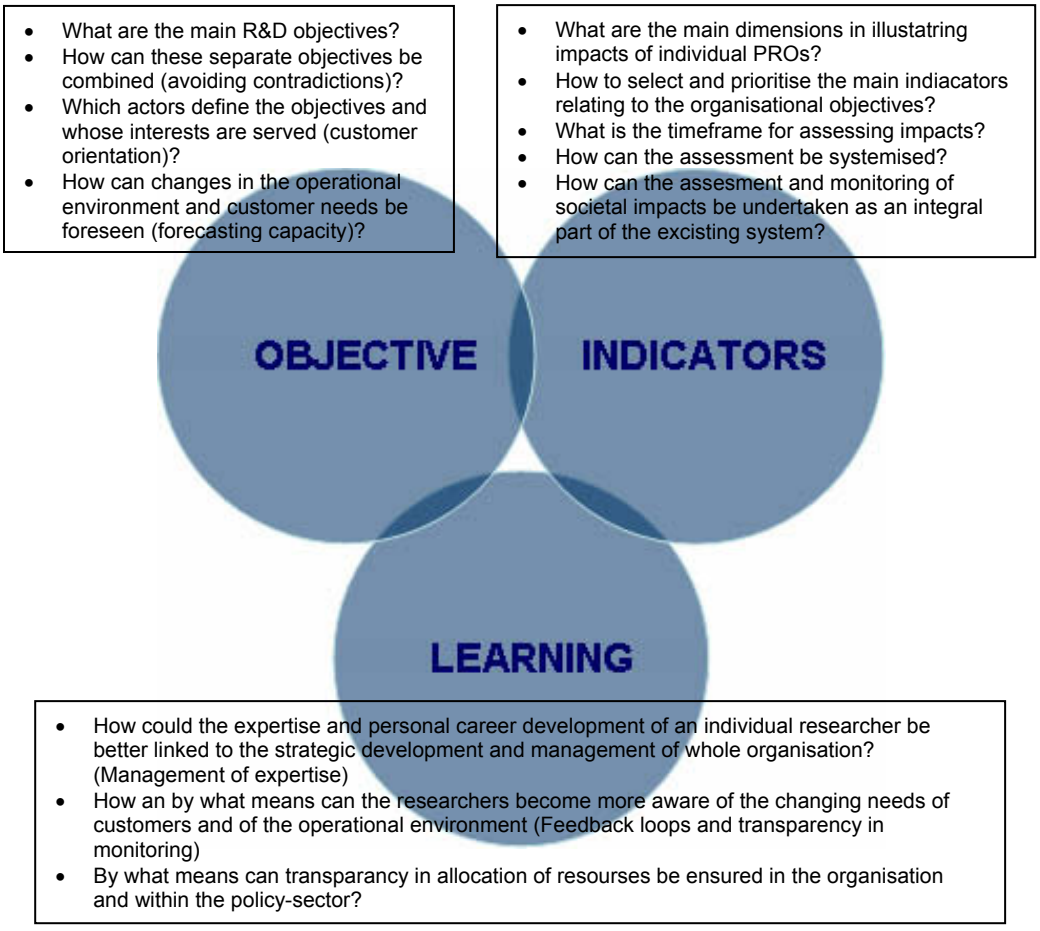


Figure 6. Main dimensions of analysing societal impacts.

The main questions in relation to strategic objectives here include the following:

- How can the impact assessment activities serve strategic management purposes in the R&D-organisations?
- What methods exist for selecting and prioritising between the alternative indicators available?
- What kinds of examples of best practice can be identified from the organisations we have investigated, in order to develop methodological competence and evaluation practice in other R&D organisations?

Organisations often assess their impacts and develop their assessment tools on the basis of external motivations (legitimation purposes, e.g. performance management). The central task here is therefore to discuss how the impact assessment activities support more strategic planning in organisations. This refers both to the potential strategic "value added" of impact assessment, but also has implications for the motivation of the organisation's personnel establishment. Close and interactive co-operation on different levels of the R&D organisations' internal hierarchy can also be important in motivating and committing personnel.

In the following sections, these challenges are discussed in greater detail by providing some examples of developing areas based on the experience provided by the JYVA-organisation.

4.1 Objectives

In relation to strategic management and goal-setting, better strategic awareness emerged as a shared issue for all the organisations, though there were differences in degrees of awareness. In the case of our defence sector example ("PVTT") the need to clarify whether the core of the future strategy lies first and foremost in pursuing a clear research-based strategy It is also necessary to consider the different roles of the PRO, from strengthening the customer-interface and providing research inputs to acting as an intermediary organisation between different stakeholders in the sector. The roles do not have to be seen as mutually exclusive, but they do provide a challenge in terms of focusing research resources and steering the knowledge processes in the organisation. Here a common conclusion for all R&D organisations is that the clarity of strategic management enables better concentration on key priorities and tasks. IA may provide a useful supporting process for strategic renewal, as was also seen in some of our other cases.

The customer-interface is also of particular relevance here, as networks are the predominant governance method in all R&D organisations. Existing networks could be used more actively in order to clarify the role and "value added" of the organisation to the customer's innovation process. Depending on the customer and the nature of competence required, as well as on the role of the particular

customer in the innovation process, roles can be developed in a more flexible and inclusive fashion. This is particularly important in order to ensure that the R&D organisation's project portfolio is developed in a more strategic and differentiated fashion. While the R&D organisation in question should in some projects bear the main responsibility for project management and leadership, in other projects the knowledge could be different and more concentrated in the *niche* knowledge that the organisation has access to. In addition, the degree of risk and innovation in the expertise that is brought into the different projects can be variable, according to the role in the innovation process, to the knowledge required or to the results and effects sought. In relation to all of these aspects, strategic leadership and insights into the current institutional knowledge base should also be utilised in carving out a role for the organisation in the process where both indicators and evaluation practice for the impact assessment of the whole sector are defined. Which actors should decide on the questions of indicators and impact goals, and how can we ensure that we are participating in the processes where this is decided? This is a challenge for all R&D organisations.

