



*OECD/IMHE - Supporting the
contribution of higher education
institutions to regional development*

**Self-evaluation report of the Jyväskylä
region in Finland**

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FOREWORD

In last years, the national and regional strategies have put increasing expectations on HEIs as a source of innovations and know-how as well as a producer of economic and social welfare. The HEIs are expected to play an important role in achieving several political objectives. An extended role of HEIs and increasing expectations have been taken account also in the strategic policy lines of the Ministry of Education and in the new legislation that came into force recently. The central aim of the legislation is to strengthen the societal interaction of HEIs as a natural part of their core functions. Thus, the legislation should rather be seen as a tool for stressing the societal importance of science and education than as a new separate task. With the extended role of HEIs, however, it is time to deepen this societal interaction by means of new modes of action. As a part of larger OECD coordinated project the self evaluation process and the report on hand form an excellent opening to meet this challenge.

This critical self-evaluation brings up several starting-points that aim to further develop the societal interaction of HEIs. The key outcomes of the evaluation can be summarized as a need for the brave choices and deeper collaboration between the HEIs and their stakeholders. The efficient management of regional interaction requires strategic choices. It is not purposeful to decentralize the resources of HEIs too much in the field of societal interaction. The HEIs should also be able to determine the activities that are not relevant to their operation. From the point of view of leadership, it is the question of profiling and prioritizing of activities. On the other hand, the leadership of societal interaction cannot be solely based on the internal starting-points but it also requires a close coordination of strategies in cooperation with the stakeholders. The interaction between the society and HEIs should be two-way. A prerequisite for the efficient societal contribution of HEIs is that the society and its actors also actively contribute to the development of the operation of HEIs.

This self-evaluation would not have been possible without a significant contribution of the personnel of HEIs and their stakeholders to this development process. They all deserve great commendation for their effort. Numerous discussions have revealed that there exists a real development ethos among the participating actors. The evaluation process carried out allows a concrete opening for the common learning process and capacity building to further strengthen the regional contribution of the University of Jyväskylä and Jyväskylä Polytechnic. To enable an effective exploitation of the results of this self-evaluation there is a need for close strategic cooperation and for concrete joint measures between the HEIs and their stakeholders. This forms the next step to be taken in the near future.

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SUMMARY

Together with 13 other regions from different OECD countries the Jyväskylä region is participating in the project that aims to boost regional contribution of higher education institutions (HEIs). The overall project *Supporting the contribution of HEIs to regional development* is coordinated by the OECD programme on Institutional Management of Higher Education (IMHE). As a part of the regional development process a cooperative self-evaluation, which gathers together the HEIs and their stakeholders, has been launched in each region. This is followed by the review visit of an international review team which aims to further support the regional learning process. In the Jyväskylä region all central actors were participating in the self-evaluation process and content of this report is based on their viewpoints on prevailing situation and potential focal points for development. The regional steering committee consists of representatives from the University of Jyväskylä, Jyväskylä Polytechnic, Regional Council of Central Finland, City of Jyväskylä, Jyväskylä Regional Development Organization (JYKES), Jyväskylä Science Park, Federation of Central Finland's Enterprises, Central Finland Chamber of Commerce and the Ministry of Education. The member organizations of the steering committee participated also in the funding of the project. In addition, the expertise of the State Provincial Office of Western Finland and Employment and Economic Development Centre of Central Finland was used in the process.

The self-evaluation process of the Jyväskylä region was coordinated by the Expert Division of the University of Jyväskylä. The main objective of the self-evaluation was to produce a versatile description about the contribution of HEIs to the development of the Jyväskylä region, and practical information on possible bottlenecks of the process and potential development fields. The self-evaluation is basically intended for the support of learning and development process. Interaction between the HEIs and their regional stakeholders was analyzed and processed through interviews, questionnaires, workshops and work of the regional steering committee. Within the HEIs the evaluation data was gathered from the central management, management of different units (faculties, schools, separate units), experts of different themes and from the development personnel. In regard to stakeholders the interviews were mainly directed to the leadership of organizations and thematic experts.

The self-evaluation revealed that the starting-points of regional interplay differ markedly between the two institutions and between the faculties and schools within them. In the Jyväskylä Polytechnic the regional interaction is one of the most important vertical aspects guiding its operation, whereas at the University of Jyväskylä the regional contribution is rather seen as a horizontal theme which maps the applicable channels for regional exploitation. Part of the faculties / departments / schools have integrated the regional contribution as a key field in their operation, whereas in the others the need for regional interaction is only recognized but not real measures have been taken so far. However, when analyzing the regional contribution of HEIs the ability of regional actors to use the know-how produced by the HEIs should also be taken account.

Despite the different starting-points the HEIs cooperate actively and interact with their stakeholders to contribute regional development. Several important regional development processes are in progress in HEIs in which the regional intermediary organizations and firms have a significant role as well. On the other hand, a lot of potential for strengthening the regional contribution is still unused. However, the exploitation of that reserve requires a new kind of approach in which the HEIs collaborate closely with each others as well as with their stakeholders. Both the HEIs and their stakeholders have recognized a need for a common forum that supports the strategic planning. Moreover, it is considered essential that the cooperation between the HEIs will be further deepened to rationalize and strengthen the regional development work.

Keywords: higher education institutions, evaluation, regional effects, societal interaction

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I INTRODUCTION

1.1 Strengthening the role of HEIs in regional development

The Finnish higher education system comprises two sectors: universities and polytechnics. The traditional university sector consists of 20 universities and art academies, all of which carry out research and provide education awarding degrees up to doctorates. According to legislation governing universities, their purpose is to promote independent research and scientific knowledge and to provide the highest education based on this research and knowledge in their particular fields of study. Universities must also aim to prepare students to be of service to their native country and all humankind. The polytechnics are more practically oriented, training professionals for a large variety of occupations and professions. There are 29 polytechnics in Finland. Most of them are multidisciplinary, regional institutions, which give particular weight to contacts with business and industry. Polytechnics are developed as part of the national and international higher education community, with a special emphasis on their expertise in working life and its development. In addition to the educational task, the polytechnics carry out R&D relevant to their teaching and to working life.

The regional role of higher education institutions (HEI) is becoming more and more important. The regional development task is explicitly defined in the new Polytechnics law, which stresses co-operation with business and working life especially in the polytechnic's own area of operation, and collaboration with other educational institutions. Also in the university sector the impact of education and research on surrounding society and region has gained increasing attention. However, in this sector the regional development task does not have such an emphasized and explicit role as in the polytechnic sector. The new Universities Act, which came into force in August 2005, highlights the significance of societal interaction associated with the basic duties (education and research) of universities. In public debate, this societal interaction has often been strongly connected to regional development. The aim is to act in close collaboration with the surrounding community and to transfer the body of knowledge to the use of society and industries.

Moreover, the Ministry of Education in Finland stresses the complementary knowledge of universities and polytechnics, to be developed with a special emphasis on the strengths of regions. On request of the Ministry of Education, the University of Jyväskylä and Jyväskylä Polytechnic among other HEIs in Finland prepared in 2002 a joint regional strategy, which was updated at the end of September 2005. In order to meet the increasing regional expectations, the main focus of updated regional strategies is expected to be on developing cooperation between HEIs and supporting the interaction between the HEIs and society based on a clear division of work. This requires for both institutions to be capable of identifying their strengths, renewing their operating cultures, and increasing mutual trust between each other and in relation to other regional actors.

The University of Jyväskylä and Jyväskylä Polytechnic are among the key actors in the region of Jyväskylä and in Central Finland as a whole, and their significance in supporting regional competitiveness is increasing. The development of the Jyväskylä region comprises several milestones which have influenced the regional contribution of HEIs in the Jyväskylä region. The key milestones in the period of the past twenty years are presented in Table 1.1. They can be internal or external to the operation of HEIs.

YEAR	KEY MILESTONE
1987	Launching of intermediate services supporting the HEIs regional involvement (Jyväskylä Science Park)
1989	Launching the development programme of applied sciences by the University of Jyväskylä
1989	Launching of the Information Technology Research Institute (ITRI)
1992	Foundation of the Jyväskylä Polytechnic
1994	Launching the Regional Centre of Expertise Programme in Finland
1995	Adopting the European Structural Funds as a tool for regional contribution of HEIs
1995	Launching of regionally orientated Master's Degree Programme -series in the University of Jyväskylä (European Structural Funds)
1996	Launching of intermediate services supporting the HEIs regional involvement (Jyväskylä Regional Development Company Jykes Ltd)
1997	Launching the BA programme of wellness technology in Jyväskylä Polytechnic
1997	Foundation of the joint building of the applied chemistry of the University of Jyväskylä and Jyväskylä Science Park
1998	Foundation of the Faculty of Information Technology
1999	Foundation of the Jyväskylä Polytechnic's Institute of Information Technology and Institute of Natural Resources (located in Saarijärvi)
2000	Foundation of the Agora building
2001	Launching the Regional Centre Programme in Finland
2001	Launching the Career and Recruitment Services of the University of Jyväskylä
2001	Foundation of the R&D support unit of the Jyväskylä Polytechnic
2002	First joint regional strategy of HEIs
2002	Foundation of the Agora Center (multidisciplinary human technology center)
2003	Launching the pilot of regionally oriented Polytechnic Master's Degree programmes in Wellness technology and in Health Promotion and Preventive Work
2003	Foundation of the Wellness Technology Center (Viveca)
2004	Foundation of the Nanoscience Center to support the future development of the nanotechnology
2005	Launching of permanent Master's degree education in Jyväskylä Polytechnic
2005	Participation in the OECD-project <i>Supporting the Contribution of HEIs to Regional Development</i>
2005	Updating the Joint Regional Strategy of HEIs

Table 1.1 Milestones influencing the regional contribution of HEIs in the Jyväskylä region in 1985-2005

1.2 Central national processes connected to the regional role and contribution of HEIs

Several national development processes are currently in progress in Finland, affecting also the societal and regional contribution of HEIs. One of them is the Government productivity and efficiency programme which aims to increase the productivity and effectiveness of operation in the field of public administration. The key reasons for launching the programme include, e.g., increasing costs and relatively low productivity of public services, increasing competition for competent workers due to ageing of population, and pressures of population and regional development on provision of public services. The HEIs are also involved in this process of change and, for instance, the renewal of the structure of the higher education network towards larger units, cuts in university staff, decrease of student intakes (due to diminishing age groups), and increase of the economic autonomy of universities have been under debate during autumn 2005. Recent discussions in the HE sector refer to the change of focus from regionally equal coverage of HEIs to quality and international competitiveness. The measures to be taken in the future might have considerable effects (both positive and negative) on the capability of HEIs to participate in regional development. In the best case scenario the prerequisites for the operation of HEIs might be improved through the reallocation of resources.

