

**OECD SCIENCE, TECHNOLOGY AND INDUSTRY OUTLOOK 2004
COUNTRY RESPONSE TO POLICY QUESTIONNAIRE**

ICELAND

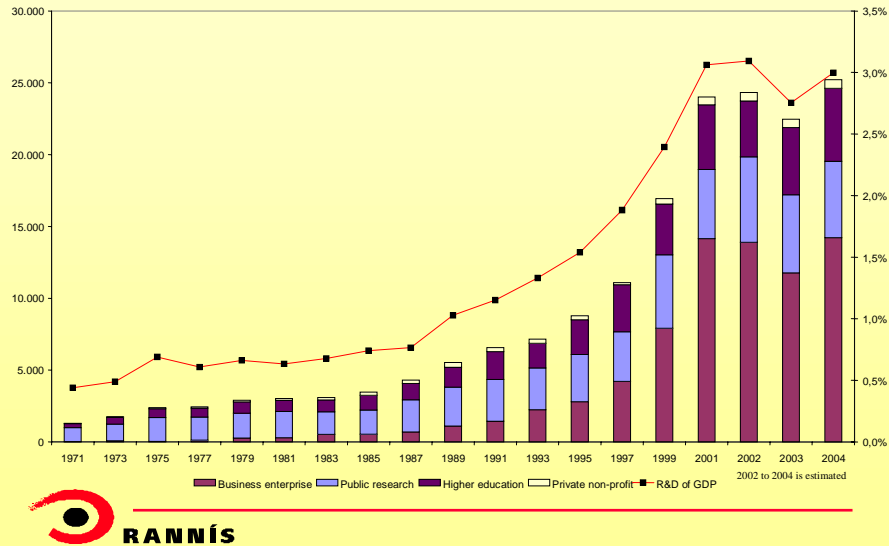
1. General framework and trends in science, technology, and innovation policy

1.1. Overview of the main directions, objectives and elements of the country's policies for science, technology, and innovation.

The main changes in science, technology and innovation policy framework of Iceland are the following:

- As indicated in the 2002 STI Outlook for Iceland a new legislation for the governance of STI in Iceland was foreseen in the near future. The new system is now in place.
- The former abolished Icelandic Research Council – RANNÍS delivered its last report on the state of the Icelandic science and innovation system. The report outlines the considerable changes that have occurred over recent decades. This includes the following (See also attached graphs):
 - A rapid rise in the national R&D spending to over 3% as a share of GDP but, based on estimates, probably stagnating and possibly falling in 2002 but likely to resume in 2004.

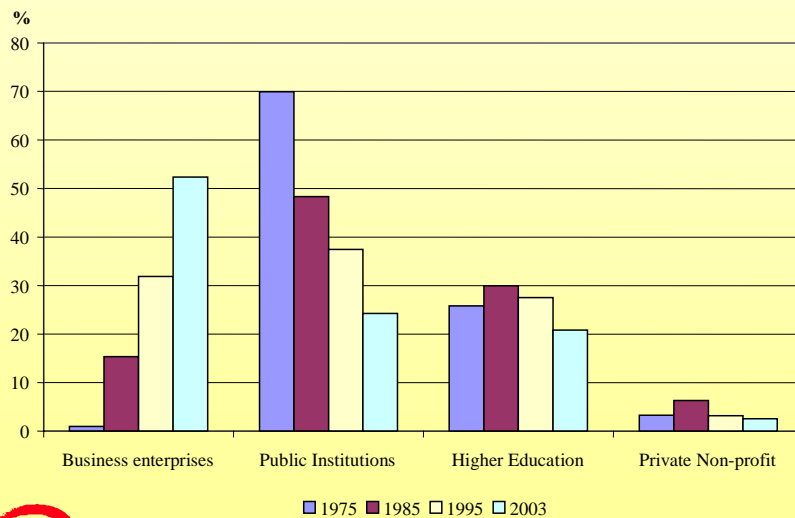
Development of R&D expenditures by performer in 1971 to 2004 and R&D share of GDP (in 2003 prices)



Source: RANNIS.

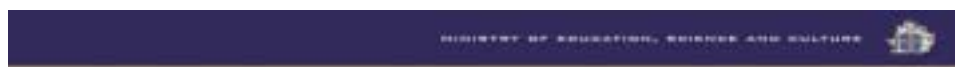
- A major relative shift in balance between the public sector and the private in funding and performing research.

Relative share of R&D performance by sectors in chosen years (2003 is estimated)

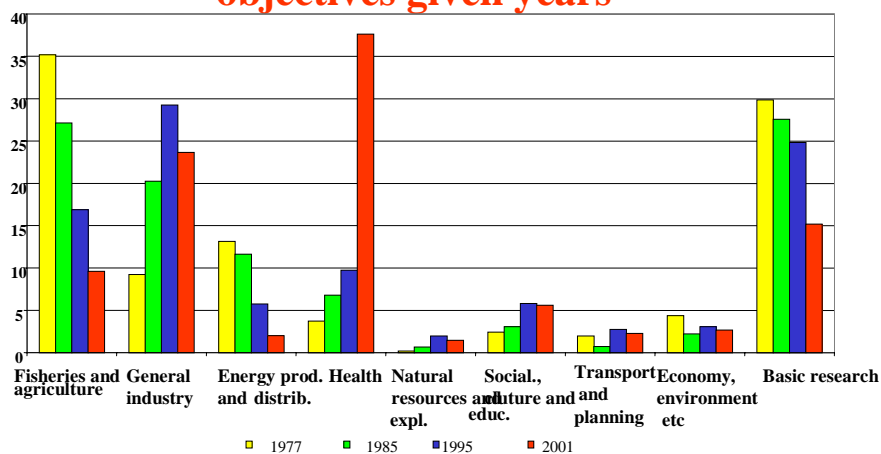


Source: RANNIS.

- A major shift in emphasis between research objectives on a national basis from natural resources pre-occupation to health and biotechnology related objectives.



R&D expenditures by socio-economic objectives given years

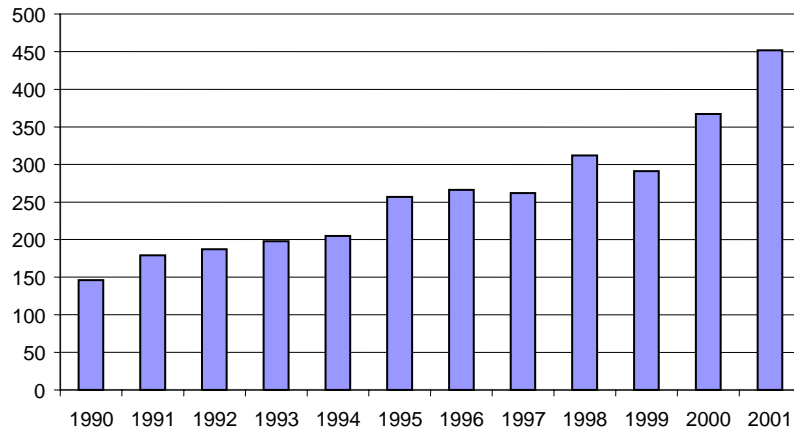


Source: RANNÍS.