Agrifood Research Finland has been particularly active in defining impacts and identifying processes where they could be achieved, as well as in working with methodological development processes and learning where the capabilities required in impact assessment are strengthened and mediated into the organisation as a whole, as well as to its key stakeholders. A more active debate has also been pursued amongst the R&D organisations in this sector, though here further work is likely to be necessary. The nature of expertise required is often found in the interfaces between the core competence areas of *Agrifood Research Finland*. Here we suggested a more problem-based approach to IA, as many of the expected impacts are best viewed through the lenses of problem/solving and the required types of expertise that is required. Areas where such multi-/cross-sector or multi-/cross-disciplinary approaches are necessary include for instance the competitiveness of the food industry sector as a whole, and the vitality of rural areas, as well as environmental quality or sustainability (also encompassing social and economic dimensions).

In the case of the polytechnics included in our study, the objectives and strategic dimensions of analysis are particularly central. This is partly due to the external pressures and ongoing processes of change in the whole polytechnic system, and

to the fact that the R&D activity is still secondary to the main task of education. Notwithstanding the future system and structure of Finnish polytechnics, the need to closely connect R&D activity to the core educational tasks remains an essential prerequisite for promoting effectiveness in a turbulent environment. R&D activities do however need to be more firmly integrated into the overall strategic profile of the polytechnics.

The dimensions of effectiveness proposed for the polytechnics are closely connected to the customer-base and environmental pressures. We concluded that strategic coherence would best be served by addressing the following impact dimensions:

- successful and competitive businesses and among the broad set of societal actors
- sound and successful regions
- good quality teaching with practical relevance and applications
- strategic relevance.

It is essential that working life perspectives, which are so central to the mandate of the Finnish polytechnics, are maintained and developed as close to the development of the R&D profile and competence as possible. In addition to the external impacts generated, polytechnics should therefore also monitor the development of their own expertise and the incorporation of R&D projects into the strategic goals of their own organisation with particular care.

The third task of societal interaction is included in the strategic motivations of all of the organisations analysed here. We have also paid attention to the way in which this is operationalised, e.g. how the "regional" perspective and societal impacts have been integrated into broader strategies. In connection with the polytechnics in particular, we argue that there is as need to move form a more administrative delineation of "regionality" to a functional and innovation-based understanding of the "regional". The polytechnics' "regional perspective" has often been defined from the point of view of local or regional needs, themselves often determined by administrative boundaries rather than functional concerns (e.g. as determined by eligibility criteria as regards Structural Funds funding etc.). Societal impacts however necessitate a broader, more functionally based

interpretation of "regionality", based on the promotion of innovation rather than administrative or geographical motivations. Supporting regional innovation capacity may thus require a much broader international and cross-border scope, especially when customers include businesses seeking to promote their own organisational and/or market competitiveness.

In all of the cases addressed here, regional impacts can require the support of a variety of dimensions, including regional strategies, networking, internationalisation and the promotion of social or environmental welfare. International projects can thus also be seen as encompassing regional impacts. The promotion of regional impacts requires a proactive approach that takes into consideration the potential to strengthen competences within the context of foresight and future perspectives more generally. In order to build this capacity, networking is required, both nationally and internationally.

Setting priorities is a challenge for all R&D organisations. Those included in our study are no exception to this. It is not easy to strike a balance between the customer-approach (delivering the products they want), and the strategic and necessarily more long-term choices internal to the organisation. In this publication we have suggested that IA practice can be used as an instrument in clarifying strategic choices and in striking a better balance between the "internal" and "external" needs, thus also improving the forecasting ability through both networking and internal competence development.

4.2 Indicators

Indicators and their prioritisation have been extensively debated in the course of this project, with different experiences and "best practices" from other organisations and sectors used as sources of inspiration. Selecting the indicators was originally one of the main motivations for the PROs participating in this project. As indeed the *Agrifood Research Finland* case has shown however, the process of selecting indicators can result in the realisation that a broader learning process is required to clarify the strategic priorities that the selection of indicators necessarily entails. Here also the communication of indicators within the organisation and beyond becomes an important part of the learning process.

While there are lessons to be learned from across the organisations, as well as from across the sectors and disciplinary boundaries more generally, the specificity of each organisation has remained a key element of our study. Each organisation can only, to a limited extent, follow established practices and routes to innovative and societally effective R&D activities. This is due to a number of issues, including the differences in the challenges posed by the operational environment and the various characteristics that organisations have. We can however, on the basis of the study, draw some conclusions of a more generic nature.

Some of the requirements for "ideal indicators" as outlined in the Finnish context include the following:

- Indicators should not describe activity as such, rather they should relate to outcomes, results and effects.
- Indicators should describe strategically prioritised themes and be related to the core activities of the organisation.
- Indicators should be selected such that their value can actually be influenced by the organisation in question and connected to the strategic goals set for this organisation.
- Indicators should be selected such that target values can be set in a numerical form and in a similar scale (thus allowing for comparisons).
- Indicator should be well enough established and stable in such way that they can be monitored on a long-term basis and therefore used as an indicator of change and the direction of change (identifying trends etc.).
- Both the (R&D) organisation in question and its "owner" (in our case a government department) should be able to interpret the indicator in the same way (in fact this is facilitated by both sides participating in the selection and definition of the indicators used).
- Information about the indicators can be collected with relatively little extra effort (not monitoring or evaluation for its own sake). (E.g. Salminen 2005.)

Figure 7 summarises the dimensions of IA practice within the public research organisations. The basic idea of the model is to describe how the services that PROs provide in their strategic business areas generate impacts in the different target areas within their own areas of expertise, as well as in relation to the external environment, including the customers and their innovation processes, and finally for society as a whole.