To address the same theme, the Ministry of the Interior launched in 2005 a process which aims at a renewal of the municipality and service structure. The main goal is to ensure a sufficient structural and economic foundation for the provision of municipal services in the future. At the same time, the quality, effectiveness, accessibility and technological development of services will be taken into account. Three different models of a new regional structure have been under heated debate, and whatever the final decision, it will have effects on the regional policy and to some extent also on the operation of HEIs.

Furthermore, the regionalization of government administration might influence the operation of HEIs and their regional effectiveness. Regionalization means relocating central government functions outside the Greater Helsinki Region. The objective of regionalization is to improve governance and enhance regional

development. The aim is that regionalized functions and the expertise of regions will support one another. All central government functions can be regionalized in principle. The establishment of the unit of National Research and Development Centre for Welfare and Health (STAKES) at Jyväskylä is part of the regionalization process.

Besides the above mentioned processes, several programme periods of regional development will stop at the end of 2006, which causes uncertainty also in the HEIs. The projects funded by EU Structural Funds have been an essential tool of regional development. The new programme period will, however, involve changes in the volume and contents of programmes. These changes will probably have great impact on the resources of HEIs as regards, e.g., regional R&D and continuing education. The changes of contents, focuses and target areas of the special national programmes, like the Regional Centre Programme and Regional Centre of Expertise Programme, will also influence the regional contribution of HEIs, but it remains to be seen what the magnitude and tendency of those effects will be in the region of Jyväskylä.

1.3 Self-evaluation as part of the regional learning process

Following the recession period in the early 1990s, the Jyväskylä region has experienced a rapid growth, and today it is one of the five Finnish growth centres. However, the current key question is how to ensure this favourable development path in the future, and realize more efficiently the efforts and resources invested in developing the regional innovation system into an increase of enterprises and jobs as well as economic and social wellbeing. The actors in the region of Jyväskylä are rather unanimous in stating that it is time to exploit new development opportunities. As a whole, to be able to stay competitive in this rapidly changing and knowledge-oriented environment requires a strong commitment of all regional actors and their readiness for cooperation. The vision of the whole Central Finland describes the area as a province with a high quality of life, which bases its future development on knowledge, know-how and entrepreneurship.

This self-evaluation project can be seen as one stepping stone along the regional development path of the Jyväskylä region. Hence, the self-evaluation process should not be considered as a separate mission, but an integrated part of the local learning process including other relevant processes in the past, present and future. In the HEIs, the self-evaluation project cooperates with other ongoing projects operating towards the same goal – like the OPTIIMI-project, which contributes to the development of a learning network in Central Finland, or the pilot-project of the Chydenius Institute - Kokkola focussing on the mission of university centres as providers of social services, as well as the Competence-project of the Jyväskylä Polytechnic, which develops tools for various regional activities. The self-evaluation project is also closely connected to the mutual strategy work of the HEIs. The preliminary results, conclusions and recommendations of this self-evaluation process were exploited in the formulation of the HEIs' joint regional strategy in autumn 2005. The self-evaluation project will continue in 2006 by further strategy building and preparation for implementation. The phases of the self-evaluation project are illustrated in Table 1.2.

TIME LINE	OPERATIVE PHASE	MAIN OBJECTIVES	MAIN MEASURES
JAN 2005 - MAY 2005	PHASE 1: <i>LAUNCHING OF THE DEVELOPMENT PROCESS</i>	<ul style="list-style-type: none"> • integration of the key stakeholders in the development process • strengthening of the development ethos • mutual expectations for the development project 	<ul style="list-style-type: none"> • discussions with HEIs and regional stakeholders • constructing of the regional steering committee • constructing of the regional workgroup • discussions with national stakeholders
MAR 2005 - FEB 2006	PHASE 2: <i>SELF-EVALUATION PROCESS</i>	<ul style="list-style-type: none"> • identification and prioritizing of the critical fields to be evaluated • identification of strengths, weaknesses, opportunities and threats of the prevailing system • identification of critical development needs • prioritizing the development needs 	<ul style="list-style-type: none"> • constructing the self evaluation plan • analysis of the operative milieu of the HEIs • interviews of the units and key personnel of HEIs • workshops with regional and national stakeholders • visit of the OECD evaluation team
MAR 2006 - AUG 2006	PHASE 3: <i>STRATEGY BUILDING</i>	<ul style="list-style-type: none"> • mapping profiles of the HEIs and stakeholders in regional development • mapping the division of labour between HEIs in regional development • mapping concrete objectives and measures for increasing the efficiency of the contribution of HEIs to regional development 	<ul style="list-style-type: none"> • peer review report of the OECD evaluation team • launching benchmarking with other regions involved in the process • strategy process in HEIs and regional stakeholders • interplay with relevant universities in Finland and OECD • auditing the national stakeholders and relevant experts • dissemination of the results
SEPT 2006 -	PHASE 4: <i>PLANNING OF IMPLEMENTATION</i>	<ul style="list-style-type: none"> • mutually accepted implementation plan • evaluation plan and system • supporting concrete openings of development 	<ul style="list-style-type: none"> • constructing of the implementation plan • constructing of the evaluation plan • clarification of roles and responsibilities of the actors • starting/supporting the concrete projects • evaluation of implementation

Table 1.2 Phases of the self-evaluation project

1.4 Realization of the self-evaluation process

The self-evaluation process was undertaken through wide data gathering, and consultations within the HEIs and their regional stakeholders. The organizations of HEIs were integrated widely in the evaluation process through questionnaires and interviews carried out. The self evaluation report is drawn up through intensive interaction between the authors and representatives of the Regional Steering Committee. The main task of the Regional Steering Committee is to provide and process information. They also indicate the focal points of the self-evaluation, comment the self-evaluation report and guide the evaluation process. The steering committee comprises members representing the following organizations (Appendix 1): University of Jyväskylä, Jyväskylä Polytechnic, Ministry of Education, City of Jyväskylä, Regional Council of Central Finland, Jyväskylä Science Park, Jyväskylä Regional Development Company (Jykes), Central Finland Chamber of Commerce and Federation of Finnish Enterprises (regional unit of Central Finland). The working group, which consists of members from both HEIs, the Regional Council of Central Finland and State Office of Western Finland, contributed to the self-evaluation report with information and valuable comments.

The self-evaluation considered herein is a great challenge, especially within the limits of the given timetable. The questions posed cover a very large field of themes, from operating milieu and organizational strategies to future plans for improvement of the system. Hence, the relevant self-evaluation process involves unavoidably comprehensive data gathering, including the statistics, viewpoints of leadership of organizations under evaluation, as well as viewpoints of individual units implementing strategies and making the aspirations come true. As such, the data gathering also operates as a learning process and a tool for commitment in the participating units. The data gathering process of self-evaluation included the following steps¹.

1st step: Existing written material and statistical data. The starting point of the self-evaluation is a comprehensive analysis of existing relevant material, such as theoretical and empirical literature, strategy papers, evaluations, register data and other printed documents. The objective of this phase is to map out and conceptualize the issues of regional engagement by the HEIs in the Jyväskylä region, and their role in regional development. Analysis of these documents forms the basis for the themes tackled in Chapters II and III of this report.

2nd step: Internet-questionnaire to HEIs' units. Undoubtedly, the existing documents do not cover the information needed for relevant self-evaluation, which is why a more profound understanding of the issues involved was pursued by means of an internet-questionnaire addressed to the faculties of the university and schools of the polytechnic. The reciprocal relationship between the HEIs and their stakeholders formed a basis for the set of questions. The strategic issues were also taken into consideration.

3rd step: Interviews of HEIs' units. After the survey process, more in-depth information was gathered through personal interviews with the key persons of the faculties/schools (including rectors, deans and directors of units). The interviews aimed to clarify those issues which came up during the questionnaire process and to specify the roles of each operative unit in the region. The objective of these interviews was to produce a deeper orientation on the prevailing system of HEIs and their regional roles and strategies. In addition, the interaction with the working group preparing the joint regional strategy of HEIs provided valuable information from the viewpoint of the HEIs' management.

4th step: Interviews with the stakeholders. Deep and organizationally orientated information was gathered through personal interviews and workshops of experts representing the main stakeholders of HEIs. The objective of these interviews was to deepen understanding of the roles and strategies of actors in the regional innovation system, structure of networks, as well as atmosphere and development ethos of the operating milieu. Furthermore, the interviews formed a basis for mapping out the potential spheres for a reciprocal development between HEIs and the stakeholders. A workshop at the Ministry of Education was used to map out the national viewpoint.

¹ More information on data (including summaries of interviews) can be found in Appendix 2. The results of the questionnaire and interviews are used widely as a basis for Chapters III-V. The conclusions of each chapter gather the main points based on the empirical data and other relevant information. The concluding points are not in an order of importance.

II OVERVIEW OF THE REGION

2.1 Geographical Situation

Location in the heart of Finland

The Jyväskylä region comprises nine municipalities with a total of nearly 163 400 inhabitants, and covers an area of 4 500 km². It forms a central area of the province of Central Finland, as 61% of the population live there. It is located in the lake district of Central Finland, some 250 kilometres north of the nation's capital Helsinki. The location in the heart of Finland, combined with fairly good transport connections on the national scale, guarantees easy access to the region. A flight from Helsinki takes forty minutes and a car or train ride some three hours. There are several daily flights between Jyväskylä and Helsinki. The daily railway and bus connections to the capital region and other parts of the country are also quite well-organized. Jyväskylä forms a crossroads for Finland's main highways, which has helped it become an increasingly important centre of road transport. The nearest other central regions, Tampere and Kuopio, are situated at a distance of about 150 kilometres from Jyväskylä.