- Significant improvement in performance of the science and technology system as indicated by the increasing number of scientific publications in internationally recognised scientific journals and rapidly increasing numbers of patents taken under European and US patent offices.



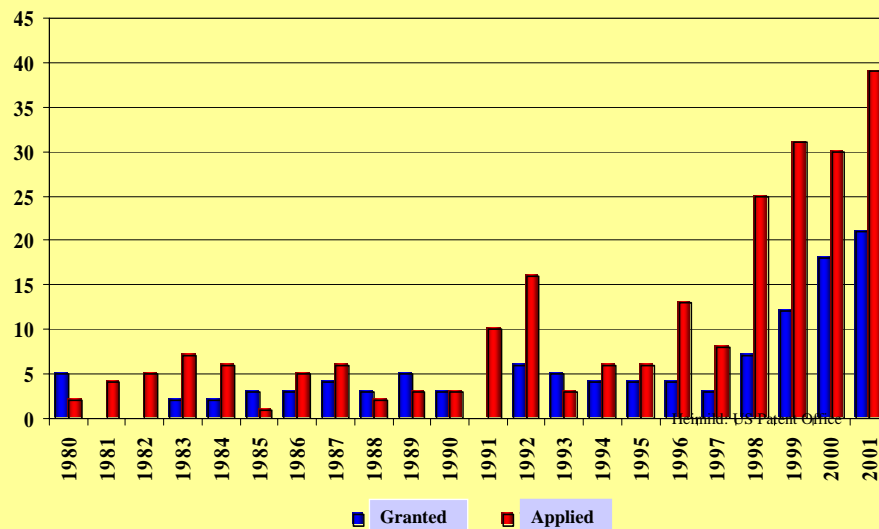
Number of publications from Iceland in peer reviewd journals 1990 to 2001



Source: Web of Science



Patents applied and granted to Icelanders by USPTO 1980 til 2001.

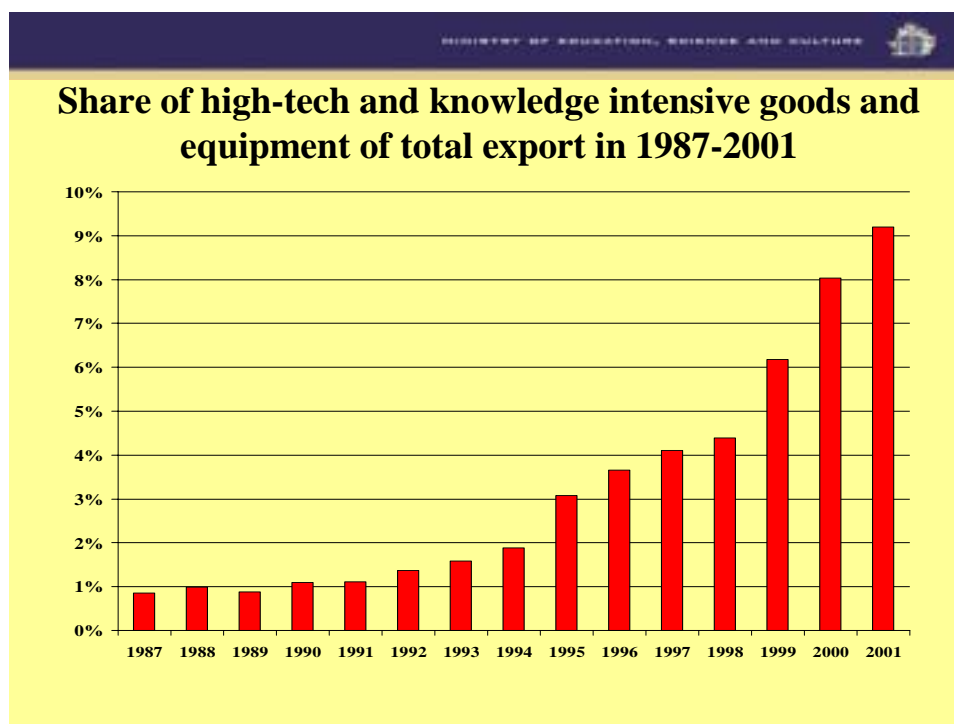


Source: USPTO

- The share in the labour market of tertiary-level graduates in Iceland has been below the OECD average. Recently a very significant rise in the higher education enrolment has developed in various fields, including natural sciences, mathematics and engineering but even more so for business education and teachers education. This is creating a strain on the higher education

system in Iceland. A technical college has been elevated to an engineering school (university level) to respond to increasing demand for technical and engineering education. An operation licence has been issued to two private sector establishments for higher education. These institutions focus on popular university subjects, business education, computing and law.

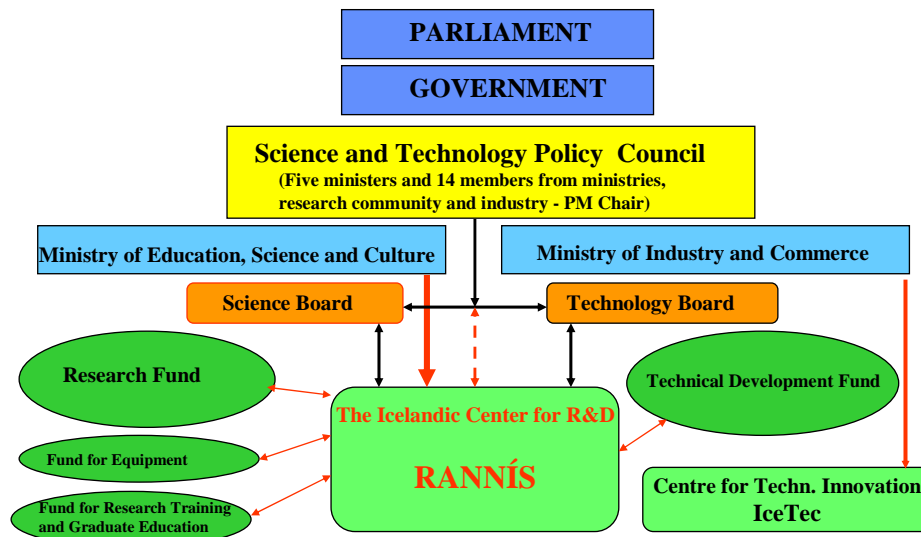
- Clear signs of a knowledge based economy emerging from a predominantly resource based growth of the 20th century as shown by rapidly rising share of technology based exports (goods and services) in the total export value.



