Knowledge Transfer – universities building the society, the Finnish case

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Background

University research is a key factor in the success of the Finnish society. This has bee stated in many official documents, such as the *Government Programme* of 1998, *Governmental development plan for education and research for the years 1999 – 2004*, and the *Report of the Science and Technology Policy Council 2000: Challenges of information and knowledge*.

Innovations made in universities, as well as research and development work done in co-operation with the industry are the basis for creating many new products and services. In Finland, the co-operation of universities with outside partners is not limited to the industry and private sector. Other organisations, public administration and municipalities also utilize universities' knowledge and critical approach in many ways in preparing different policies. University researchers are members and experts of State committees and working groups, they are heard in the Parliament, and they participate actively in the public discussion.

Finnish education system

Since the 2nd World War, higher education has played an essential role in the Finnish national policy. In addition to the development of general and vocational training, this policy can especially be seen in the establishment of a network of universities that cover all regions of the vast country. Nowadays, there are 21 university level units (ten multidisciplinary universities, three technical universities, three schools of economics and business administration, four art academies and a military academy; *figure 1*) as well as 31 vocational higher education institutions, called polytechnics. Since the beginning of the 1970's, all Finnish universities have been State universities.

The Finnish national education system is described in *figure 2*. At the moment (in 2000), about 20 000 new students enter annually at the universities, and almost 30 000 (1998) enter vocational higher education institutions (polytechnics). At universities, tuition fees are forbidden by law, and they don't exist in polytechnics, either. A financial aid system guarantees the students a study grant for 55 months.

University funding

The continuous economic growth of the 1980's in Finland meant increased resources also for the universities. This steady growth was coupled with strong external steering. In the beginning of the 1990's, there was a shift to a new way of thinking and working in the universities. Budgetary and regulatory control ("steering by inputs") has gradually been replaced by management by results. Management by results is based on result negotiations in which universities and the Ministry of Education set objectives and agree upon the amount of degrees and the required funds for the next three-year period; this is called result agreement. The universities have a fair amount of freedom in deciding how to allocate the granted funds to most effectively obtain the set objectives.

The operating expenditure agreed upon in these result negotiations comprises basic funding, project funding, and performance-related funding. In basic funding (about 90%), a formula-based funding model has been gradually implemented from 1997, and it is now in full force. It allocates basic funds to universities according to their target for Master's degrees and doctorates weighted by field of study and some other factors. The resources are allocated to education and research in the ratio of 60/40, where Master's degrees represent results of education and doctorates represent results of research. As this has been seen a bit problematic, concentrating too much on quantity and neglecting quality, a working group will be set up to examine the effects and possible improvements of the model.

Research policy

The decision making and research funding systems of the Finnish research policy are described in *figure3*. The Science and Technology Policy Council is an advisory body to the government, chaired by the Prime Minister with i.a. several other Ministers as members, as well as university rectors and representatives of research funding and industry. In recent years, the Science and Technology Policy Council has been significantly involved in preparing the national research policy and decisions.

Research funding

The Academy of Finland concentrates on basic research, and it funds research programmes and projects, most of which are carried out in universities. To create favourable research environments, the Academy of Finland names and funds centres of excellence in research in universities. They are chosen at the proposals of the universities and based on thorough, international peer reviews. The Academy funding requires almost always also funding from the university, and in fields where it is natural, other external funding, usually from companies. It is clear that this kind of activities have to form part of the universities' own strategies.

The National Technology Agency, *Tekes*, which operates under the Ministry of Trade and Industry, is the most important financing organisation of technological research. It funds especially applied research and development, and is responsible for the transfer of research results to industry and services. *Tekes* is the responsible co-ordinator in Finland of many EU research and development Framework Programmes and other technology programmes.

The Finnish National Fund for Research and Development, *Sitra*, also plays an important role. Lately, *Sitra* has i.a. been leading a research programme about the needs and challenges of the growing elderly population in Europe. *Sitra* has also been charged with evaluating the impact of the increased research funding of the past few years in Finland. The evaluation is carried out with international experts.