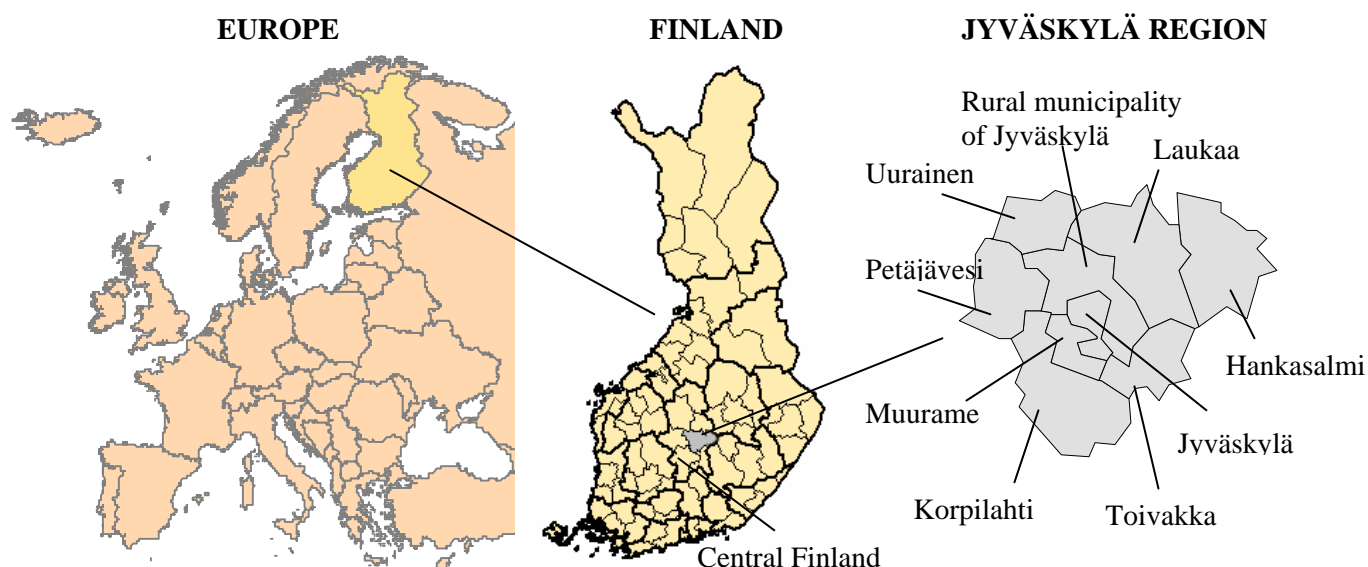


Figure 2.1 Geographical location of the Jyväskylä Region

The region's centre is the City of Jyväskylä (with nearly 83 600 inhabitants) and a major part of the economic activity in the region is concentrated there. The Jyväskylä Rural Municipality, which virtually encircles the City of Jyväskylä, has almost 34 400 inhabitants. It is also the location for the region's airport. A municipal merger of the Jyväskylä Rural Municipality and City of Jyväskylä has been under debate for a long time. The municipality of Laukaa has a population of 17 000, a figure which is growing as plots of land for one-family houses are made available. Of the region's municipalities, the population of Muurame is showing the fastest growth, and thanks to the number of families with young children the demographic structure is very youthful. Muurame has almost 8 600 inhabitants. Uurainen is the northernmost of the region's municipalities, and has a population of some 3 100 people. Uurainen is conveniently situated close to the renewed airport complex. The other municipalities of the Jyväskylä Region - Hankasalmi, Korpilahti, Petäjävesi, and Toivakka - have a total population of 16 600.

Commuting area of Jyväskylä

More than half of the population (nearly 83 700 inhabitants) in the region of Jyväskylä live in the City of Jyväskylä which covers an area of 137 km². The number of occupied dwellings in the whole region is approximately 75 000 of which 56% are located in the city area. The City of Jyväskylä is one of the most

densely populated cities in Finland and about 80% of its population live at a walking distance from the city centre.

Four municipalities of the region of Jyväskylä (City of Jyväskylä, Jyväskylä Rural Municipality, Laukaa and Muurame) have pursued a cooperative housing policy since the early 1990s. The other five municipalities joined this group in 2000. Their starting point is to create synergies by combining the resources. The main goal is to secure sufficient loans for housing construction in the smaller municipalities. An indirect aim of the cooperation is to improve the housing conditions and vitality of the surrounding areas of the City of Jyväskylä.

All students studying in the Jyväskylä region are eligible to apply for housing from the Central Finland Student Housing Foundation (KOAS), which is governed by the student associations and the Jyväskylä City Council. It constructs housing, maintains and rents them to the students. The KOAS has student housing in over ten areas located within one to five kilometres from the centre of Jyväskylä. The foundation has nearly 1 500 apartments for approximately 3 500 students and their dependents.

Regional traffic system is also planned in cooperation between the municipalities. Intra-regional public transportation is based on intra-city and rural bus services. The regional ticket, which covers the whole region of Jyväskylä, has been available for the residents since 1994. The region forms a uniform commuting area where it is usual to reside and work in different municipalities. More than one third of the regional labour force go to work outside their home municipality. The most part of worker flows are directed towards the City of Jyväskylä where job autarky is nearly 130%.

The joint actions in regional housing and traffic systems form one part of an ongoing pilot project for developing a network-town administration model. The network city project of Jyväskylä aims at a combination of the best characteristics associated with public, private and civil activities, so that the regions' boundaries could be moulded flexibly according to needs. The number of municipalities involved in collaboration and the extent of the area vary in different activities.

HEIs as a part of the city centre

The region of Jyväskylä is known for its long tradition of education. The higher education institutions of the region, University of Jyväskylä and Jyväskylä Polytechnic, are located in the centre of the city of Jyväskylä. The University of Jyväskylä is comprised of three campuses: the main campus area (Seminaarinmäki campus), the campus of Business and Economics and Social Sciences in Mattilanniemi, and the campus of Science in Ylistörrinne. The Finnish Cabinet has classified the main campus of the university, Seminaarinmäki, among Finland's most significant cultural historical and architectural areas. Besides these main campuses, there are smaller units around the city. The new building of the University (inaugurated in 2003) is the wellness technology centre Viveca located near the Seminaarinmäki campus. It provides premises also for the Jyväskylä Polytechnic, separate research units and companies.

The University of Jyväskylä also has a separate institute, the Chydenius Institute – Kokkola University Consortium, which is located in the region of Central Ostrobothnia (240 km from Jyväskylä). It is an independent university-level teaching and research unit devoted in particular to supporting the material and intellectual growth of its own region by means of education and research and to improving its inhabitants' access to university-level teaching, partly on a networking basis. In the municipality of Sotkamo (350 km north from Jyväskylä), the Department of Biology and Physical Activity has recently started both a sports technology master programme and a doctoral programme. Through these programmes the University of Jyväskylä is part of the Kajaani University Consortium.

The Jyväskylä Polytechnic has a few units in the city area located near one another. The main campus of Rajakatu is partly under construction. The construction project will join two separate properties and it is one of the biggest investments in the region of Jyväskylä in 2004-2007. The new main campus will provide location for more than 2 000 students and 200 employees. The other campus area consisting of the new building called IT-Dynamo and the old renovated Turbiini ("Turbine") House, formerly part of a plywood factory, is situated in the Lutakko area in the city centre. The IT-Dynamo is a new creative environment for actors in information technology, culture, and entrepreneurship. It now hosts the Polytechnic's School of

Information Technology, the Degree Programme in Business Information Systems, and the Degree Programme in Media Design focusing on the new media. The "Turbine" building provides premises to the Team Academy, which is a separate special unit of entrepreneurship within the Jyväskylä Polytechnic. In addition to the Jyväskylä region, the Jyväskylä Polytechnic also has two small education and R&D units in other parts of Central Finland, in Saarijärvi and Jämsänkoski (5% of the total number of students).

Besides these major higher education institutions there are two smaller HE units in the region of Jyväskylä: Air force C3 Systems School (with approximately 90 cadets) in Tikkakoski in Jyväskylä Rural Municipality (20 km from the city of Jyväskylä) and the Korpilahti Unit of Humanities Polytechnic HUMAK² (some 80 students and 9 employees) situated at a 30 km distance from the city. These units form part of a national network and do not have a direct regional aim.

2.2 Demographic Situation

Growing population

The Jyväskylä region was a sunset area of chimney industry in the 1970s and 1980s. With a rich tradition in industry, administration and education, the City of Jyväskylä was one of the most prosperous cities in Finland. In the early 1990s, Finnish economy experienced a period of deep recession, which had serious effects on the regional economy of Jyväskylä. However, the region has recovered from the recession period and since the end of the 1990s, it has been considered one of the five Finnish growth centres, alongside the regions of Helsinki, Tampere, Turku and Oulu. In terms of population, it is the sixth largest region in the country and one of the fastest growing regions in Finland in this respect. Population growth from the mid-1980s onwards has been 20% and the annual growth rate over the past ten years has exceeded one percent almost every year (Figure 2.2).

Birth-rate exceeds mortality in the region, but the main reason for population growth is positive in-migration figures. Migration inside the country strengthened after the mid-1990s and the speed of population movement into just some core areas increased. In only a few regions has it had a positive net effect in the past years. The region of Jyväskylä has been one of those regions outside the capital region where the number of annual in-migrants has exceeded that of out-migrants. The annual net gain of migrants has increased in the past ten years, being nearly one percent. In 2004, only in two other regions did relative net-migration exceed that of the Jyväskylä region. The relative proportion of immigrants has remained rather stable over the past twenty years, being 3-4% of all in-migrants.

²In close proximity to the Jyväskylä region is also the Suolahti unit of HUMAK.