Source: Statistics Iceland and RANNÍS

- The new legislation establishing the Science and Technology Policy Council (STPC) under the Office of the Prime Minister and its related legislation on Public Support to Scientific Research (Ministry of Education, Science and Culture) and Public Support to Technological Development (Ministry of Industry and Trade) took effect on April 1, 2003. There are five ministers on the Council and the two subcommittees of the STPC, The Science Board and the Technology Board, both have 9 members instead of 7 from the 14 non-ministerial membership of the Council. Thus there is an overlap of 4 members on the two committees, intended to ensure a strong policy link between science and socio-economic concerns, including support to innovation.

New structure for STI policy in Iceland



- On Dec 18 2003 the STPC issued its first statement on a national science and technology policy. It touches on many of the issues asked for in this questionnaire. The following is a summary of the statement (See also attached Annex for a more detailed version):

A new statement of policy for science and technology in Iceland

The Science and Technology Policy Council under the chairmanship of David Oddsson, the Prime Minister of Iceland, convened on the 18th of December 2003.

The Council is composed of the Prime Minister, the Minister for Education and Science, the Minister for Industry and Trade, the Minister for Finance, and the Minister for Fisheries together with fourteen representatives from the research community and industry. The Council is a unique forum where regular meetings are held between the representatives of the science community, the economic sectors and ministers of the Government. Thus the spotlight of political attention is cast on science and technology as the drivers of the knowledge society.

The STPC adopted at its meeting a new statement of policy in science and technology which had been prepared by the two subcommittees of the Council. The long-term policy goal is for strengthened efforts in science and technology to underpin the cultural and economic position of Iceland in an internationally competitive environment in order to secure the continued high living standards and quality of life for Icelanders at the forefront among nations. This should secure acquisition and delivery of new knowledge and competence in order to:

- Strengthen sustainable management of resources, increased wealth production and generation of attractive jobs in a knowledge based society.
- Improve health and social well-being and strengthen social responsibility and cultural advancement in a society where entrepreneurial freedom, equal opportunity and equity prevail.

- Secure the economic and cultural independence and thus the foundations of the inhabitation of the county.
- Advance the international influence of Iceland and facilitate the adjustment of Icelandic society to variable external conditions.

To further facilitate this development the Government will, in cooperation with other stakeholders in this field, take the following initiatives during its mandate period:

1. *Increase the financial resources of competitive funds* and coordinate their programmes to make optimum use in support of scientific and technological research and development as well as innovation in the Icelandic economy.
2. *Strengthen the universities as research establishments* and expand and strengthen university research in Iceland by promoting competition by individual scientists and research groups for research funding from competitive funds.
3. *Redefine the organisation and working methods of public research organisations* with the view of coordinating their efforts with the universities and the private sector companies.

Furthermore the Government will take various other measures aimed at strengthening the foundations of the scientific and technical system and thereby the position of Iceland at the forefront internationally. More specifically it is envisaged to develop strong research groups for work in an international research environment, increase cooperation between public research institutes, universities and companies and give higher priority to the training of young researchers in an international context.

In addition the Government will promote open access by the public and users to public research data and research results funded by public means against equitable/reasonable service charges for delivery. It will also create a legal framework to encourage scientists and engineers to protect their intellectual rights through patenting. It is considered imperative that the quality of research conducted at universities and public research institutions be regularly evaluated by discipline or sectors or clusters of knowledge. The results of evaluations should guide to appropriations and priority setting for research and development.

The Government will take steps to specifically strengthen the resources of competitive funds for R&D in the years to come and aims to double their annual resources from the beginning of its mandate period, 2003 to about ISK 1 750 million. In the budget law for 2004 an increase of ISK 400 million is provided of which ISK 200 million will go to the Technology Development fund which was established earlier in 2003 and ISK 100 million going to projects supporting increased value creation in seafood.

Major shifts or changes in the balance of the use of different types of policy instruments, and/or attention or support given to particular science, technology, and innovation policy areas.

The research programme supporting **environment and information technology research** and development comes to an end in 2004 and will be evaluated.

A new programme for added value from fisheries and marine resources was launched in the beginning of 2004. The policy of increasing the share of competitive funding in public financing of research is likely to sharpen strategic planning and increase flexibility in the use of public funds.

Future project or policy issues identified by technology foresight, forecasting or technology road mapping.

A joint study of the current state and future relevance of **nanotechnology** in Iceland has resulted in plans to advance this field through close cooperation on investments by universities, public laboratories and industry.

A forward looking assessment of the **state of education research** is under way addressing the future needs of the education system. The project will take into account the notions of the “knowledge based society” and the “learning society”. Icelanders are among the most active among the OECD nations as participants in continuing education.

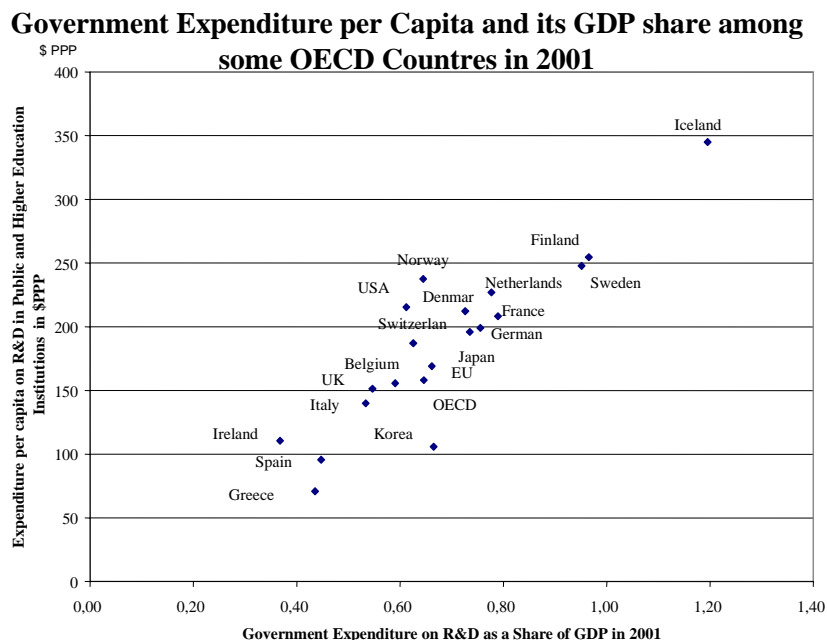
2. Public sector research and public research organisations

2.1. Major policy changes related to R&D performed by public sector organisations (mainly universities and government laboratories)