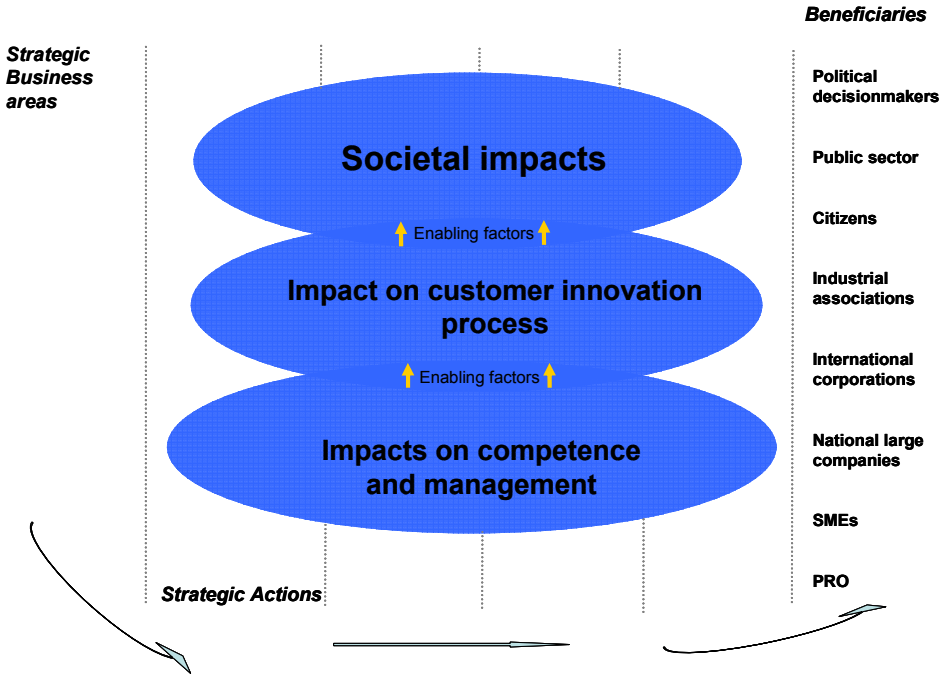


Figure 7. Impact assessment model.

Some typical dimensions of the potential impacts produced by publicly funded R&D could also be discerned, as classified in Table 10.

Table 10. Dimensions of impacts and some suggested indicators.

Dimensions of impacts	Examples of indicators
1. Impacts on economy, technology and commercialisation	• Improved competitiveness • Cost-savings • Improved R&D efficiency • New/improved products/services/ processes • New/improved research techniques • Entry into the new markets • Patent applications
2. Impacts on knowledge, expertise, human capital and management	• Strengthened expertise • Improved research methods • Scientific impacts: scientific publications, conference and seminar presentations
3. Impacts on networking and social capital	• Improved networking between research partners, firms etc. • New networks • Domestic networks – global networks • Organisational and social innovations (e.g. new working practices, problem-solving models and methods)
4. Impact on decision making and public discourse	• Support of decision making through expert consultancy and governmental advice • Participation in legislative and strategy planning • Norms, regulations and standards
5. Impacts on social and physical environment	• Reduction in material/resources and energy consumption • Promotion of regional development and growth • Promotion of safety • Development of infrastructure

As argued previously, the organisations involved in the JYVA-project had distinctive features related to goal-setting, evaluation needs and defining the dimensions of impacts. The polytechnics in particular have different mandates from those of the other PRO cases, specifically, through their role as educators and by having greater responsibility in reacting to regional and local needs. These characteristics had to be taken into account when defining the dimensions and indicators. The conceptual framework for analysing impacts of polytechnics' R&D is presented in Figure 8.

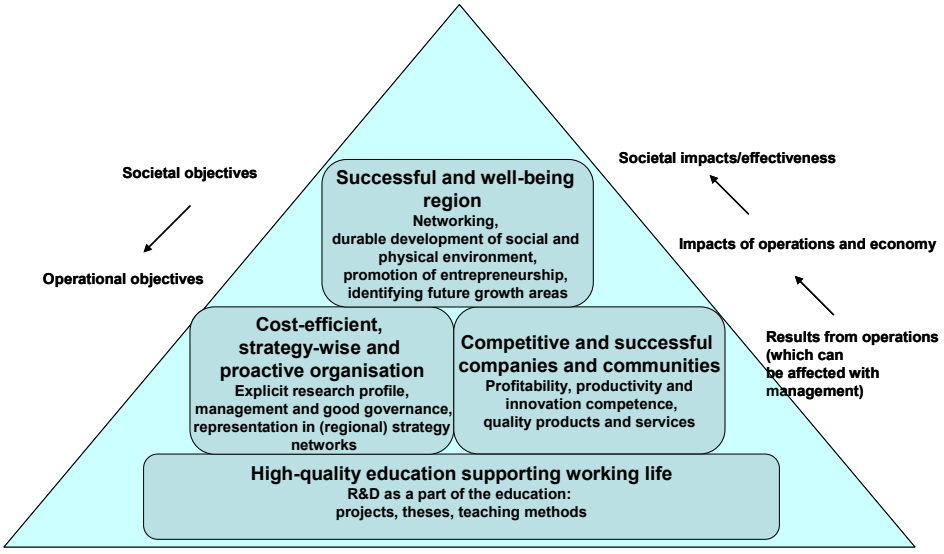


Figure 8. Framework for analysing societal impacts of polytechnics' R&D activities.

The four areas (dimensions of impacts) inside the circle and some potential impacts produced by polytechnics within these dimensions are summarised in Table 11 below, together with some examples of indicators.

Table 11. Dimensions of impacts and examples of indicators in polytechnics.

Dimensions of impacts	Examples of indicators
1. Cost-efficient, strategy-wise and proactive organisation	• Project's linkage to strategy (does the project support the polytechnic's strategic targets?) • Activeness of researchers within the project • Pros and cons of project implementation
2. Competitive and successful companies and communities	• Improved productivity • Improved profitability • New or improved products, processes and services • Development of sales and marketing • Influencing decision-making • More intensive cooperation with authorities • More intensive cooperation between companies in the same industry field
3. Successful and well-being region	• Development of and support for regional strategy activities • Reinforcing the networking and trust between regional actors • Developing mutual norms and standards • Transmitting expert knowledge to regional actors • Development and diversification of business activities • Improving customer safety • improving the availability of public services (e.g. health and social sector)
4. High-quality education supporting working life	• Identification of challenges arising from the work and business life • Supporting practical training • New or improved teaching methods • Development of personnel's R&D expertise • Increasing R&D cooperation within own organisation • Creating international partnerships

4.3 Learning

In the beginning of the JYVA-project the main aim in all project organizations was to legitimise their activities both for their stakeholders and for the Ministries responsible for steering them. Project learning, both in the organisation and in the policy sector, has however begun to play a more important role when it comes to developing impact assessment activities. In addition to developing concrete tools and indicators, the question of how the PROs could better utilise the results of assessments in strategic management also became relevant.