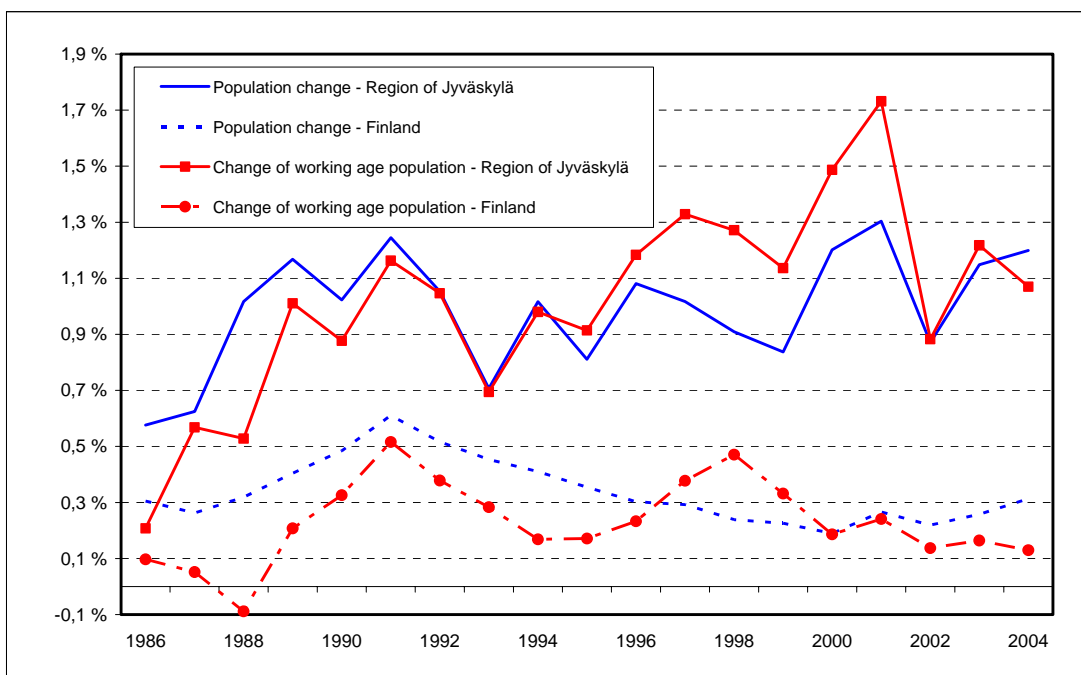


Figure 2.2 Population change in 1985-2004 (Source: Statistics Finland)

Favourable age structure in relation to other regions

In the next few years ageing of population will be faster in Finland than in most other countries. The projected increase in life expectancy and lower fertility rate will lead to a permanent change in the age structure of the population. The number of children, young people and working-age population will decrease and the number of older people increase. In Northern and Eastern Finland, in particular, the age structure will become highly skewed towards the older age groups. However, in the central regions the forecast is more positive. In the region of Jyväskylä the regional age dependency ratio³ has remained rather stable in the past 20 years. In 2004 it was 0.46, which means that there were 46 individuals aged 0-14 or older than 64 per one hundred individuals within working age. In Finland the dependency ratio was 0.5 in 2004. The number of working-age population has increased considerably faster in the region of Jyväskylä than in the whole country. In the region of Jyväskylä young people aged 20-24 form the biggest age group, mainly due to the large education sector. Their relative share of the whole population was 8.4% in 2004. Among the central regions the dependency ratio was lowest in Helsinki and Jyväskylä. The ageing trend of population can be seen in Figure 2.3, which presents the age pyramids for the years 1975 and 2000 and a scenario for the year 2030.

³Age dependency ratio is defined as a ratio of the combined child population (those aged 0-14 years) and aged population (above age 65) to every 100 people of the working aged population (those 15-65 years).

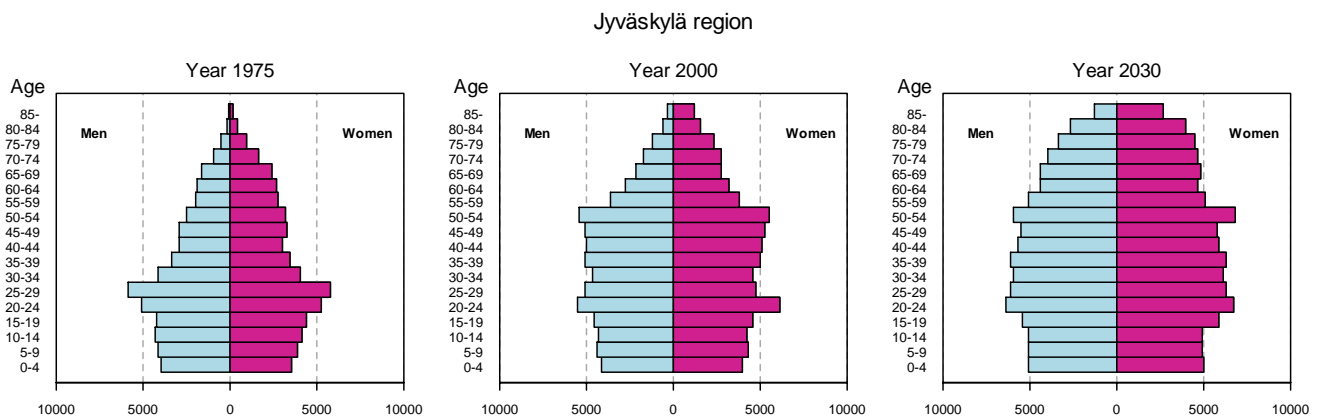


Figure 2.3 Development of the age structure of population in the region of Jyväskylä in 1975, 2000 and a prediction for the year 2030 (Haapanen & Nivalainen, 2002.)

Concentration of human capital

The educational level of the population in the Jyväskylä region is higher than on the average in the country. In 2003, 67% of the population aged 15 years and over had completed at least an upper secondary education (including upper secondary general and vocational schools, vocational colleges, polytechnics and universities) and the tertiary level education was completed by 27% of the population. The equivalent numbers at the national level were 62% and 25%, respectively. However, the educational level varies considerably within the region. The proportion of highly educated persons is largest in the City of Jyväskylä (31%). But when the distance from the city of Jyväskylä increases, the level of education becomes lower, e.g. in the municipalities of Hankasalmi (53 km from the city) and Toivakka (34 km from the city) only half of the population have completed an upper secondary education and the share of those who have obtained tertiary level of education is about 15%.

Problems involved in rapid population growth

Despite the rapid growth of the region of Jyväskylä, all of the signs of success are not flattering. The region is suffering from a high number of unemployed people (the unemployment rate is approximately 14%) of whom nearly 30% are long term unemployed and nearly 20% are under 25 years old. In the whole country the unemployment rate in 2004 was 11%, and the shares of long term and young unemployed were 25% and 13%, respectively. The fast population growth together with high unemployment may give rise to social problems. For example, the number of receivers of social assistance, which was 109 per 1 000 inhabitants (11% of population) in 2003, is higher in the region of Jyväskylä than on the average in the country (81 per 1 000 inhabitants which means 8% of population). Also, criminality and abuse of alcohol and drugs, particularly among young people, have increased in the region and at the national level the region is ranked among the most unwell regions in terms of social performance (Tuomainen et al., 2004).

2.3 Economic Base

Strong foundation in machinery, metal and papermaking technology

The industrial structure of the region is dominated by the service sector (75% of jobs) which is concentrated particularly on the city area. Entrepreneurial activity geared towards supplying services for both private individuals and business (including large-scale representation of engineering design offices) is continuously expanding. The number of firms in the region of Jyväskylä has increased over the past years, being today nearly 6 700. Over 90% of the new firms are established in the trade or service sector. The proportion of entrepreneurs among all workers in the region is approximately 9%, which is below the national level (12%). In the whole of Central Finland, 95% of firms are small ones with fewer than ten workers and they employ half of all employed workers.

The share of jobs in primary production is 2% and in the industrial sector 18%. The Jyväskylä region is an industrial centre with approximately 11 000 industrial jobs. In terms of people employed, the largest branch of industry - and also the region's strongest area of expertise - is machinery and equipment. The next largest industrial branches are basic metals and metal products, as well as the graphic industry. The metal industry as a whole covers nearly 30% of the regional GDP and employs 12% of workers, which clearly exceeds the national averages (8% and 3%, respectively). Figure 2.4 shows the specialization indices (based on the number of employees) of different fields in relation to the whole country. The index is highest in those seven fields presented in the figure. However, it does not necessarily imply that all these fields have a very significant regional role even if they exceed the national level.

Based on the industry specific analysis of the province of Central Finland as a whole, the manufacture of pulp, paper and paper products, and publishing and printing are clearly the most important spearhead industries in the province (see Appendix 3) (Ritsilä & Haukka 2005).