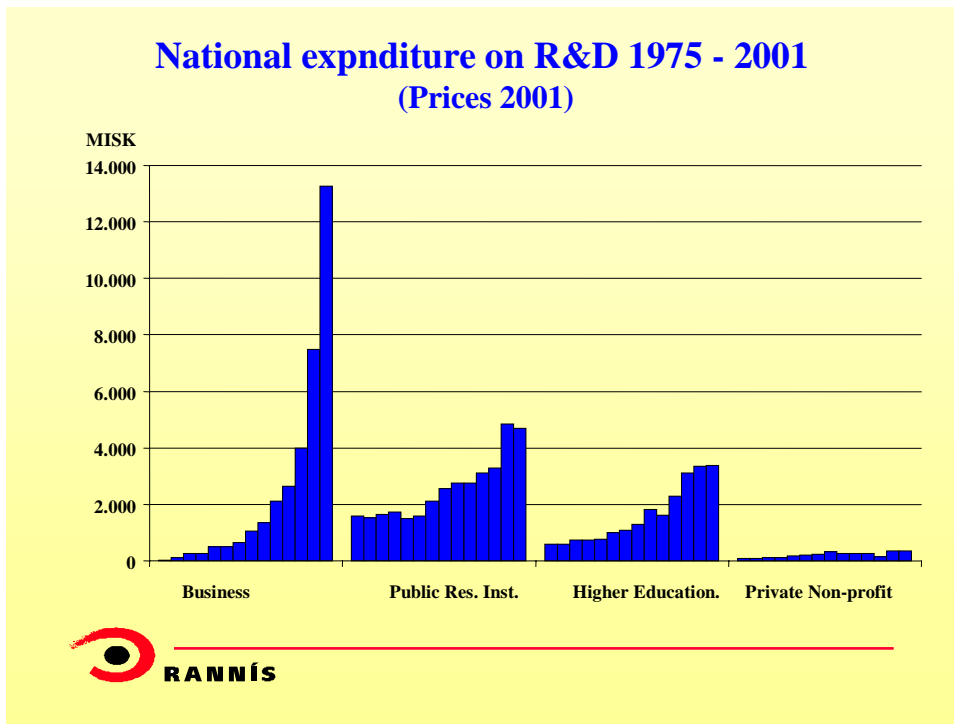
The public sector funding of research in Iceland among the highest in the OECD. The funding level is rising at about 5% per annum in real terms. A shift to more competitive funding is foreseen over the coming years without significant reduction in the level of institutional funding.

The volume of research has grown much more rapidly within the university sector than the public research laboratories. A marked shift from applied research related to natural resources towards basic research, industrial technologies and, in particular, towards biomedical and health related research and development can be seen over the recent decades.

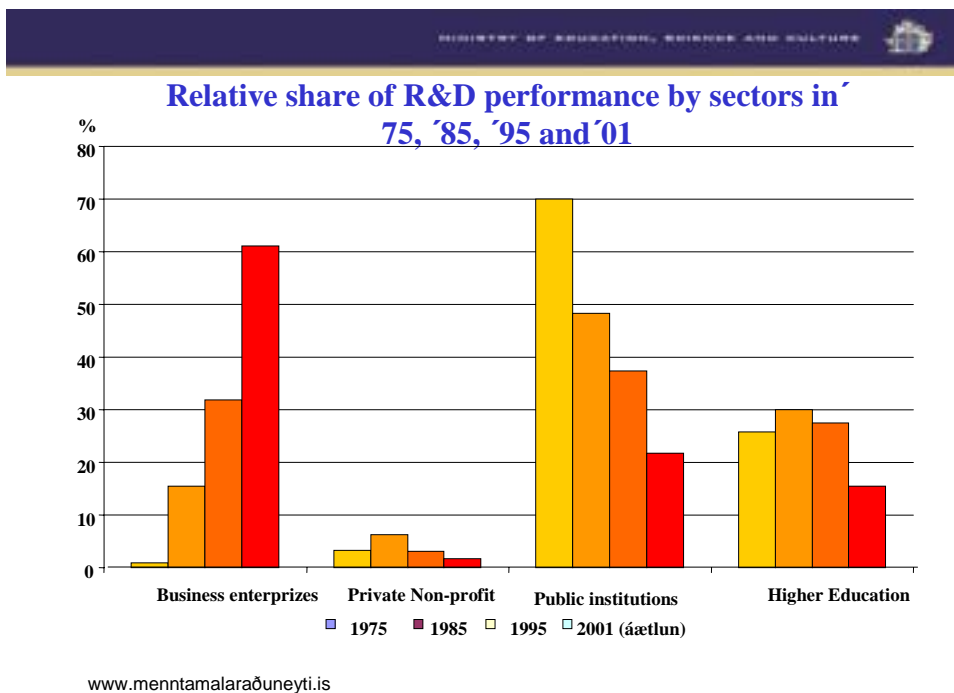
See attached figures



Source: OECD and RANNÍS.



Source: RANNÍS.



Source: RANNÍS.

The first major policy recommendation by the STPC, in its policy statement of December 18th 2003, is to increase the volume of competitive funding. Appropriations to public funds for science and technology

sponsored by the Ministry of Education, Science and Culture, the Ministry of Fisheries, and the Ministry of Industry, as well as appropriations for their administration, amounted to around ISK 800 million of the national budget for 2003. This includes about ISK 700 million to funds within the Ministry of Education, Science and Culture. The Government of Iceland has decided to raise appropriations for these funds and their administration in the 2004 budget by about ISK 400 million, of which approximately ISK 200 million would be for funds within the Ministry of Industry and ISK 100 million to a programme, under the auspices of the Ministry of Fisheries, for increasing the value added the fishing industry.

The Government intends appropriations to public funds for the sciences and technology sponsored by the above-mentioned Ministries to rise by around ISK 250 million in 2005, about ISK 200 million in 2006 and approximately ISK 100 million in 2007. Thus appropriations for competitive funds and their administration will be about ISK 1 750 million at the end of this Government's term of office, *i.e.*, around ISK 950 million higher than at the beginning of the term thus more than doubling the appropriations for competitive funding.

2.2. Major initiatives to reform the organisation and governance of universities and public research organisations.

The second main recommendation of the statement from the STPC is that the universities should be strengthened as research organisations. This will partly depend on the formulation of their own research strategies. The University of Iceland has over time through negotiations with staff developed an arrangement fixing the relative share of to be used for teaching vs. research. The research output has been monitored through publications and other statistical measures and encouraged through a system of remuneration against performance. Other university level institutions do not have a salary system that fixes share of time devoted to research among their staff.

Presently the fixed relation between research and teaching at UI is likely to be abolished or made more flexible to encourage a greater variety in the use of human resources and encourage excellence in research and research training. Methods for evaluation and monitoring of quality in research performance is under way at the University of Iceland. The STPC recommends systematic evaluation of research carried out by the universities to create a basis to link institutional appropriations to their research performance.