Change in the work environment of universities in the 1990's

In addition to management by results (see above), an assessment system has been created. The independent *Finnish Higher Education Evaluation Council* supports universities in their development activities. The frame for structural and operational changes has been set by the university law of 1998. It defines the universities and their tasks and administration on a quite general level, giving universities a considerable autonomy in organising their internal structure and activities.

The change was accelerated and also rendered somewhat dramatic by the economic depression, which during the period of 1993 – 1994 cut the operating expenditure of the universities by ca. 15 %. The economic difficulties also hastened the efforts to strengthen co-operation with external partners and to look for new forms of activities and funding. Research service units were established to actively search for partners in industry and commerce and to offer suitable university research units and groups to companies. Today, the funding universities receive outside the State budget forms a bigger part of their operating expenditure than in most countries of the world.

National strategic goal: knowledge society

The most severe consequence of the recession was, of course, the rapidly grown unemployment. As the reasons for the unemployment were structural, it was decided that employment could be permanently improved only by profound structural changes. Education and research and development were recognised as key factors on which new, knowledge based production and services can be built. The solutions can be seen in strategic decisions and measures taken on different levels.

In 1996, the government passed a resolution to raise the level of R&D funding to 2,9 % of the GNP by the end of 1999; at the moment it is well over 3 % (*figure 4*). In addition to State investment, the business sector is responsible for 70 % of the volume of research funding. The percentage is so high that universities wish the government would balance the situation by increasing its own share.

A notable share of the increase of research funding is channelled through universities. It's obvious that this has put considerable strains on the infrastructure of universities, their room, information service, and research equipment capacities. That is why universities try to convince the government of the necessity to increase their basic resources in order to fully make use of the opportunities of the research funding gained by quality-based competition.

Life long learning, open and distance learning, open university, and continuing education are central parts of the national higher education policy. The efforts to decrease the unemployment by retraining are aimed at contributing to the necessary structural changes and at meeting the new challenges of the work life. All universities have their own continuing education centres that also serve the open university. As part of the education they provide is especially designed to respond to acute needs of the working life, the centres form important contact points between the universities and the business sector, as well as e.g. between State, regional and municipal administration.

The consortium of Finnish Virtual University was founded in January 2001, and activities and projects are being created. All Finnish universities are involved in the activities, open to both degree students and open or distance learning.

All university libraries are networked, i.a. all their directories are shared, and special attention has been given to develop electronic information services.

Improved research environments

Money alone is not enough, human resources are also needed. To increase the amount of researchers, a system of post-graduate schools has been created in the 1990's. In 1985, about 250 doctors graduated annually, now the number of doctoral degrees is about 1200. For the period of 1999 - 2004, an even higher target number has been set, namely 1400 doctorates. Researcher training has been increased specifically so that there would be enough researchers for both universities and research organisations, as well as the growing needs of industry and commerce. The latter recruit an increasing number of researchers: since 1995, more than 50% of people with researcher training work in companies. This way, national competence is built with education, and knowledge is transferred broadly to the society.

In order to encourage young talented people to commit themselves on a career in research, also a system of post-doctoral researchers has been created in universities, in co-operation with the Academy of Finland.

Internationalisation

Internationalisation has been an essential part of the development above described, both in research and education. In the beginning of the 1990's, Finland joined several international organisations (i.a. CERN, ESA, EMBL, and ESF). As the exploitation of research results and innovation transfer are the premises of the Framework Programmes of the European Union, Finland has been able to profit successfully of its experiences in the co-operation between the scientific community and the business sector. Finland has been successful in the European Union education and training programmes, too, and has invested considerably in serving both outgoing and incoming exchange students and teachers.