Learning at the organisational level became one of the main concerns both at *Agrifood Research Finland* and PVTT. This related in particular to strengthening the linkages between impact assessment and the organisations' strategic planning, as well as to strengthening the transparency of the organisations' internal operations. Part of this motivation is connected to using the information gathered in evaluations in strategic planning (i.e. in choosing and prioritising the focus areas, organisational and project level) and in developing expertise. This expertise is both substantive and methodological in nature. It allows the innovative expert organisations to better influence their environment and to respond to changes in it. At the same time, this poses a challenge in respect of organisational capacity, as PROs need to be proactive and not merely reactive in this development.

The other challenge concerning learning in PROs' was how to integrate IA into the everyday-work of researchers. Embedding assessment activities is a motivational tool and needs the commitment of the entire personnel establishment of an organisation. As such, IA should be a shared concern for the organisation as a whole, not merely a "management" or "administrative" concern. Clarifying the link between PROs' final mission and researchers' expertise areas became an important aim for the project in committing and motivating researchers but also in respect of implementing the activities of impact assessment and finally strengthening the effectiveness of the organisation. It became crucial to make visible the importance of individual expertise in the effectiveness of whole organisation. One of the main challenges identified in the project thus related to managing an expert organisation and the competences this requires.

Another aim in the project was to strengthen the level of discussion and learning outcomes between the PROs' and the Ministries as regards their impacts and effectiveness in terms of performance management. In all cases, the project provided a good basis for discussion. More effort will however be needed both in setting the indicators and in promoting learning on IA across the sectors. The focal issue here seems to be **learning at the level of the policy sector**. Two types of challenges concerning learning have been recognized within the context of the JYVA-project. One concerns the use of information about an individual PRO's impacts in relation to performance management, while the other relates to utilising PROs' expertise in relation to policy development and in target setting on the policy level.

In the following sub-chapter we will illustrate the challenges in relation to learning via the example of *Agrifood Research Finland*. The active role of *Agrifood Research Finland* in promoting the debate on societal impact and the selection of assessment and monitoring indicators and practices in particular emerged during the project as an interesting case of organisational learning. While in many cases the research organisations were sceptical or even hostile to introducing societal impacts as an element of performance guidance practice into the steering practices implemented, *Agrifood Research Finland* took this opportunity to actively influence the practice to be developed and indicators to be selected. In so doing it also carved out a role for itself within the sector and its stakeholders that could strengthen the definition of strategic objectives for the sector as a whole. Within the project we tried to create a model of organisational learning relating to the implementation of impact assessment. This model illustrates the different phases and steps of implementation, while also identifying the main resources that have been important within the implementation process.

4.3.1 Implementation of impact assessment: case *Agrifood Research Finland*

The main motivation for undertaking the JYVA-project was the existence of a *shared objective*, based on the *need* to recognise and develop indicators for assessing impacts and legitimising the receipt of public financing. Existing expertise and prior IA assessment projects at VTT were the base upon which the

project was constructed. Other interested PROs with similar needs were contacted and subsequently became active partners in defining the project goals and means.

The commitment of the own organisation was required to launch the development project. The main factors here were the commitment of key actors, such as the organisation's board, steering group, as well as research and communication directors. This step also entailed the allocation or resources (both human and financial) to the project, moreover, the fact that project was resourced with a project manager and secure financing was important for its development progress.

If the legitimisation of *Agrifood Research Finland's* role was the main motivation at the beginning of the process, a number of incidents within the process eventually changed this, and in so doing, changed its role. *Support of the key stakeholders* and in particular, the commitment of the Ministry of Agriculture and Forestry (and, at a personal level, its permanent secretary) allowed the organisation to become a key actor in developing indicators and tools for impact assessment within the sector as a whole. At the same time its role changed from being reactive to proactive.

The risk in developing impact assessment was that it would become marginalised outside the core strategic management of the organisation. The main challenge here was to link the assessment to the everyday work of those involved in research etc. *Directing the learning process* and *developing the tools* were the next steps in developing impact assessment and embedding it into the organisation as a whole. Crucial resources in the context of learning here were leadership, education and networks for sharing information. Leadership and education were important in implementing the knowledge and in ensuring that it became part of everyday-work, while networking was important in creating common concepts and in deepening the understanding of the challenges of impact assessment. In the discussion within the networks the partners gained an understanding that instead of looking backwards, IA also needs to look forward, with forecasting the changing needs of stakeholders and the capacity building of expertise. Even developing the indicators for assessing impacts was seen to be important in the discussion here.

The *Agrifood Research Finland* example is illustrative of how important learning is and of how the information contained in impact evaluations can be used. The next step concerns *operationalisation, or putting into practice the expertise* gained within the project. Implementation requires change in the organisational culture and here as always the main resource is *leadership*. Directing the learning process, developing the tools and implementation will be a continuous process in which utilisation of the *feedback information* and critically examining the grounds of one's actions play a central role.

The process of developing impact assessment and putting it into practice as described above has neither been linear, nor trouble-free. Resistance has occurred within the process, concerning both the process of change and the actual impact assessment. In expert organisations, impacts cannot be achieved independently of the knowledge of the experts. Therefore the commitment of researchers is crucial. In terms of the implementation of the methods of impact assessment, several tools and methods have been developed in relation to the issue of motivation and to understanding the importance of impact assessment among researchers. Prior to the JYVA project expected societal impacts were part of the project reporting practice and researchers, when writing project applications had already to address questions relating to this issue. The discussion on societal impacts has moreover been quite heated, and this is perhaps best illustrated by researcher awareness of the links between their individual research efforts and the organizational societal impacts. One tool here has been the internal researcher training programme within *Agrifood Research Finland*. These programmes are modelled on bringing together researchers on the team and group leader level to improve their competence in the areas of project management, teamwork, leadership skills, as well as competence within the areas of communication and in academic writing.

4.3.2 Tools for learning

The R&D organisations participating in our study utilise different evaluation practices. Those with an extensive external project portfolio tend to utilise the methods of programme and project evaluation quite well, though such practices differ from one programme/project to the next, as does the degree of systematic utilisation of evaluation. In most cases the theme of societal impacts is as yet

only emergent, i.e. already well-established evaluation practices are tailored or adapted to suit the new interest in societal impacts. Some conclusions as to the evaluation cycle practices of the organisations participating in our project can however be summarized:

- *Ex ante* evaluation is not well established, and in most cases it is only undertaken if it is part of the external funding organisations'/programme's established practice, or as a more informal "in-house" practice, where only minimum criteria are set. Questions are thus of the type, "is the project within our broad field of competence and not conflicting with our strategy?" "Is if financially feasible?" "Do we have the resources required?" In many cases this stage is unsystematic and as long as there is no obvious reason for not undertaking it (if it is not in the field of expertise of the organisation), projects are not turned down very often. This type of information is most often used as support in decision-making on steering group level.