The Ministry of Education, Science and Culture is working on the modification of regulations affecting the direct appropriations for university-level research. One of the alternatives being examined is assuring universities a specified basic appropriation for research and toward internal development, whereas they would otherwise compete for research money. In this way increased appropriations to competitive funds would create the fresh opportunities for progress at universities, while competition would create the necessary quality control. These changes are as seen necessary by the appropriating authorities in order to guarantee that funds are used optimally and are subject to systematic prioritisation within the universities themselves as well as by the funds supporting research. However, it is important not to disrupt the foundation of the ongoing scientific and research activities that merits public support. At the same time, investment must be continued in facilities, apparatus and other infrastructure which is needed for the realisation of quality research work.

Not only does the STPC call on the universities to formulate a clear policy for themselves on research, in accordance with the overall policy of the Council, but the Council also encourages increased co-operation among universities, research institutes and firms on research and research training. The participation of research institutes in master's and doctoral studies by providing research facilities and guidance is well suited to enhancing co-operation among these institutions and meeting the needs of the economy and society in general.

The third major policy recommendation by the STPC is that the division of tasks between public research institutions themselves and their relationship to the universities ought to be revised, and eventually redefined and reorganised. The goal should be to increase co-operation, enlarge research groups, and share funds, knowledge and facilities better so as to achieve more impact on the international competitive market for technology development and innovation. Research institutes and universities have to work closely together, for instance on the training of young scientists and engineers. Another priority of the Council is co-operation on interdisciplinary projects that seem promising for innovation but firms would normally not undertake otherwise. In addition, the STPC urges institutions as well as universities to work with centres of knowledge outside the capital city area in cases where this is appropriate and where professionally attractive prerequisites can be found and local initiative brought into play.

The target is for proposals on further development of these ideas to be available at the spring 2004 meeting of the Council.

The Research Fund linked to RANNIS that was created by merging the previous Science Fund and the Technology Fund will continue and further develop the notion of “**Grants for Excellence**” started in 2002 by the earlier Science Fund. These are larger than usual project grants for three years intended to stimulate the generation of larger research groups.

As a result of changing policies by the Nordic Ministerial Council several Nordic research institutions are now to be turned over to national responsibility and while they will retain a Nordic dimension, the Nordic budget contribution will be lowered by 50% by 2006. One of these institutions is the Nordic Volcanology Institute (NVI). An agreement has been made between the University of Iceland and the Ministry of Science, Education and Culture that NVI will be merged with the geosciences divisions of the University Science Institute to form a new Geosciences Institute with a strong international dimension. A special Governing Board with international representation will be appointed by the University of Iceland to guide its strategic development and link it to international interests in the field of earth dynamics.

2.3. Major policies and government-sponsored programmes to foster international collaboration among researchers in universities and public research organisations.

International participation in work on science, technological development and innovation is one of the cornerstones in scientific and technological strategy and a prerequisite for blossoming Icelandic activity in this field. The participation in the EU Framework Programme on Research and Technological Development has been highly successful. Furthermore, interest is growing in Nordic regional co-operation within the framework of the European Research Area, as described in the Sixth Framework Programme of the EU. Sponsored by the Nordic Council of Ministers, work is proceeding toward composing a white book (position paper) on the so-called Nordic Research and Innovation Area (NORIA), which in the coming years may be expected to shape Nordic co-operation in this field. In recent years, co-operation in the area of science and technology has also grown between Iceland and the USA and through memoranda and declarations of co-operation this has been brought into a more formal structure that link it to agencies that finance scientific research in the US and in Iceland.

Active participation in international co-operation on research provides backing to overseas marketing initiatives by the Icelandic companies. Supporting technological development in firms is a significant factor in Nordic and European co-operative programmes, building in many instances on co-operation among research institutes, universities and business firms.

The Science and Technology Policy Council is of the opinion that Icelanders should take an active part in the discussion now occurring in Europe and within the Nordic countries on the possibility of reciprocally opening the support system of these countries to people in education and science in other

countries. It is probable that the professional and financial advantages will outweigh the cost of participation for Iceland.

3. Government support for private-sector R&D and innovation

3.1. Major policy changes in the individual instruments or in the mix of instruments used to provide public support for private sector R&D and innovation

A fairly complete description of current industrial policies is to be found in the 2002 STI update for Iceland. Only some of the changes and new policies are described in the following.

Tax treatment of business R&D

The corporate income tax in Iceland has been lowered in recent years from 53% to 18%. A flat tax rate of 10% is applied to capital income. The current taxation levels have met with generally favourable approval from the business community and as a result companies have decided to expand their international operations from an Icelandic home-base rather than move abroad.

Icelandic authorities have in past years worked toward simplifying tax rules and lowering tax percentages, so that firms retain a higher ratio of their income, thereby receiving indirect encouragement to engage in research and develop products bringing them future profits. The policy is not to use tax measures to encourage specific behaviour of companies. The plan is to continue on the same path, taking care when modifying tax rules that no imbalance appears between different forms of business organisations. In this regard consideration will be given to suggestions that inequalities exist among firms, public institutions and non-profit foundations in connection with the levying of value-added tax.

Direct public funding of business R&D and innovation.

The Technology Fund of the Icelandic Research Council–RANNÍS and The New Business Venture Fund (NBVF) were the main public instruments for financing applied research and development and early risk financing in the private sector. With the new law of 2003 the Technology Fund was merged with the Science Fund and the demarcation in funding criteria between basic research and applied research was removed. The NBVF was substantially weakened by losses in technology based stock-market trade in recent years. This has drastically reduced the availability of early stage seed funding, and precluded the earlier cooperation on bridge financing between NBVF and the Technology Fund. To counter this The Technical Development Fund was established in 2003 receives its first fiscal appropriation in 2004. Its mission is to support technological development and research to support innovation in the economy of Iceland. The Fund will in general operate as a competitive fund through which firms, research institutes and universities will have the possibility of financing projects that support technological development and innovation. The Fund is intended to give support to spin-off ventures and innovative firms to secure that economic benefits accrue to society from the scientific and technical knowledge and the innovation arising from these new ventures. The Science and Technology Policy Council attaches high importance to close co-ordination between the Research Fund and the Technical Development Fund, as well as co-operation with other public funds and venture investors as regards support for these firms. This will be an extremely significant factor in the scientific and technological strategy of coming years.

The Technical Development Fund can take the initiative to establish programmes and specific actions prepared in consultation with the business community, research institutes and universities, in areas which are likely to yield economic returns and have a decisive impact on developments in a given economic sector or group of companies. Finally, the Technical Development Fund is permitted to enter into partnerships with venture capital investors for seed and early risk financing toward establishing firms which base their operations on technological development and research and which involves a novelty to the

economy. The available resources of this Fund are to be ISK 200 million in 2004, rising to ISK 500 million towards the end of present Government term.