Intellectual property rights (IPR)

The increase of research funding has been made with high expectations for improving employment and creating new business branches. To ensure that there are no gaps in the innovation chain (*figure 5*), a system is needed to ensure that applicable research results gained in universities and research institutes are made to profit also economically.

Unlike in many other countries, Finnish universities don't own intellectual property rights (IPR), they belong to the researchers themselves. For example, when a company joins in the further development of the invention, an agreement has to be drafted to determine the relations between the inventor, the university and the company, the goals of the project and the economical repercussions. Usually, the IPR is transferred to the company as soon as possible. Universities are now developing a system in which researchers, with reasonably modest research awards, are encouraged to report potential inventions.

IPR exercises

In 1998, a working group set by the Ministry of Education and chaired by professor Ossi V. Lindqvist, published its report on the intellectual property rights of university researchers. The report suggested many ways to improve innovation transfer in universities. However, only one of the means was publicly discussed, namely the suggestion that the existing law on IPR should be changed.

As the discussion seemed to get stuck to the one issue of changing the law, the Finnish Council of University Rectors (FCUR) set up a project to develop the innovation activities as a whole. Started in 1999, the project was economically supported by the Finnish National Fund for Research and Development *Sitra*. The IPR working group of the FCUR was chaired by rector **Jarl-Thure Eriksson** of Tampere University of Technology, and the FCUR group steered the *Support Services of Innovative Activities in Universities* –project, also financed by Sitra and chaired by director **Veijo Ilmavirta** of Otaniemi International Innovation Centre. All Finnish universities participated in the project.

A common development and learning project

The first two-year phase of the FCUR project was finalised in May 2001. The aim has not been to change the existing law, but gather experience, develop good practises and agreement models, and train the researcher community on intellectual property rights issues. Innovation transfer services have been created according to the different characteristics and environments of universities, and a national co-operation network has been set up. The support services concentrate on developing versatile services and expertise to make good use of the inventions and to ensure the rights of all parties. Small units have joined the national service network and buy the services they need from bigger universities. A manual on transfer agreements has also been published. Training of experts and support service personnel in universities continues.

Increased awareness of IPR issues

The *Support Services of Innovative Activities in Universities* –project has developed innovation support service solutions according to the different characteristics and environments of universities. The solutions differ from each other mostly in the level of externalisation of different services. It has shown that it is possible to develop, and it has been developed, well working innovation support services in universities. It has induced among researchers and other partners' trust on the university's will and ability to take care of innovation transfer. The project has also brought up many concrete issues that cannot be dealt with immediately. Continuing work is therefore necessary.

The most important conclusions of the steering group are presented below.

It can already be noted that, in a relatively short period of time, the project has managed to stir universities' awareness about the importance of the concrete innovation issues, to create well working systems and solutions, to set up a university network, and to develop common operations models. The information gathered, and the models and practises created during the two years of the project have been significant when drafting the recommendations of the FCUR working group.

Universities and their environments are very different from each other. Although the innovation service project has created - and thus a general, multi-purpose operations model has been presented - universities must be able to develop individual solutions for their innovation activities. When giving its recommendations, the working group has emphasized this principle. However, freedom does not mean that no system is needed at all; every university must have an innovation strategy and procedures.

Future measures in universities

Universities need to create rules of innovation activities that will guide research co-operation and related agreements, transfer of IPR rights, and university researchers' entrepreneurial activities. Universities must offer a minimum standard of services to guarantee that recognising inventions is in the hands of universities themselves, and that researchers can rely on the professionalism and confidentiality of the innovation transfer services.

National measures to be taken

It is important to guarantee the continuity of the network created during the project. That will ensure the development of agreement models, the accumulation of special expertise and information transfer, increase the knowledge of research and innovation advisers, strengthen the development of entrepreneurial services, and continually maintain necessary training.

Although it is primarily the task of universities to take care of the work environment and conditions of researchers and to support their motivation, they must be taken into account also in developing the national innovation transfer system.