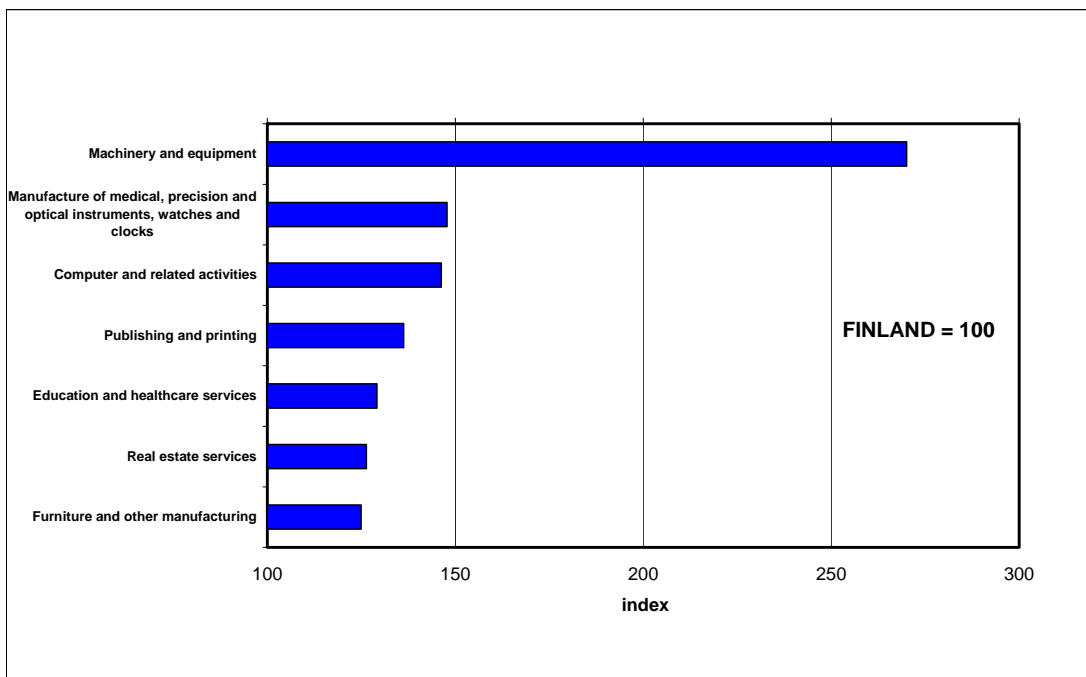


Figure 2.4 Regional specialization relative to the national level (based on the statistics of the year 2002) (Source: Statistics Finland)

The metal industry comprises the biggest cluster in the Jyväskylä region's economy and it has also expanded to other parts of Central Finland. The metal industry originates in the manufacturing of defence equipment, which has enabled the development of a solid knowledge base in the region. After Finland became independent, the state set out to build new military factories. The first to be built was a gunpowder factory in Laukaa in 1922. The second was the State rifle factory in 1927 and lastly, a cannon factory began its operation around ten years later within the town area. The arms industry later gave birth to the Valmet tractor (Valtra in Suolahti) and paper machine factories.

Adaptability, information and expertise are the key factors on which the success of metal is based today. The amount of machinery, equipment and services are experiencing a rapid growth in the world markets and the Finnish share is also rising. In the Jyväskylä region the metal industry offers around 7 000 jobs (including engineering firms) and around 10 000 in the entire area of Central Finland. The papermaking technology covers around 4 000 - 5 000 workplaces of this. The metal industry comprises some 400 operating businesses, of which the share of papermaking technology is around 150 - 200 businesses. The world's leading manufacturer of paper machines, Metso Paper, is one of the biggest companies in the region (approximately 2 000 employees). It has considerable influence also through a comprehensive network of SME's operating in the metal industry. Different educational programmes can also be found in this field (e.g. in Jyväskylä Polytechnic: Machine and production technology and paper machine engineering) and the research and product development know-how are at a high level in the region.

As a regional concentration of expertise in paper making technology Central Finland has a considerable role. Companies in the area aim at supporting and changing the traditional papermaking R&D operations field into a new competitive industry. One emphasis of papermaking technology is on innovative and expansive exploitation of information technology, development of paper technology and its related business activities, as well as controlling the printing surface and chemical environment. This project has a joint name, the PaperIT project.

The forest industry, including paper making and the industries serving it, forms a large cluster in the Jyväskylä region's economy. It is an important employer in the region and a large part of the industry's production is exported. Paper company M-Real's Kangas paper mill is located in Jyväskylä (established in 1870s). However, the regional role of the forest industry is even more important in other parts of the province of Central Finland (e.g., in sub-regions of Jämsä and Äänekoski). The forest industry is closely connected to several other fields like metal industry, energy sector, information technology, logistics, etc.

Breakthrough of high technology

Information technology

During the 1990s, Information and Communications Technology (ICT) has become one of the cornerstones of the industry in the Jyväskylä region. The main focus points in information technology are software business activities and the development of business competitiveness. ICT businesses in the whole of Central Finland currently employ about 4 000 professionals. The telecommunications equipment maker Nokia started its operations in Jyväskylä at the end of 1999 employing currently approximately 330 workers. The other significant enterprises in the region are TeliaSonera Finland Inc. (approximately 600 employees) and TietoEnator (approximately 550 employees). The fast growth of the ICT industry is largely a result of increased educational opportunities provided both by the University of Jyväskylä and Jyväskylä Polytechnic. The correct timing of educational investments has enabled quick development of ICT business activities. The Faculty of Information Technology of the University of Jyväskylä was founded in 1998.

Electronics industry

The electronics industry is one of Central Finland's most important sectors (employing some 1 800 workers) even if its importance has been declining in the past years, particularly outside the Jyväskylä region. The activities of the industry have gradually concentrated on the region of Jyväskylä from the other parts of Central Finland. The electronics industry is based on a high level of expertise, particularly where R&D activity and logistics are concerned. The foundation for developments in the electronics industry is provided by a strong infrastructure, tight networking, availability of expert personnel and first-class educational opportunities.

Energy technology

Bioenergy, small-scale energy production and the management of energy use are also strong areas of expertise in energy technology in the Jyväskylä region. At the core of this cluster is a co-operative network centred in the Jyväskylä Science Park, the Benet marketing network. The co-operative network contributes to the development of research and training through the University of Jyväskylä, Jyväskylä Polytechnic and VTT Processes. The energy cluster employs 1 900 people.

Environmental industry

Environmental technology is a key area of expertise in the Jyväskylä Region. It is particularly closely linked to the fields of energy, papermaking and ICT technologies. The focus areas in environmental technology in Central Finland are waste treatment and environmental biotechnology, process industry ecology and recovered and mixed fuels. Further fields of know-how are environmental management and measuring, monitoring and analysis technologies. The environmental cluster comprises enterprises supplying environmental equipment, systems or expert services, waste management companies, research institutes, educational units and environmental protection authorities. The total number of employees of the Central Finland environmental cluster is 1 900 people, all involved in some type of environmental business.

New pillars of future's development

Wellness technology

One of the newest areas of expertise in the region of Jyväskylä is wellness technology. The body of knowledge in that field has been accumulated in the region by the Faculty of Sport and Health Sciences since 1966. One important milestone for the wellness industrial activities has been the launch of wellness engineering education in the Jyväskylä Polytechnic in 1997. The objective of the Development Programme for Wellness Technology is to promote business activity, applied research and product development as well as training and research in this sector. Enterprises are still at an early stage, but the business sector is growing quite rapidly. Research is conducted at the University of Jyväskylä and the palette is complemented further by the expertise of HEIs in physio and occupational therapy, health education and gerontology, as well as by the activities of Likes, a trust that promotes public health through sport, and KIHU, the Finnish Research Institute for Olympic Sports.

Nanotechnology

Nanotechnology's entry into the Centre of Expertise Programme at the beginning of 2003 was an important step for the Jyväskylä region. Nanotechnology aims at finding applications that combine physics, chemistry and biology, and the field is expected to develop rapidly in the next 5–15 years and to have an impact on almost all business fields. The University of Jyväskylä already has a considerable knowledge resource in the field with its almost 100 researchers and professors. The goal is to raise this figure to 300 experts in the course of the next ten years.

The main economic and labour market trends

The Gross Domestic Product (GDP) per capita of the region is below the national level. The economic recession of the beginning of the 1990s had a dramatic effect on the regional economy of Jyväskylä. From 1990 to 1995 the GDP per capita decreased by 10% whereas at the same time period the national decrease was 2% (Figure 2.5). In the recovery period (in 1995-2000), the GDP per capita increased by nearly 20% in the region, but at the national level the increase was as fast as 29%. However, in the period of 2000-2002 the growth rates equalized and the region of Jyväskylä surpassed the national growth being still below the national per capita level. The rapid population growth in the region together with the economic structure comprising large low value -added service industries can contribute to the lower GDP figures. Contrary to the GDP, the regional Gross Value Added (GVA) per capita increased faster than the national GVA in the 1980s. But after that, in the recession and recovery periods the development of GVA in the region of Jyväskylä has been very much the same or slightly lower than that of the GDP per capita. In 2003, the GVA per capita in the Jyväskylä region was EUR 20 324 whereas in the whole country it was 22 840.

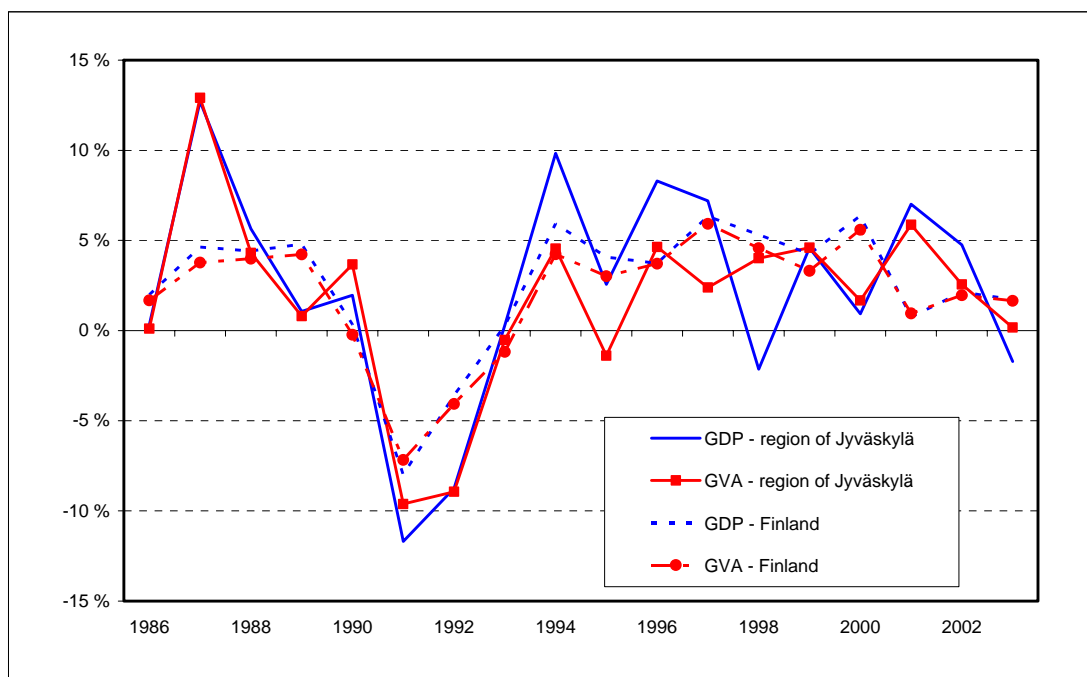


Figure 2.5 Change of GDP per capita and GVA per capita in 1985-2003 (*Source: Statistics Finland*)

Regional development in terms of value added, employment and population can be described by the GEP-index⁴ which is a combination of those three components. Annual deviations of the GEP-index of Central Finland and its sub-regions in relation to the national level are presented in Figure 2.6. In Central Finland, the development of value added per capita and employment have been negative compared to the national level. At the sub-regional level, the average deviation of annual changes in value added, employment and population have only been positive in Jyväskylä, compared to national level.