- Also in the *ex ante* stages, some of the organisations have a public role which makes it necessary for them to ask whether the project could be undertaken by another, commercial business organisation in the area. This is the case with the defence sector, as well as with the polytechnics with their strong regional role.

- *Mid-term evaluation* is often undertaken, as part of common implementation practice, though it is often the case here that the societal impacts are not addressed. We should note here also that the time-scale required to realise such societal impacts does not allow for this dimension to be fully addressed at his stage. Nevertheless, it is useful to address questions concerning *expected* impacts and identifiable bottlenecks and potentials at this point. At this stage the questions posed relate more to whether the project/programme/organisation is going in the right direction, in light of the expected results and impact set.

- *Ex post* type evaluations are the ones most commonly undertaken in the JYVA-organisations. Societal impacts are specifically investigated in some of the organisations. In most cases this is done through the means of surveys among the clients and stakeholders. The polytechnics have thus far only done so in relation to educational issues, and thus have only consulted graduates

and their current employers. None of the organisations have systematically addressed their impact on policy-making. This has been more a question of surveying the public image of the organisation, which has been done in some form in all of the organisations. In the VTT case impacts on customers' innovation process has also been investigated. The actual details of the policy-impact and the stages in which the organisation is most likely to be able to have such an impact could be addressed much more systematically. Here a qualitative approach is often required and this makes the collection of data and monitoring more labour-intensive and thus more expensive, which is one of the reasons that it has not thus far been undertaken in a systematic fashion.

These steps and the way in which they contribute to the accumulative information base upon which new R&D projects and activities are built is illustrated in Figure 9 below.

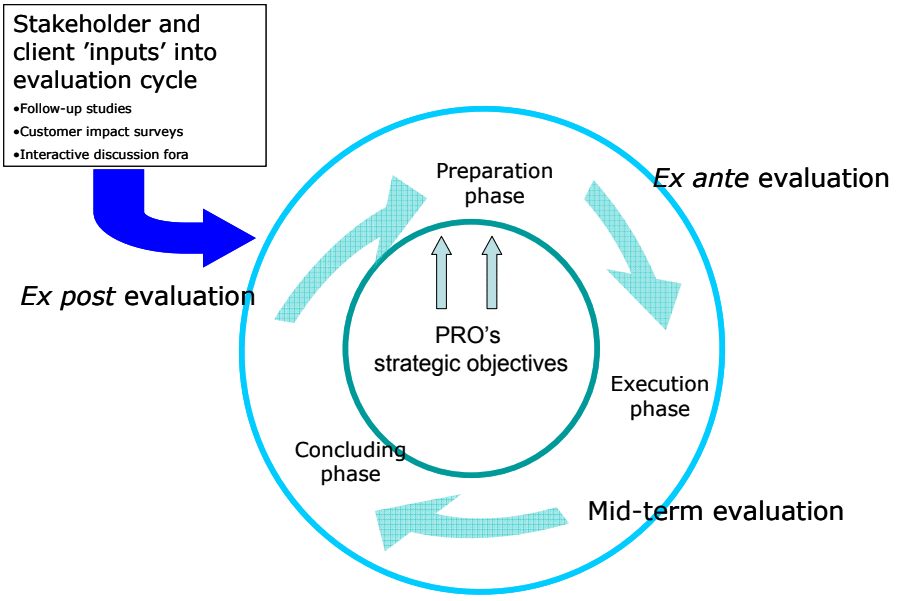


Figure 9. Evaluation and learning cycle.

Each of the organisations came into the project with high hopes in terms of the potential lessons to be drawn from previous evaluation practice, but here the process was often quite sobering: evaluation is not a mechanistic process that can simply be put into place, taking a bench-mark form another R&D organisation and "implementing" it. Rather it is best implemented in ways

utilising and building upon already existing evaluation and development practice. Learning, the specific needs of each organisation and the differences in terms of knowledge governance set important prerequisites for evaluation in general and societal impact assessment in particular. Depending on the sector and the steering and governance practices in place, the interaction between the organisation and its "owners" (i.e. the Ministry, as well as other stakeholders) sets the stage for the evaluation models that can be applied. The level of ambition in terms of using impact evaluation as a tool in organisational development and strategic management also differs markedly from organisation to organisation, and these differences need to be taken into account.

5. Conclusions and policy recommendations

In this publication, we have summarised some of the characteristics of, and challenges faced, in assessing the societal impact of public research organisations. This final chapter concludes the main findings and policy implications from three related perspectives: *objectives* (as they relate to organisational perspectives), *indicators* (as they relate to innovation process more generally) and *learning* (both in terms of learning of actors and policy). Each provides insights into improving organisational performance management and measurement of larger societal impacts.

The type of organisational mode that emerges from our analysis requires the PROs to develop their strategic competence (e.g. customer interface), methodological practice (e.g. indicators and types of projects implemented) and leadership and management skills (e.g. in-house training and organisational practice). These changes may also require new types of services and project portfolios. This entails development in a more customer-based direction, as well as favouring large "service packages" and developing cooperation with customers in long-term partnerships. The customers are seen as (permanent) partners, not as "research projects". When customers realise the opportunities that public research organisations present, they may be prepared to open slightly the "cloak of secrecy" surrounding their business operations, and let the research organisation operate within their organisation. Eventually this will create more "win-win" solutions: customers are more receptive to possibilities that public research organisations can offer and research organisations can prepare and sell larger research projects. This also gives public research organisations the ability to develop their own competences and areas of expertise, and in the end to generate substantial positive impacts. For impact assessment this means that monitoring and indicators should follow the creation of long-term partnerships and the aggregation of tailored services to customers. The main common challenge seems to be striking a balance between academic orientation and customer orientation.