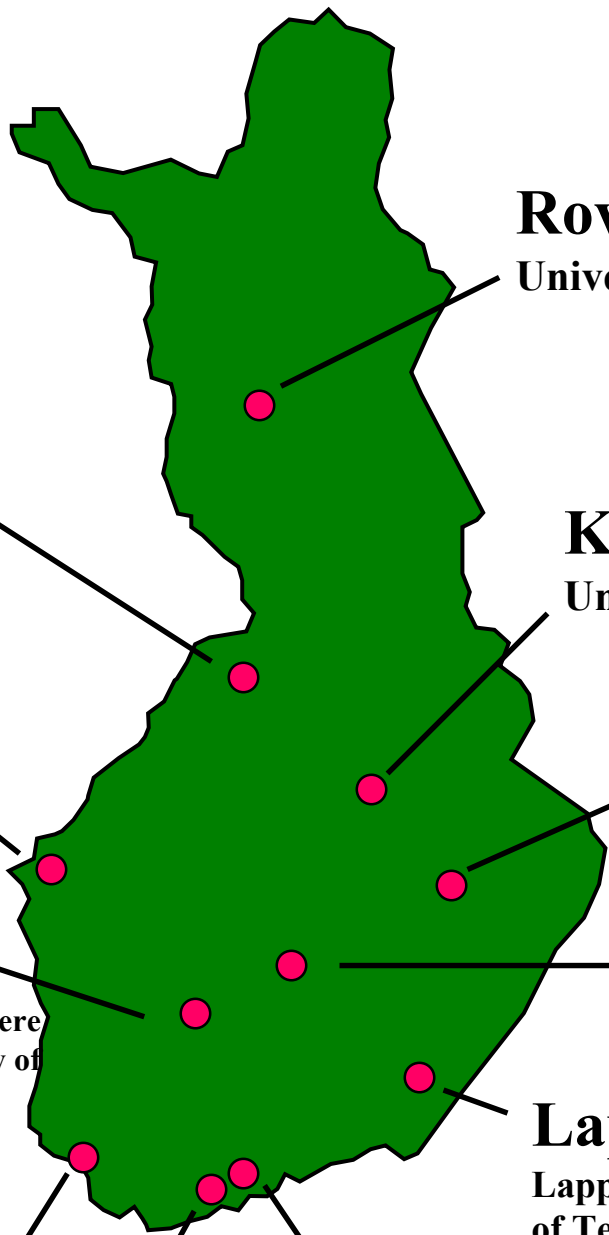
The position of the universities as a part of the civil service system limits their possibilities to act actively in innovation transfer and to take responsibility of it. The working group thinks that university legislation should be reviewed to clarify the jurisdiction of universities and to increase their economic autonomy so that universities can be responsible for innovation transfer.

Joint measures of universities, the Ministry of Education, the industry and other research funding organisations must be taken i.a. to clarify the legal position of universities as an active participant in commercial exploitation of research findings, to create legally sustainable frames for furthering co-operation between universities and enterprises, to examine what changes the growing needs of the national innovation system will generate in universities' degree education and continuing education, and to find motivators for innovation activities in the universities' result steering system.

Conclusions

Finnish universities embrace the view that universities play a major role in promoting the development of the society and contribute to solving major problems with research and higher education. They want to work in close co-operation with the surrounding society. Guiding students to work with industry and commerce, and to do research for their diplomas, thesis, etc., about subjects close to production and services, is an excellent way to educate experts who can meet the challenges of the working life. The research co-operation universities have with the business and the public sector genuinely promotes the development of knowledge based production and services. As the central mission of universities is to look at the world and its development with a critical eye, they cannot yield to market forces, only. By being critical the university fulfils one of its central service functions to society. That is why the co-operation of universities with their environment has to be in line with their strategies. Then it will serve, in a healthy way, both universities and national and international development.