⁴GEP-indicator is based on an unweighted average of mean deviations of annual changes between regions and the whole country in value added, employed, population. The indicator is calculated by Statistics Finland.

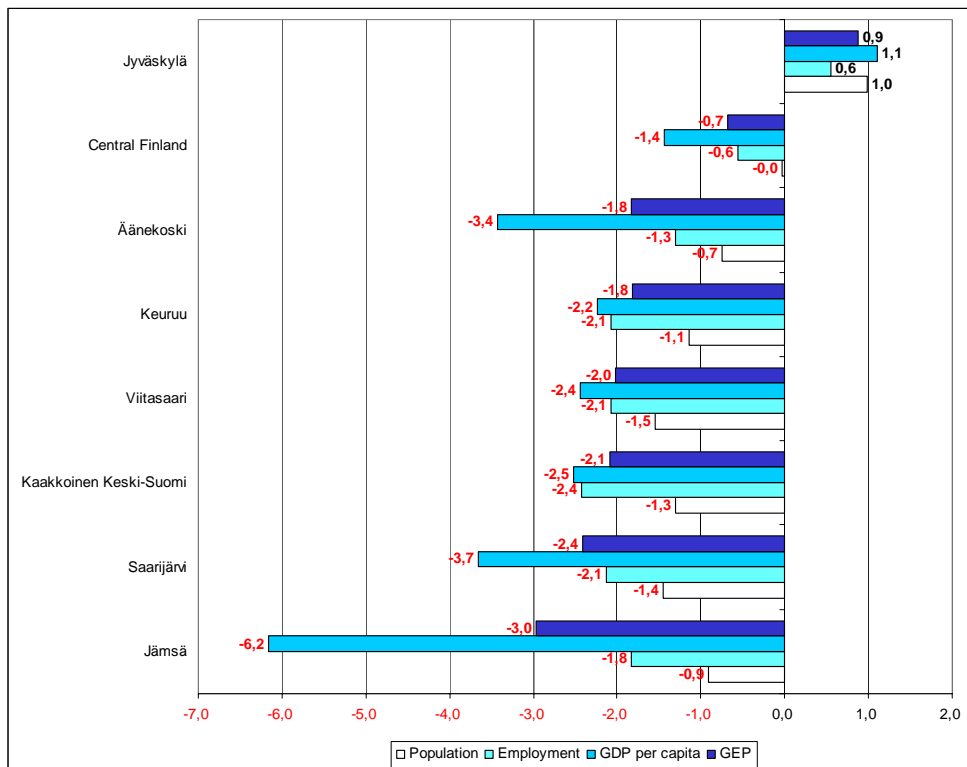


Figure 2.6 Average deviations of annual changes between Central Finland (including sub-regional units separately) and the whole country in value added, employed and population in 1996-2003,% (Source: Statistics Finland)

The employment in the region of Jyväskylä decreased sharply in the early 1990s due to the deep economic recession that hit the region of Jyväskylä harder than many other regions in Finland (Figure 2.7). Several firms went bankrupt or downsized their activities and the simultaneous cuts in the public economy made the economic performance still worse. In 1994, employment started to increase again, by 2-3% in recent years. The employment rate has not reached the level of the late 1980s, instead, it seems to be settled at the level of 61%, which is below the national rate (67%). The difference between regional and national employment rates has slightly increased after the recession.

The unemployment rate is rather high in the region of Jyväskylä. During the recession, the unemployment rate in the region peaked at as high as nearly 25%. In the recovery period, it has markedly decreased but it is still highest (14%) among the largest growth regions and exceeds the national unemployment rate (Figure 2.7).

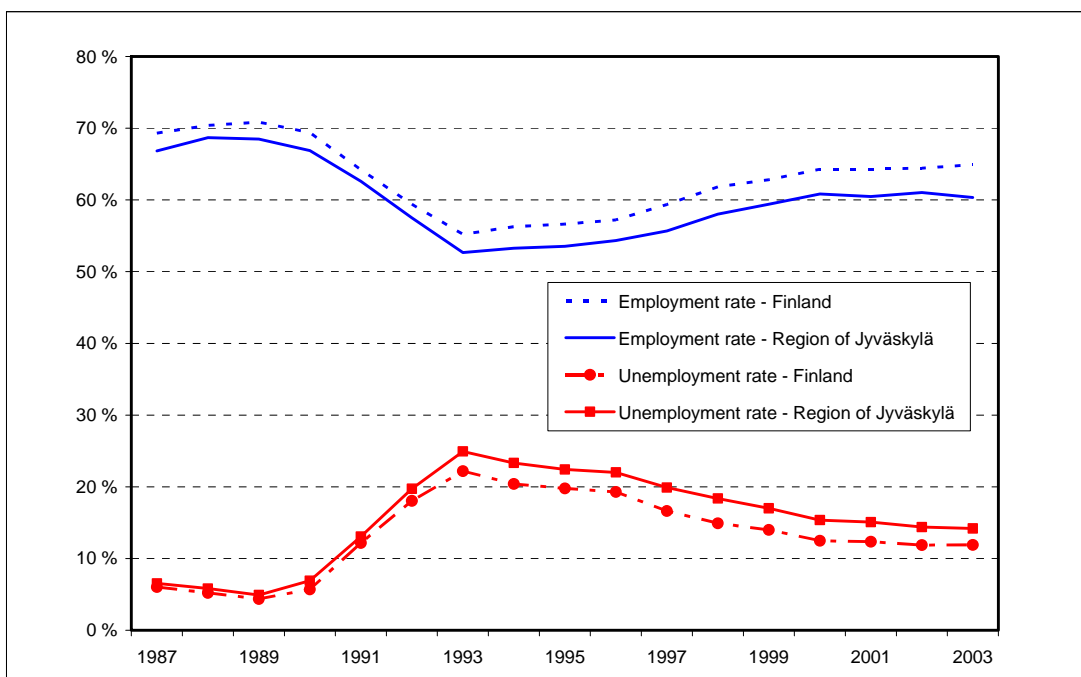


Figure 2.7 Employment and unemployment rates in 1987-2003 (Source: Statistics Finland)

The knowledge intensive sectors have an important role within the region of Jyväskylä. Approximately 10% of the jobs are in the information sector (including production of goods, services and content production). The number of jobs in that sector increased by 83% in the region in the period of 1993-2001, whereas at the same time the total increase of jobs was nearly 30%. The speed of the sector's employment growth in the Jyväskylä region exceeds the corresponding change at the national level as the number of jobs in the information sector increased by 62% and the total increase of jobs was 20% in the same period. In Finland, the information sector is strongly concentrated on a few regions and Jyväskylä is one of the six regions where the relative share of jobs exceeds the national average (9.5% in 2001).

The number of personnel in the higher education institutions, in the University of Jyväskylä and Jyväskylä Polytechnic, was 3 150 in 2004. This means that approximately 5% of all workers in the region of Jyväskylä are employed by HEIs. The regional input-output analysis of economic effects of HEIs shows that the employment effects are considerable in the Jyväskylä region. The total employment effect is nearly 5 500 jobs. Since the educational sector belongs to the service sector, the regional production effects are minor. The input-output analysis carried out for this purpose is presented in more detail in Appendix 4.

The largest occupational groups in the region of Jyväskylä are experts and specialists, and sales, service and healthcare workers. About one half of all workers belong to these groups and their importance is expected to increase in the future. The manual and technical workers (including e.g. construction and repair, and process and transportation workers) form an occupational group which covers nearly 30% of all workers. However, these groups will probably lose their relative share in the future. The share of farmers and forest workers has sharply decreased in the last decades and the same trend is expected to continue.

The labour force and the number of jobs in the region of Jyväskylä correspond rather well to each other. Job autarky was 98% in 2003 and it has remained stable since the mid-1990s. However, it varies markedly between the municipalities. In the City of Jyväskylä job autarky is rather high (126% in 2003) whereas in the other parts of the region it is mainly around 70%. Commuting from the surrounding municipalities to the City of Jyväskylä is usual, e.g., in the Jyväskylä Rural Municipality some 50% of all workers have a job in the city.

2.4 Governance Structure

Municipality – the basic unit of regional governance

For the purposes of regional administration, Finland is divided into six administrative districts. Each of them has a general administrative body called the Provincial State Office, which functions under the guidance and supervision of the appropriate Ministries in discharging the duties related to different administrative fields.

Local administration is mainly managed by local authorities (municipalities). Every four years, residents elect a local council, which is the decision making authority in local affairs. The council's responsibilities include municipal finances and decision making. The municipal board, appointed by the council, is responsible for the practical running of local administration and its finances. It prepares the issues which come before the council, represents the local authority and safeguards its interests. The council appoints a municipal manager, who is subject to the board. Municipal committees are not obligatory, but in practice almost every local authority has committees made up of elected officials which handle local affairs related to education, social welfare and health, the environment and other community concerns.

Municipal finances are based on a budget which the council approves for each following year. Local authorities finance their annual expenditure with money drawn from taxes, state subsidies, various charges, and sales revenues. Local income tax, real estate tax and a share of corporate tax account for more than half of all municipal revenues. Charges and fees account for about a quarter of the municipal revenues. Central government grants local authorities financial assistance in exchange for a wide range of statutory services. The State subsidy system evens out differences between local authorities and ensures equal provision of services. State subsidies account for less than one-fifth of all municipal revenues.