A shared challenge for the PROs is also the need to balance client orientation with developing organisational competence and "know-how". Although closer

client interaction and network ties are positively associated with competitive advantage in terms of innovation and societal impacts, success is also related to knowledge creating capabilities. To become effective in creating and transferring knowledge, organisations need to build and manage multiple processes, involving the simultaneous exchange of information inside and outside the organisation.

5.1 Concluding on the objectives and organisational perspective

Assessing the effects of R&D activities is challenging for two types of reasons. Firstly, it is challenging to establish and verify causal relationships between certain effects and specific policy actions. This challenge is further exacerbated by the time-lag between doing research, generating innovations and reaping commercial benefits, as well the time-lag between R&D activities and policy change. Notwithstanding these limitations, the study attempts to provide a coherent analysis of the salient features of the impact assessment of R&D. In addition, the benchmarking of impact assessment practices may offer an opportunity for other organisations to learn about assessment measures and about the attributes of impacts.

Some of the issues related to impact assessment are cross-cutting in nature, particularly in the wider international environment. A knowledge-creating organisation does not operate in a closed system; rather the system is open by its nature, with knowledge creation as a never ending process, renewing itself continuously, with knowledge being constantly exchanged with the external environment. It is important to recognise however that the societal impacts of an individual R&D organisation not only depend on its particular functional role in innovation but also on its capabilities to build and maintain a competitive advantage.

Based on our analysis, the following aspects seem to be essential drivers in terms of developing impact assessment in the organisations analysed.

IA is useful for the strategic perspective because…

- It enables the organisation to chart client needs, as well as the challenges of the whole sector, and in so doing, to identify future policy options. While the impact assessment has traditionally been used to justify research spending and public intervention, strengthening the image of the organisation within the broader innovation sector, attention is increasingly now being paid to using impact assessment as a strategic management tool. Output and outcome indicators are used to monitor whether the organisation is doing the "right things", and to assess the direction of changes to be expected. The impact assessment may thus result in a broader knowledge base for strategic management and targeted performance.
- It helps to clarify the mandate of the PROs and ensure the relevance of their strategic choices. Here the main objective is to identify what and where actions need to taken, bearing in mind the core of the PROs expertise.
- It helps to demonstrate the "value added" of public research organisations and their ability to meet the R&D goals of their customers and stakeholders. The main objective here is to identify the innovation processes in which the PRO *should* be involved and discern *at which stage* it should be most active.
- It helps to identify the main customers (current and potential) and to act in a closer client interface and in networks. A client-orientation includes questions such as whose needs come first, and which clients should be prioritised. The aim is to create and maintain networks, but also to clarify the organisation's role in them.

To sum up, the positive impacts that public research organizations generate originate in networks and with partners. Future competence development requires a more cross-sectoral approach where organisational and cognitive needs relating to impact assessment are related specifically to the creation of new partnerships and network management.

In terms of policy implications, the role of the R&D organizations is essential in providing a cognitive base for developing cross-sectoral and more broadly based policy initiatives. In this respect, management by results and management by programming are mutually supporting processes.

Moreover, the intent here is to ensure a better integration and coherence between policy objectives on different levels. The more transparent objectives are, the easier it is for the steering and funding organizations to be aware of the role and contribution of each actor within the system.

5.2 Concluding on the indicators and the innovation process

The main conclusions relating to the indicator perspective have to do with the ability of PROs to select indicators that best reflect their effects and impacts on their customers' innovation processes, as well as to develop indicators for the sector as a whole. Innovation activities are increasingly becoming part of the basic policy development process, and thus form a part of the evidence base upon which public intervention rests. Research organisations have an increasingly active role to play in this regard, both as providers of information and knowledge, and in the role of "networkers" and intermediaries.

The change from a reactive to a more proactive role entails the possibility for public research organisations to engage in developing new business concepts and innovation activities. Traditionally, reflecting the reactive mode, research organisations' task was to solve individual problems, emerging from the needs of their individual customers. The proactive mode however implies that research organisations increasingly seek to address the needs emerging from the overall management of innovation processes, as well as to provide solutions to different phases within these processes. For this purpose, they need to operate in the same platform with their customers and to identify indicators that best reflect the goals set by the customers and within the policy sectors.

By becoming more pro-active in this debate, the research organisations can carve a niche role for themselves and strengthen the evidence base upon which policies are built. Together with the Ministries, but also through broader public debates, the research organisations can contribute to future decision-making i.e. on those important strategic decisions which are taken over resource allocation and future development, be it for the development of regulatory frameworks influencing business conditions, measures targeting competence development, or in the context of public service management and/or provision or other important topics.

IA and carefully selected indicators allow the PROs to…

- Select projects that are of particular use for the key beneficiaries, customers and society at large.
- To terminate projects that are unrealistic and irrelevant, particularly where the set goals are unachievable.
- Enables the development of measures to prioritise and distribute R&D resources in a transparent fashion and with societal relevance.
- Helps the organisations to develop a dialogue with other public bodies, and in particular financing organisations and Ministries, on the ways in which public intervention is supported and targeted.

To sum up, impact assessment helps to identify the strengths and weaknesses of organisational performance, as well as to focus on the key competences of different organisations. In so doing it helps to analyse the "additionality" of public R&D, from the point of view of current and potential customers, stakeholders and society at large.

Policy implications here relate to the necessity for the PROs to define their impact indicators in close co-operation with, the Ministries and other key actors in the sector. PROs are themselves most knowledgeable of their own impacts and of the role of the Ministries in relation to prioritizing the indicators that demonstrate the impacts within the sector as a whole.

5.3 Concluding on learning from a policy and actor perspective

Impact evaluations are increasingly seen as tools for organisational development and learning. They are also instrumental in foresight activities related to meeting changing customer needs. This role requires a good understanding of the evaluation process and its points of departure. PROs can better utilise the cognitive "value added" and concrete results of evaluations. The learning perspective forwarded here entails both an internal and external learning motivation.