On the initiative of the Ministry of Education, Science and Culture, the Government of Iceland made a special financial appropriation for a research programme in the field of information technology and environmental research. This plan was initiated in 1999 and will be completed in 2004, with a total financial provision of ISK 580 million. Another research programme sponsored by the Ministry of Fisheries, is being launched under the label of “**Added Value from Fisheries**”. The first stage of this will last for five years with an annual budget of ISK 100 million. It was prepared in co-operation with professionals and stakeholders both in fisheries and fish processing industry.

Public procurement policies, new contractual guidelines, more competitive selection processes, etc.

The Government does not pursue active policies in this area for support of R&D.

Efforts to attract R&D investment by foreign-owned firms..

The Government does not pursue active policies in this area for support of R&D.

Support for venture capital or other sources of private sector financing (e.g. foundations).

The STPC attaches high importance to close co-ordination between the Research Fund and the Technical Development Fund, as well as co-operation with other public funds and venture investors as regards support for these firms. This will be a very significant factor in the scientific and technological strategy of coming years.

Changes in IPR regimes.

The increasing volume of scientific and research activity in Iceland raises the importance of protecting intellectual property and knowledge assets. While this was for a long period not high on Iceland's agenda, that has changed in recent years. The number of patents issued to Icelanders by the US Patent Office have risen from a steady level of 4-5 per year until 1997 to 20-25 in 2001. A similar increase is detected in patents issued by the European Patent Office. It is important that the patenting process be efficient and the legal status of employees and employer clear. There must also be appropriate incentives for registering patents and using them to economic advantage.

There are relatively few patents taken by the personnel of public research institutes and universities. The task of obtaining and defending patents remains extremely specialised and costly, and universities have not perceived benefits for themselves in attending to this matter to any degree, in particular because, according to laws currently in force, the right of use lies entirely with each and every employee.

During the current Parliamentary session, the Government has presented a bill to amend laws regarding the inventions of employees to induce the further use of knowledge to economic advantage and also to encourage universities and research institutes to register patents more frequently. These institutions need to acquire the capacity to assess the patentability of research findings and to market the patents obtained along with the knowledge lying behind them.

The STPC also believes it would contribute to greater technological development and a more efficacious business environment for Iceland to become party to the European Patent Convention.

Other forms of public support for innovation

Offering advisory support to innovation and technological development is the duty of the IMPRA Innovation Centre, established by the new law in 2003, in accordance with the policies of the STPC at any given time. The Centre has an important function in establishing co-operation among public bodies which comprise the support network for innovation in the economy. Its principal task is to shape and operate support projects tailored for small and medium-sized enterprises and individuals, particularly in regard to new entrepreneurs in the realisation of new business ventures. A special effort has been made to encourage women entrepreneurs. A regional office, The Northern Coast Innovation Centre a regional, branch of IMPRA was established in Akureyri in 2002. The importance of the regional dimension of IMPRA is likely to increase in the future.

The SPTC calls attention to the operation of support centres for entrepreneurs as an important means of connecting knowledge in universities and research institutes to the development of business enterprises. Thus IMPRA must maintain extensive co-operation with universities and institutes and provide service in this area.

The STPC believes that experience demonstrates the effectiveness of promoting public-private co-operation through so-called “innovation clusters”. Such clusters involve public bodies and groups of firms in related fields working informally together so that potential users of new knowledge meet those who hold knowledge needed by the users. Some experience exists in Iceland of carrying out projects which build on this concept; instances that might be mentioned are the Fisheries Technology Forum and the Health Technology Forum.

The SPTC encourages the Technical Development Fund, the IMPRA Innovation Centre, and the appropriate governmental authorities, as well as associations in the employment sector, to engage in further co-operation on organising innovation clusters in Iceland. Not only will this approach allow for co-ordinating the energies of numerous bodies with the purpose of achieving added success for innovation and for entrance into foreign markets, but these means will also facilitate product development, innovation and the initial marketing of new types of goods and services.

3.2. Major changes in the balance and/or priority of public support of business R&D and innovation in terms of:

No specific policies are pursued in these area other than those listed before.

4. Enhancing collaboration and networking among innovating organisations

4.1. Major initiatives to promote collaboration and networking among private firms

The STPC wishes to encourage universities, institutes and firms to work together on creating research facilities within areas defined for common purpose. These bodies might apply together, as appropriate, to the Research Fund, Technical Development Fund, Fund for Equipment, or Fund for Graduate Research Training in order to finance specific items, among which expensive instruments, data-bases, and facilities used by a number of parties might be named as examples.

Regional development will probably be determined to a large extent by success with innovation in the economy and knowledge based job-creation in the rural communities of Iceland. Research units manned by competent personnel with strong initiative can have a decisive, and positive impact on community development, especially in certain areas where it is possible to harness local uniqueness. The SPTC emphasises that universities and research institutes in regions outside the capital city area should continue

to be enabled to carry on research and technological development in fields especially well-suited to reinforcing innovation in the local economy and business life of the respective region.

In the opinion of the STPC, these endeavours should be promoted above all through the organised co-operation or linking of such rural centres to research institutes and/or universities which possess a greater breadth of knowledge and provide access to needed equipment and facilities. Regional support programmes can in this context play a significant role and promote co-operation.

4.2. Major policy initiatives to promote stronger industry/science

[See also the note on IPR issues in the public sector under 3.1 above]

The public sector fulfils an important role by funding studies of natural phenomena and processes and the monitoring of the environment, of resource exploitation, of health and of care for public welfare. The expenses for these investigations are mainly met by direct budget appropriations. In the long term the data gathered during such research can become a valuable resource to be exploited by institutions as well as private parties, or through their co-operation. As a resource usable for scientific research and co-operation among universities, research institutes and firms or among countries, such databases must be managed in accordance with international standards and their utilisation provide just returns to society.

The Prime Minister has appointed a working group to prepare legislation to facilitate the freest possible access by the public and by users to research documentation and results from work funded by government appropriations. The goal is to ensure that the public and the private sector has as much freedom as possible in accessing this information, against fair service charges. The work in this area now proceeding under the auspices of the OECD and the EU will be taken into account in determining Government policy in this area.

Increase the mobility of human resources between public and private sectors

The abolishing of lifelong tenure by public employees some years ago has had the effect of encouraging mobility in the government sector. The rise of several R&D intensive firms and structural change in the private sector has promoted this evolution further. The labour market in Iceland has in general developed towards increasing flexibility through recent agreements between the labour market partners.

Set up new modes of public/private partnerships for research and innovation.