Finnish local authorities provide basic public services for their residents according to the Nordic welfare state thinking, most importantly those related to education, social welfare and health, and the technical infrastructure. Many of the services are provided jointly with other local authorities, which makes organizationally and financially most sense. However, due to the uneven distribution of population and economic activity, ageing population and increasing international competition, the regional administration and service structure are under pressure of renewal. Several municipalities have suffered from serious financial problems year after year. Hence, it is evident that changes are to be expected in the years to come. At the moment, three different models of municipal structure are under discussion. They are presented in Appendix 5.

Main actors of regional development

Regional development is one of the strategic focus areas of the Government Programme, which emphasizes the need to increase expertise in the various regions and promotes the competitive capacity of viable regional and sub-regional centres. Finland is divided into 19 regions (including Central Finland), plus the autonomous province of Åland, and into 80 sub-regions (including the Jyväskylä region), with local authorities.

The six Provincial State Offices monitor and evaluate the implementation of key services by municipalities for the seven ministries. In Central Finland the State Provincial Office of Western Finland represents the central state at the sub-national level and implements national decisions at the regional level in certain policy fields. In particular it monitors security and equality and, with regards to regional development, it implements structural fund programmes in the field of education. As far as regional development is concerned two main missions are carried out by State Provincial Offices: secondary education and welfare services. (OECD, 2005.)

The Finnish Regional Councils, composed of municipalities, draw up regional development plans in cooperation with the local authorities within their respective regions and with the state authorities, as well as with representatives of economic life and non-governmental organizations. Regional development work also involves the Employment and Economic Development Centres, TE-centres (15 in the country). The functions of the TE-Centre of Central Finland include improvement of operating conditions for businesses, support for rural economy, promotion of employment and functionality of the labour market and, in relation to them, promotion of adult employment (labour market) training. Each centre has a Labour Market

Department, which attends to the regional functionality of the labour market. The local employment offices are subordinate to regional Labour Market Departments. The EU funding in the region is managed by the State Provincial Offices, Regional Councils and Employment and Economic Development Centres.

Policy management for economic development is increasingly spread out across the entire municipal organization. The policy is implemented through economic development companies, business partnerships, enterprise agencies, or incubators, to name a few. Furthermore, the regionally based science parks, technology centres and other local development organizations are also essential components of the regional development system. Individual science parks are part of a national network (TEKEL) with 22 members located in 19 cities. (OECD, 2005.) In the region of Jyväskylä the main intermediate organizations are the Jyväskylä Regional Development Company Jykes Ltd (established in 1996) and Jyväskylä Science Park JSP (founded in 1987). Numerous regional strategies influence the operation of HEIs in the field of regional development (the list of key strategies is presented in Appendix 6). Lack of clarified relations between the various strategies makes their coordinated implementation difficult in the Jyväskylä region.

2.5 Conclusions relating to the local milieu of the HEIs

1. **Boundary conditions connected to the size of a region.** The location of the Jyväskylä region creates great challenges for the higher education institutions from the point of view of societal interaction. The relatively small size of the region partly limits the possibilities of the HEIs to integrate with regional economy and to participate in developing the regional economic life and well-being. Moreover, because of the limited size of the labour market, the region cannot utilize all the know-how produced in the HEIs. Particularly the expertise achieved through university education would require a sufficiently extensive labour market in order for the demand and supply to meet in the region. In addition, the small size of the firm sector and the fact that most of the regional businesses are small enterprises, set limits for utilising the research and development work conducted in the HEIs. The HEIs operate on two levels of societal interaction: national and regional. These sectors should be considered equal and they should be seen as starting points for the activities of the HEIs, supporting and complementing one another.
2. **The challenges and possibilities of ageing.** Although the age structure of the Jyväskylä region is positive compared to the national level, ageing of population will affect also the Jyväskylä region in the next years, and especially the rural areas. Ageing affects the regional economy in various ways. Because of ageing, a smaller and smaller working population becomes responsible for the vitality and development of the region's economy. In practice this means less available labour force and, on the other hand, more pressure on social and health services and on the stability of the local economy, created by the increase in the ageing population. The HEIs are also expected to participate in solving these problems.
3. **Managing a fragmented strategy jungle.** The Jyväskylä region is in many ways a unified area. However, the development of the region is guided by various strategies. Some of these strategies are thematic, some are connected to various programmes, and some of them involve different spatial units or actors. The huge number of strategies presents the challenge of consolidating them and exploiting them effectively. Having too many strategies may easily have a damaging effect on managing the whole, as the visions and goals of different strategies might be conflicting and lack a common mission. Furthermore, a fragmented set of strategies may lead to each actor and activity having their own "suitable" strategy, which prevents the development of a more profound learning process between the operators.
4. **Growing regional divergence.** The key figures of population, employment and regional development show signs of simultaneous success and losses in Central Finland. Although the Jyväskylä region seems to be doing fairly well, the harsh truth is revealed when the differences are examined at the provincial level. The population, business life, and jobs are strongly concentrated in the Jyväskylä region and particularly in the City of Jyväskylä. At the same time the rural areas are fighting for their existence in the middle of deteriorating age structure, business life and employment situation. A crucial question in the future is, to what extent the region is willing to transfer the fruits

of its development outside the central area, and to what extent this is possible. On the other hand, also growth presents problems that would need solutions. Therefore, mapping new ways of strengthening the cooperation between the central and rural areas in a way that satisfies both parties is necessary. The municipality and service structure investigation being carried out at present might bring new points of view into this discussion. The HEIs can also actively participate in the discussion and offer their expertise to map and develop new scopes for action.

5. **Capability of business life to renew itself.** The economic life of the Jyväskylä region and of the whole of Central Finland has a strong foundation in metal and wood industries. These fields are still very important. Yet, a strong service sector has been developed in the Jyväskylä region, and presently employs a majority of the region's population. The breakthrough of high technology in the Jyväskylä region also seems promising. While new technology arrives horizontally to the traditional fields of industry, it seeks new potential markets in the rising fields such as bioenergy and wellness technology. The region also aims at becoming an active operator in the promising fields of the future, such as nanotechnology. Thus, the local economy aims at creating its future proactively instead of waiting for the next move by the operational environment. This willingness and ability to renew itself creates the basic conditions for maintaining competitiveness in the future. The role of the HEIs is significant, and becomes even more important as output becomes more and more know-how and technology-oriented. The HEIs should be able to respond to the challenge presented through their roles as pioneers in basic research, to promote the application of new technological solutions in production and to produce experts for the changing labour market.

<p>Strengths</p> <ul style="list-style-type: none"> + growing population + attractive living environment + nationally recognized as a growth centre + strong supporting structure for business (development and intermediary organizations) + strong higher education sector and a strong educational sector as a whole + strong locomotive firms + more favourable age and educational structure than nationally on average + strong clusters of expertise in the key fields + efficient infrastructure of road traffic and data communications + strong basic industry + good geographical location inside the country + strong investments in future's opportunities and challenges, such as nanotechnology, ageing and renewable energy + emerging utilization of horizontal interfaces of technologies + positive development ethos of regional actors + potential of small firms as they are typically strongly engaged in the region 	<p>Weaknesses</p> <ul style="list-style-type: none"> - small economic area - large share of small businesses (small resources) limits the possibilities of cooperation with the HEIs and utilization of HEIs activities - lack of growth enterprises - inconsistencies of strategy work - unclear division of tasks between the regional actors and insufficient use of resources resulting from this - high unemployment rate - the ability for commercialization and wider utilization of expertise is rather limited - small investments in R&D work by enterprises - fragmentation of projects and lack of a common mission - insufficient exploitation of international possibilities - lack of capability to prioritize industries and activities - lack of concrete trust between the actors - insufficient commitment in long-term development projects
<p>Possibilities</p> <ul style="list-style-type: none"> + commercial possibilities of nanotechnology + commercial possibilities of wellness technology + business possibilities connected to ageing of population + business possibilities of renewable energy + innovations at the interfaces of different fields of business + a strong cluster of education and research achievable through close cooperation between the polytechnic and university + increased efficiency of development and intermediary organizations through clarification of the roles (efficient allocation of resources) + new operational models connected to internationalization + advantages of synergy produced by prioritising of tasks and complementary activities at national and regional level + wide utilization of social and public sector innovations 	<p>Threats</p> <ul style="list-style-type: none"> - moving of spearhead enterprises' operations to another location, e.g., as a result of increasing globalization - decreasing of the quality of basic research as a result of national policies - poor matching of produced competence and jobs in the region - decreasing of the R&D work and technological development, and an unhealthy competition between actors due to a decrease in resources in the new EU Structural Fund period - inability to transfer the knowledge into business activity (a "grower team" position) - local actors are not focused enough and the use of resources is insufficient - burdens of ageing population and social exclusion - short-sighted and fragmented regional development work - service structure reform in municipalities

Table 2.1 SWOT -analysis relating to the Jyväskylä region

III CHARACTERISTICS OF THE HIGHER EDUCATION SYSTEM

3.1 Overview of the national system of higher education

The Finnish education system consists of comprehensive school, post-comprehensive general and vocational education, higher education and adult education (for a more detailed description, see Appendix 7). The Finnish higher education system is made up of two parallel sectors: universities and polytechnics. There are universities and polytechnics all over Finland, since the ultimate aim has been to ensure that all prospective students have equal opportunities for study, regardless of where they live. Instruction at institutions of higher education is free of charge⁵.

A high level of education is one of the cornerstones of the Finnish national strategy. In 2004, there were nearly 306 000 students in total in HEIs: 173 974 in universities and 131 919 in polytechnics. The number of new students is larger in polytechnics (youth education: 26 411 in 2004) than in universities (20 420 new students). However, due to the longer time of education (some six years on the average) the total number of students in universities exceeds the number of students in polytechnics. The capacity of higher education will have reached the set objective, when a student place can be offered to two thirds of each age group. Higher education is popular, and the number of applicants is consistently several times higher than the annual intake⁶ (in 2004, 34% of applicants⁷ were admitted and 29% were new students). The annual student intake is equivalent to about 65% of the average size of the 19-21 age group (Ministry of Education, 2004b). Competition for student places can be largely attributed to the expansion of general upper secondary education, traditionally preparing for studies at the tertiary level, and the extension of eligibility for higher education to those with an initial vocational qualification. Women form the majority (53%) of the students. The areas with a male majority are engineering and natural sciences.