IA requires, and at the same time supports, learning within the PROs by…

- Strengthening the transparency of the organisation's internal operations. It does so by helping to make visible the linkages between evaluations and strategic planning and allowing the management to choose and prioritise the focus areas and to develop organisational expertise.
- Making impact assessment an issue for the whole organisation and not just for the management. Implementation of impact assessment in the everyday work of researchers is thus an important part of committing the whole organisation to the objectives and the development of organisational competence. This can also be seen as an important element of motivation for the personnel establishment of any organisation.
- Making visible the mutual interdependence of learning and the successful management of expert organisations. For an organisation to learn or draw conclusions requires its management practices, knowledge and expertise management to work efficiently, which in turn can help to identify future learning needs within the organisation itself.
- Serving the needs of decision-making and policy development (within the sector and between sectors). The IA should also pay heed to better utilising the expert knowledge found in the PROs in the Ministries and policy organisations, through performance guidance and other administrative practices.
- Clarifying the roles and "value added" between different actors. PROs are mainly producing information and assessing their impacts relating to the strategic objectives of one organisation, while Ministries collect and communicate the information on societal impacts composed of effects and impacts of individual organisations taken together, as well as the cumulative interventions of one policy sector that these contribute to.
- Developing the cooperation between different actors within a policy sector. This is an important part of committing the sectoral actors to common objectives and developing a more pro-active role for them.

To conclude, it is important to develop impact assessment practice in ways that do not jeopardise the creativity of individuals and institutional capabilities in expert organisations, as these are the core receptacles for continuous knowledge creation, acquisition, and transfer and are thus ultimately central to boosting future innovation.

Policy implications here relate to striking a balance between the short and long-terms objectives of innovation activity, and in respect of the PROs, between customer-needs and academic expertise.

References

Antila, T. & Niskanen, P. (2001). VTT:n vaikutuksia. VTT Tiedotteita 2105. [The Impact of VTT R&D Activities.] (Only in Finnish.) Espoo: VTT. http://virtual.vtt.fi/inf/pdf/tiedotteet/2001/T2105.pdf.

Davies, H. T. O. & Nutley, S. M. (2001). Evidence-based policy and practice: moving from rhetoric to reality. Paper presented at the Third International, Inter-disciplinary Evidence-Based Policies and Indicator Systems Conference, University of Durham, 4–7 July 2001.

Edquist, C. & Johnson, B. (1997). Institutions and organizations in systems of innovation. In: Edquist, C. (ed.) Systems of Innovation – Technologies, Institutions and Organization. London and Washington: Pinter Publishers.

Forss, K., Rebien, C. & Carlsson, J. (2002). Process use of Evaluation. Evaluation, 8(1), 29–45.

Geoghiou, L. (1998). Issues in the Evaluation of Innovation and Technology Policy. Evaluation, 4(1), 37–51.

Gustafsson, R. & Autio, E. (2006). Grounding for Innovation Policy: The Market, System and Social-Cognitive Failure Rationales. Paper presented at Innovation Pressure-conference, 15–17 March 2006, Tampere, Finland.

Hyytinen, K. & Konttinen, J. (2006). Vaikuttavaa tutkimusta. Arviointikäytäntöjä julkisissa tutkimusorganisaatioissa: Puolustusvoimien Teknillinen Tutkimuslaitos. VTT Tiedotteita 2333. Espoo: VTT. [Research with impact. Evaluation practices in public research organisations: Finnish Defence Forces Technical Research Centre PVTT.] (Only in Finnish.) http://virtual.vtt.fi/inf/pdf/tiedotteet/2006/T2333.pdf.

Koch, P. et al. (2003). Rationalities and innovation policy learning, GoodNip (Good practices in Nordic Innovation Policies). Report, Part 2 Innovation Policy trends and Rationalities. Oslo: NIFU STEP.

Kuhlmann, S. (2003). Evaluation of research and innovation policies: a discussion of trends with examples from Germany. International Journal of Technology Management, 26(2/3/4), 131–149.

Kuitunen, S. & Hyytinen, K. (2004). Julkisten tutkimuslaitosten vaikutusten arviointi. Käytäntöjä, kokemuksia ja haasteita. VTT Tiedotteita 2230. Espoo: VTT. [Impact evaluation of public research organisations. Practices, experiences and challenges.] (Only in Finnish.)
http://virtual.vtt.fi/inf/pdf/tiedotteet/2004/T2230.pdf.

Kutinlahti, P. & Hyytinen, K. (2002). VTT:n yhteiskunnalliset vaikutukset. VTT Tiedotteita 2176. [Societal impacts of VTT.] (Only in Finnish.) Espoo: VTT. http://virtual.vtt.fi/inf/pdf/tiedotteet/2002/T2176.pdf.

Kutinlahti, P., Lähteenmäki-Smith, K. & Konttinen, J. (2006). Vaikuttavaa tutkimusta. Arviointikäytäntöjä julkisissa tutkimusorganisaatioissa: Helia ja SAMK. VTT Tiedotteita 2332. Espoo: VTT.
http://virtual.vtt.fi/inf/pdf/tiedotteet/2006/T2332.pdf.

Leviton, L. & Hughes, E. (1981). Research on the utilization of evaluations. A review and synthesis. Evaluation Review, 5(4), 525–548.

Loikkanen, T. & Kutinlahti, P. (2005). Towards Systemic Future-oriented Innovation Policy Studies – Perspectives of Finnish Knowledge Based Economy. Paper presented at the Innovation Systems in the Knowledge-based Society Conference, LABEIN Tecnalia, Bilbao, 22–23 September 2005.

Lähteenmäki-Smith, K. & Hyytinen, K. (2006). Vaikuttavaa tutkimusta. Arviointikäytäntöjä julkisissa tutkimusorganisaatioissa: Maa- ja elintarviketalouden tutkimuskeskus MTT. VTT Tiedotteita 2334. [Research with impact. Evaluation practices in public research organisations: Agrifood Research Finland MTT.] (Only in Finnish.) Espoo: VTT.
http://virtual.vtt.fi/inf/pdf/tiedotteet/2006/T2234.pdf.

Malerba, F. (2004). The Handbook of Innovation. Oxford: Oxford University Press.

Mickwitz, P. (2002). Effectiveness Evaluation of Environmental Policy – the role of intervention theories. Administrative Studies, 4(21), 77–87.

Nagarajan, N. & Vanheukelen, M. (1997). Evaluating EU Expenditure Programmes: A Guide to intermediate and ex post evaluation. XIX/02 – Budgetary overview and evaluation. DG XIX, European Commission.

OECD (2001). Innovative clusters. Drivers of national innovation systems. Paris: OECD.