The University of Iceland is an affiliate of the Tæknigarður Innovation Centre, while a Biotechnology Centre is operated by the applied research institutes. Several technology based firms have started operations at these locations. Recently the University of Iceland and other bodies have introduced more ambitious plans for technology parks founded on the idea of close relations between universities, applied research institutes and industry. The STPC considers proposals for technology parks and knowledge villages could fall well in line with the Council's policy and areas of priority.

Establish and develop venture capital funds and/or second-stage financing for the support of new technology-based firms or spin-offs from public research organisations

The new Technology Development Fund may have a role to play in this respect in the coming years as described above.

The Institute of Regional Development was in 2003 given a special grant of ISK 700 million to promote regional business development. Half of that fund was to be used for shares in new start-up and

spin-off firms. Among the selected projects was a biotech spin-off company from the Agricultural Research Institute for developing a method for producing pharmaceutically active proteins in gene-modified barley.

5. Human resources for S&T

5.1. Recent statistics (if available) on science and engineering graduates from universities, and efforts to increase numbers of university graduates with science and engineering degrees

Improving public understanding of science.

Some years ago The Icelandic Research Council initiated an effort to draw interest of primary and secondary school pupils to science. This involves i.a. scientists visiting schools and visits by student groups to scientific institutions, institute open house events and most recently a science week in October 2003 with a week of organised events with extensive media coverage. Annual innovation competition and awards ceremonies are organised every year at all levels of the education system. However these events do not reach all regions equally well.

An action program to strengthen the role of women in the labor market was initiated for the period 2000 – 2004 with public and private participants including the Ministry of Education and the University of Iceland. This included special measures to encourage more female students to enter into studies in natural sciences, engineering and technology on the higher educational level. (See attached information sheet).

Whether these actions can be credited or not the enrolment of secondary level students in science has been on a slow rise from 17% of total in 1992 to 19% in 2002. The participation of female students has at the same time risen from 45% to 50% of students in the science program at secondary level schools.

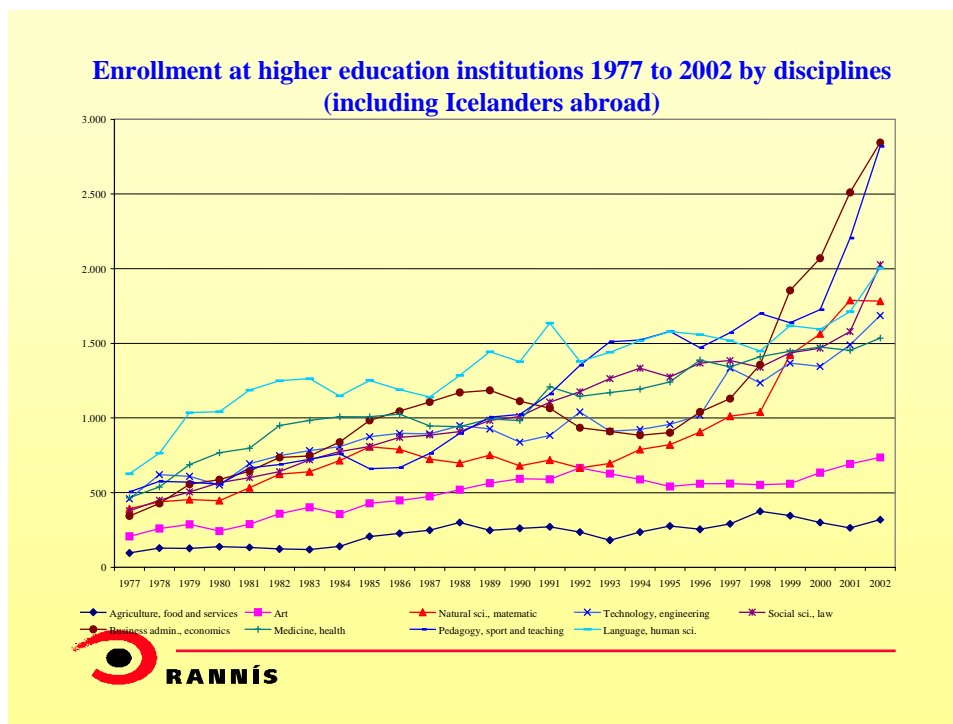
Reducing the gender gap in science education and enhancing incentives for PhD study and post-doctorate training.

After 1995 there has been a marked increase in university level enrolment in Iceland and abroad. The number of students attending university level courses has increased from 9 200 in 1995 to 15 750 in 2002 or 72%. Over 60% of the enrolled are women. By far the most rapid growth of 215% was seen in business education enrolment, followed by natural sciences and mathematics where the number of students increased by 117% and engineering and teacher education which grew by over 75% in the same period. It should be noted that the share of higher education among the total labour force was lower for Iceland than OECD average. This seems to be rapidly changing through higher enrolment in younger age-group and return by parts of the older generation to the higher education system. This is causing some strain on the public financing of that rapidly expanding system.

This growth in demand for higher education has been met by establishing undergraduate training at two new universities, expanding those at the two existing universities and transforming a technical college to university level engineering school at the undergraduate level. A total of 7 Higher Education Institutions fall under the remit of the Ministry of Education and 3 additional under the Ministry of Agriculture.

The Ministry of Education has made fundamental changes in the financial relationship with its higher education institutions. This involves time limited and performance related contracts with objective ways to determine the funding of education (and to some degree also research) and transfer of operational responsibility to the institutions. The Ministry has also taken steps to broaden the access to higher education through an operational plan on e-learning and regional access through distributed learning centres linked to the formal Higher Education Institutions.

Women have since the late nineties outnumbered men in university enrolment, most recently at the rate of 6 to 4. However they make up 44% of the enrolment in natural science and mathematics and only 25% of the enrolment in engineering and technical sciences. Efforts to encourage women to pursue science and technology careers are partly successful especially in the bio-fields but less so in engineering although their share there has risen from 19% to 25% over the last 5 years. In medical studies their presence is particularly strong in recent years where they make up 59% of the medical students.



Source: Statistics Iceland.

Graduate education at the masters and doctoral level at the University of Iceland, the largest graduate level institution, has been growing at an explosive rate, on the average 25% annually. Currently in early 2004 there are nearly 1100 masters candidates and some 110 doctoral students enrolled. Many of these students are older individuals active in the labour market. They may in part be responding to rapidly rising demand for higher education in the economy which is presently undergoing structural change due to technical change and growing globalisation. It should be noted that some 200 of these graduate students are enrolled in recently developed interdisciplinary curricula in the fields of human resource management, public administration, public health, fisheries studies, environmental studies etc. They may have undergraduate degrees in other disciplinary oriented fields and many of them are working part-time or fully employed and supported by their employers.

The gender balance at the graduate level is nearly the same as the overall balance of 60% women against 40% males, but variable between disciplines.