THE UNIVERSITY TOWNS



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University of Lapland

Oulu
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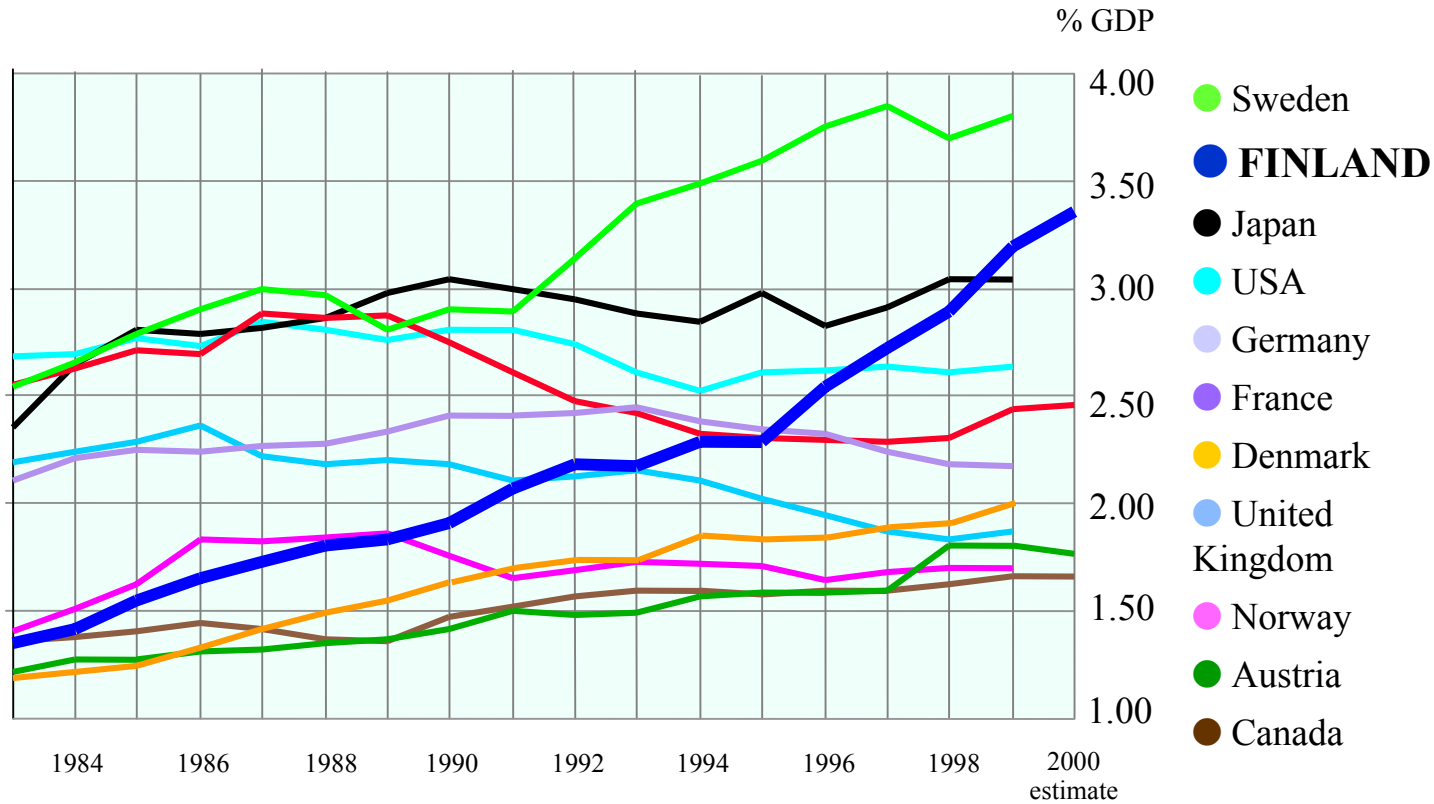
R&D input in some OECD countries



Source: OECD, Main Science and Technology Indicators 2000

7.9.2001

FIGURE 4