Oksanen, J. (2000). Research Evaluation in Finland. Practices and experiences, past and present. Working papers no. 51/00. Printing office Lars Eriksen Oy. Espoo.

Oksanen, J. (2003). VTT:n alueellinen rooli ja vaikuttavuus. VTT Tiedotteita 2205. [Regional role and impact of VTT.] (Only in Finnish.) Espoo: VTT. http://virtual.vtt.fi/inf/pdf/tiedotteet/2003/T2205.pdf.

Patton, M. (1997). Utilization-Focused Evaluation. London: Sage.

Pöysti, T. et al. (2003). Towards Better Accountability. Helsinki: Ministry of Finance.

Salminen, M. (ed.) (2005). Tulosohjauksen käsikirja. [The Manual of Performance Guidance.] Helsinki: Ministry of Finance. Electronic version available (in Finnish) at: http://www.vm.fi/tiedostot/pdf/fi/96500.pdf.

Smith, R. & Kuhlmann, S. (2004). The rise of systemic instruments in innovation policy. International Journal of Foresight and Innovation Policy, 1(1/2), 4–32.

Tassey, G. (2003). Methods for Assessing the Economic Impacts of Government R&D. Planning Report 03-1. National institute of Standards & Technology, NIST.

Tiihonen, S. (2004). From Governing to Governance. A Process of Change. Tampere: Tampere University Press.

Venetoklis, T. (2002). Public Policy Evaluation. Introduction to Quantitative Methods. Tutkimusraportteja 20. Helsinki: VATT.

Wimbush, E. & Watson, J. (2002). An Evaluation Framework for Health Promotion: Theory, Quality and Effectiveness. Evaluation, 6(3), 301–322.

Published by

Series title, number and
report code of publication

VTT Research Notes 2336
VTT–TIED–2336

Author(s)
Lähteenmäki-Smith, Kaisa, Hyytinen, Kirsi, Kutinlahti, Pirjo & Konttinen, Jari

Title

Research with an impact
Evaluation practises in public research organisations

Abstract

This publication highlights the benefits of and the challenges faced in assessing the societal impacts of public research organisations, based on a research project (JYVA) focusing on the perceptions, practises and philosophies associated with the assessment of the socio-economic impacts of research and development. The JYVA-project was undertaken in a consortium between five Finnish public research organisations (PROs) involved in R&D activity: *Agrifood Research Finland* (MTT), *Finnish Defence Forces Technical Research Centre* (PVTT), *Helia University of Business and Applied Sciences* (HELIA), *Satakunta University of Applied Sciences* (SAMK) and the *Technical Research Centre of Finland* (VTT).

The main aims of the project were to develop the necessary methods and indicators needed to analyse the impacts in each organisation, and to test an analytical framework for impact assessment developed within VTT. The main findings and policy implications are discussed here on the basis of three related perspectives:

– objectives (as they relate to organisational perspectives)
– indicators (as they relate to the innovation process more generally)
– learning (both in terms of actors and policy).

The positive impacts that public research organizations generate originate in networks and with partners. Future competence development therefore requires an approach where organisational and cognitive needs relating to impact assessment are related specifically to the creation of new partnerships and network management, as well as to the role and "value added" of the organisation in these networks.

On the level of policies, the role of the R&D organizations is essential in providing a cognitive base for developing cross-sectoral and more broadly based policy initiatives. In this regard management by results and management by programming are mutually supporting processes, where PROs should play an active role.

Impact assessment helps to identify the strengths and weaknesses of organisational performance, as well as enabling us to focus on the key competences of the R&D organisations. By so doing it helps us to analyse the "additionality" of public R&D, from the point of view of current and potential customers, stakeholders and society at large. It is important to balance these external customer needs with the internal expertise development needs of the PROs however, and to do this in such a way that it does not jeopardise the creativity of individuals and institutional capabilities in expert organisations, as these are the core producers of continuous knowledge creation, acquisition, and transfer, ultimately ensuring continuing innovation into the future.

Keywords
evaluation, impact assessment, societal impacts, R&D, public research organisations (PROs), polytechnics

ISBN
951–38–6784–6 (soft back ed.)
951–38–6785–4 (URL: http://www.vtt.fi/publications/index.jsp)

Series title and ISSN	Project number
VTT Tiedotteita – Research Notes 1235–0605 (soft back ed.) 1455–0865 (URL: http://www.vtt.fi/publications/index.jsp)	

Date	Language	Pages	Price
April 2006	English	79 p.	B

Name of project	Commissioned by
JYVA	

Contact
VTT Technical Research Centre of Finland
Kemistintie 3, P.O. Box 1000, FI-02044 VTT, Finland
Phone internat. +358 20 722 111
Fax +358 20 722 7007

Sold by
VTT Technical Research Centre of Finland
P.O.Box 1000, FI-02044 VTT, Finland
Phone internat. +358 20 722 4404
Fax +358 20 722 4374

Why are societal impacts evaluated? Which indicators are most appropriate in illuminating the "added value" of public research organisations? Whose needs come first? How can we best connect impact assessment to strategic steering? By analysing practices in impact assessment in five Finnish public research organisations (PROs), this publication provides a picture of these and other topical issues concerning the assessment of the societal impacts of PROs. The main challenges of impact assessment relate to prioritising strategic objectives and indicators in a transparent and concerted manner. Furthermore, as Impact Assessment is increasingly viewed as a vital tool in organisational development and learning, the implementation of Impact Assessment in the everyday work of researchers is itself becoming ever more important. As such then, Impact Assessment needs to be embedded in the basic framework of organisational objectives in order to play a more prominent role in the further development of organisational competence.

Tätä julkaisua myy
VTT
PL 1000
02044 VTT
Puh. 020 722 4404
Faksi 020 722 4374

Denna publikation säljs av
VTT
PB 11000
02044 VTT
Tel. 020 722 4404
Fax 020 722 4374

This publication is available from
VTT
P.O. Box 1000
FI-02044 VTT, Finland
Phone internat. + 358 020 722 4404
Fax + 358 020 722 4374

ISBN 951–38–6784–6 (nid.)
ISSN 1235–0605 (nid.)

ISBN 951–38–6785–4 (URL: http://www.vtt.fi/inf/pdf/)
ISSN 1455–0865 (URL: http://www.vtt.fi/inf/pdf/)