The growing demand for graduate education in Iceland has led the University of Iceland to place more emphasis on its role as a graduate school in an international context.

5.2. Policy initiatives taken to address perceived shortages of scientists and engineers in particular fields.

At the moment there are no defined or perceived shortages or mismatches between supply and demand for scientist and engineers. Recruitment has been active and no shortfalls have been found. International supply has made up any shortfalls in national supplies of HRST. A return of Icelandic scientist from abroad is always a significant factor. (See also 5.3 below). The return of older age groups to the higher education system and high participation rate in continuing or re-education may also help to these correct mismatches. The latter particularly in the high tech service sector.

The Fund for Graduate Research Training has the purpose of disbursing grants to research-linked graduate education. Above all, this Fund has supported university graduates engaged in research studies in Iceland toward the master's degree and fulfilled a significant function in the recent rapid expansion of research based graduate education. Nonetheless, doctoral students have become much more numerous in the past years. Since they play especially important role in research, whether in the public or private sector, the STPC emphasises their being offered educational opportunities domestically which are comparable to those offered elsewhere. The role of the Fund for Graduate Research Training should be reviewed in this context.

Already this year the resources of the Fund will be increased by 25%, then amounting to ISK 50 million.

5.3. Policy changes related to the international migration and mobility of scientific and high-skilled personnel (inward or outward mobility)

Iceland has not conceived brain drain and the lack of scientific and technical manpower as a major policy issue. Icelanders have a tradition of studying abroad but returning in due course, sometimes after several years of work abroad. The Student Loan Fund has provided loans on favourable terms for studies at foreign universities. No specific programmes have been needed to encourage their return. The Science Fund and now the Research Fund has provided a limited number of post doctoral grants to encourage resettlement of high quality researchers but the net effect of this is small.

The students choice of field of study at the university and other third level education establishments appears to be relatively market oriented despite the obvious problem of time-lag. Recently there have been concerns internationally about the future availability of S&T manpower in knowledge based industries. It appears that in Iceland student enrolments are rising in broadly those fields where demand and pay indicate impending shortages

A marked rise in graduate training at the Masters level has evolved at the University of Iceland over the last decade and more recently also at other universities. A number of the Masters students have a part-time work with companies or institutions interested in their continuing education and advanced training. The University of Iceland programme of continuing education is offering a wide variety of courses meeting a variety of retraining needs which contribute to flexibility in the HRST labour market. Last year a masters programme of training in public administration was established open to all BS/BA level graduates in all disciplines.

The number of foreign students have been increasing rapidly over recent years. The Nordic and European exchange programmes together are some of the main financial channels for promoting exchange. There were 584 students from 63 countries registered at the University of Iceland in 2003. The rather surprising development is that since 1999 there are more foreign students coming to Iceland than there are

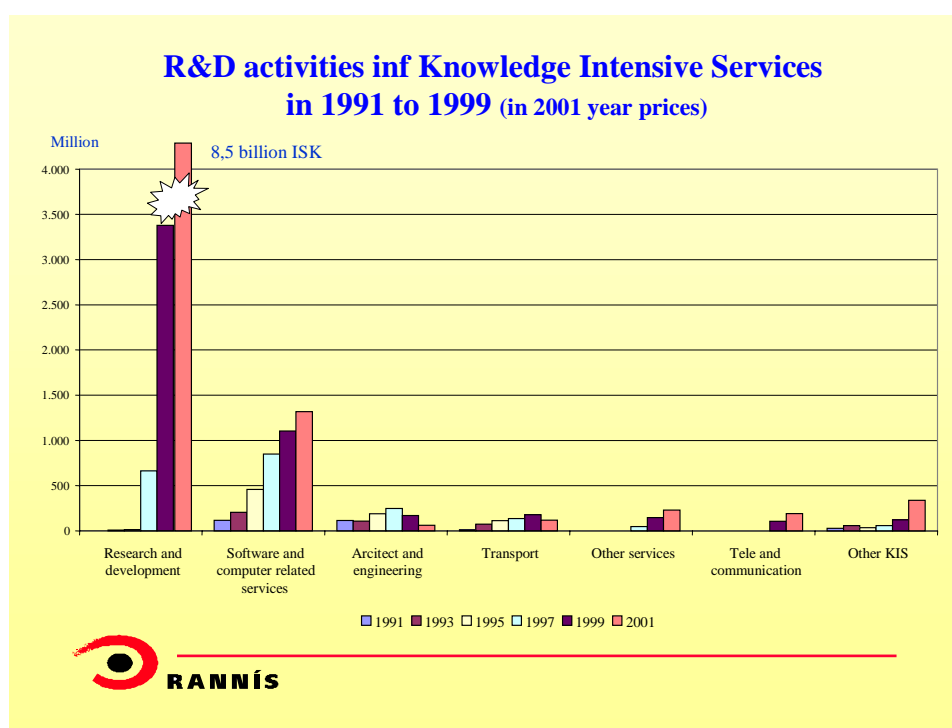
Icelandic student leaving for other countries under these programmes. This reverses a previous long-term situation.

6. Policies to boost innovation in the service sector

6.1. Policies to foster increased innovation and productivity growth in the service sector

The most important programme that has specific impact on the service-sector firms have been the information and environmental technology programmes 1998-2004 which is now coming to and end as explained before. The main beneficiaries in the private sector have been software companies. While no policies have specifically been designed to promote development in the service sector very important development has in fact occurred in that area of the economy, in particular the health and biotech research services and software related services. (See graph below). Much of the rise in R&D expenditure comes from this sector and so does the rising interest in higher education and other forms of human resource development. The companies and public and non-profit organisations belonging to this category make intensive use of the new opportunities in higher education and continuing education as described above. The initiative comes more from the private sector itself than direct public policy intervention. It should also be noted that Icelandic companies recruit freely in the international arena as discussed above.

6.2. Any available information or statistics on the participation of service-sector firms in innovation programmes that are not targeted specifically at the service sector, but are open to service sector firms.



Source: RANNÍS.

7. Policy evaluation

7.1 Recent changes in policies regarding the evaluation of innovation policy programmes or institutions.

The notion of formal evaluations of programmes and institutions is a rather underdeveloped policy arena and as an instrument for policy implementation and follow-up. It has been introduced into the educational system at the primary and secondary level, but not to the tertiary level as yet. Based on recommendation by the STPC Statement of Science and Technology Policy, The Ministry of Education is now initiating an evaluation of the scientific effort performed at the University of Iceland. An evaluation of educational research is presently ongoing through a joint project between the Ministry of Education and RANNÍS. An evaluation of the research programme on information technology and environmental research is planned to start after its termination this year.

7.2. Information, if available, about the outcomes of recent major evaluations of R&D or innovation policies.

No other specific efforts have been made towards evaluating innovation policy programmes or institutions recently.