To clarify the structure of the Finnish higher education a proposal for a higher education qualifications framework was drawn up by the working group appointed by the Ministry of Education (2005a). The framework was to include all higher education degrees and describe them in terms of the work load, level, learning outcomes, eligibility for further study and professional qualifications. The description was to indicate how the degrees relate to one another. In the proposal the qualifications are divided into first cycle, second cycle and third cycle degrees (Figure 3.1). The first cycle degrees include the lower university degree (Bachelor's) and the polytechnics' Bachelor degree. The second cycle degrees include the higher university degree (Master's) and the polytechnic Master's degrees. The third cycle degrees include the scientific postgraduate degrees of licentiate and doctor.

In Finland, a small part of students change their study place annually between the polytechnic and university in the midst of studies or apply to university after completing a polytechnic degree. In these cases, there has not been automatic substitution or inclusion between the studies completed at polytechnics and universities since they are two different kinds of institutions providing higher education. The amount of substituted or included studies varies and each case is handled separately and the decision is made by the appropriate unit. The reform of the degree structure and cooperation between polytechnics and universities is expected to

⁵Students have to pay for their books and other materials, plus their accommodation and living expenses. In the university sector, undergraduate students pay also a small membership fee to the student union every year. The system of financial aid for study has developed in the 1990s and the maximum support available for completing a Master's degree covers a period of 55 months. The financial support by government consists of a study grant, housing support and a State-guaranteed study loan.

⁶ The ratio between the annual intake and applications is not unambiguous as the group of applicants is diverse (in addition to the applicants of the relevant age group there are special groups like, e.g., those who have not been admitted in previous year(s) or those who have already completed a HE-degree but apply for admission to study in some other field)

⁷ Here, the group of applicants consists of first-choice applicants (youth education) to polytechnics and those who have participated in entrance examinations of universities.

clarify the correspondence between studies. After completing a Bachelor's degree, the new two-cycle degree structure allows students more easily to apply for admission to another HEI to study for the higher degree or find a job and return to study at a later point. However, in Finland it will take time to adapt fully to the new degree structure, as at present the university studies are still strongly aimed at a Master's degree directly, and entering the labour market after completing the academic Bachelor's degree is not seen as a relevant alternative.

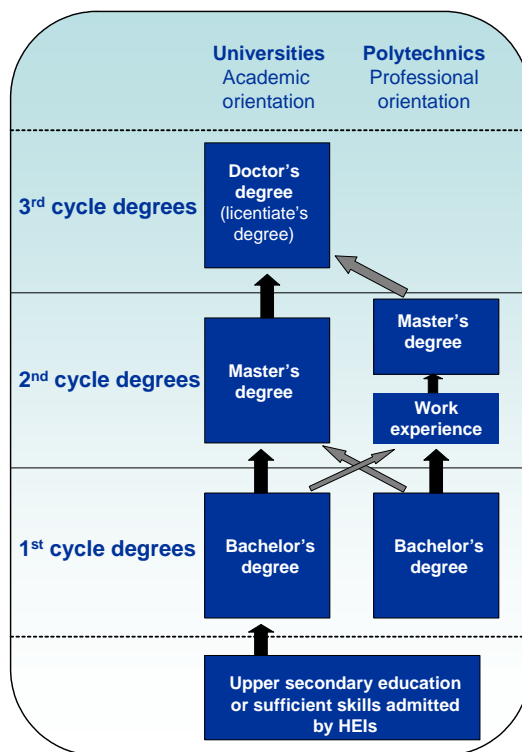


Figure 3.1 Cyclical structure of Finnish higher education degrees⁸ (Ministry of Education, 2005)

Comprehensive network of universities

The university has the longest tradition in Finnish higher education. The first seat of higher learning, the Royal Academy of Turku, was established in 1640 when Sweden-Finland was at its strongest. In 1828 the university was transferred to Helsinki and renamed as the Imperial Alexander University. It was the only university in Finland up to the early 1900s, when the first specialized higher education establishments, the University of Technology and the School of Economics and Business Administration, were founded. The Swedish-language Åbo Akademi University (in Turku) was established in 1918 and the University of Turku two years later. The expansion was rapid from the sixties to the eighties and one essential feature of the Finnish higher education policy was a regionally decentralized location of new universities. In the most recent reforms the Academy of Fine Arts was upgraded to the university level (in 1993) and the College of Veterinary Medicine was incorporated into the University of Helsinki (in 1995).

There are 20 universities in Finland - ten multidisciplinary and ten specialist institutions. Their basic purpose is to conduct scientific research and to provide higher education connected with it. Finnish universities offer a total of nearly 200 programmes leading to lower and/or higher degrees. Most programmes are multidisciplinary, and offer specialization relating to specific disciplines or sometimes vocational or professional objectives. Of the specialist institutions three are universities of technology, three are schools of economics and business administration, and the remaining four are art academies. In addition, university-level education is provided at one military academy under the Ministry of Defence. Universities also arrange

⁸Complementary studies might be required when moving between the different levels or sectors if the contents of the earlier education do not correspond to the requirements of the new degree to pursue.

continuing education and open university teaching. The number of university students and graduates grew considerably in the 1980s and 1990s. At present, there are approximately 174 000 students at the Finnish universities, 22 000 of whom are doctoral students. In 2004, the number of university applicants, who participated in the entrance examination, was 70 200, of whom 29 215 (42%) were admitted (share of new students was 29%). The number of applicants has increased by 14% from 1994 to 2004. Over the same period the number of new students has increased more, by 18%. The descriptive figures of Finnish universities are presented in greater detail in Table 1 in Appendix 8.

Many reforms have taken place in the Finnish system of higher education. The university system expanded from the 1960s to the 1980s and there was a rapid growth in resources and an increase in independent decision-making from the mid-1980s up to 1990. In the 1990s, the functional independence of universities has continued to grow, while attention has focused increasingly on improving performance and quality. In this decade the university system and the whole higher education system are under the pressure of increasing productivity and prioritizing of activities.

Each field of study in universities is governed by a separate decree. Legislation concerning the university degree structure has been revised to enable the new two-cycle degree structure to be adopted in all fields except medicine and dentistry in August 2005. Finnish university degrees correspond to Bachelor's, Master's and Doctor's degrees. In most fields students can also take a voluntary Licentiate degree before the Doctor's. With the new degree structure the Finnish credit system has been brought in line with the European ECTS credit system. The average input of 1 600 working hours needed for studies in one academic year will correspond to 60 credits.

The Finnish Bachelor's degree corresponds to the Anglo-American Bachelor's degree. According to the new Government decree the Bachelor's degree consists of 180 credits and takes at least three years of full-time study. To be awarded a lower university degree, the student must complete basic and intermediate studies in the major subject, including a Bachelor's thesis, studies in one or more minor subjects, and language and communication studies. Basic and intermediate studies familiarize the student with the scientific terminology of his/her field of study, with its most important theoretical and methodological concepts, and its most significant research results and problems relevant to the objectives of the degree programme.

The Finnish Master's degree corresponds to the Anglo-American Master's degree. According to the new Government decree the Master's degree takes at least two years of full-time study and consists of a minimum of 120 credits (Master's programme is a separate programme after Bachelor's). To be awarded a higher university degree, the student must complete advanced studies in the major subject. The main aim of advanced studies is to develop the student's ability to pursue and apply scientific knowledge. The student must also complete sufficient studies in some minor subject(s). A large proportion of the Master's studies are taken up by research, and the writing of a thesis is usually the most extensive single study module. However, the structure of the studies in medicine and technology partly differ from the other fields.

Doctoral (postgraduate) studies in Finland have traditionally consisted of two degrees, i.e. the voluntary Licentiate's and the Doctor's degree. Students holding a Master's degree may apply for the right to continue towards the doctoral degrees. A doctoral candidate is required to carry out independent research work, to familiarize him/herself extensively with other research in his/her field of study and with general scientific theory. In the studies for the Licentiate degree an extensive licentiate's thesis is required. A doctoral student is required to submit a doctoral dissertation, based on major independent scientific work, and to defend it in a public examination. Moreover, certain modules of general research studies and studies tied to one's own research field are required but the requirements vary between various disciplines.

Young polytechnic sector

The Finnish Polytechnic system is rather new. It was created in the mid-1990s mainly by raising the level of professionally oriented education, accommodating the needs of the increasingly heterogeneous student population and contributing to the structural changes of working life. The polytechnics were formed mainly from post-secondary vocational institutions, i.e. most colleges and all "professional" HEIs (engineering and seafaring), which were upgraded to the higher education level after a pilot phase and a rigorous external evaluation. This also involved renewal and extension of the education programmes. Today, the polytechnics

form an integral part of the Finnish higher education system. A network of 29 polytechnics covers the entire country. Besides these there are the Åland Polytechnics and the Police College of Finland, which operates under the Ministry of the Interior.

Most polytechnics are multidisciplinary higher education institutions providing instruction in several fields. A special emphasis is on their expertise in working life and its development. The polytechnics also carry out R&D activities relevant to their teaching and to working life. More than half of all polytechnics are owned by local authorities or joint municipal authorities, and the remainder are joint stock companies or foundations. Polytechnics vary in size from the smallest with some 1 500 students to the largest with nearly 9 200 students. In 2004, nearly 26 500 students were admitted to the polytechnics, which was 28% of all applicants. The annual number of applicants has remained rather stable since the introduction of the system. More statistical information is presented in Table 2 in Appendix 8.

The role of polytechnics is more regional in nature than that of universities. One of the important aims of the Finnish polytechnic reform and the recent policy has been to strengthen the role of higher education institutions in regional development and regional innovation system.

The polytechnics operate rather independently with regard to their teaching and research. The studies in polytechnics are organized into Degree Programmes, which are confirmed by the Ministry of Education, but the curriculum is decided independently by the polytechnics. The completion of a polytechnic degree requires 210-270 credits depending on the field of study, which takes 3.5 - 4.5 years of full time study. Polytechnic degrees are higher education (Bachelor's) degrees with a professional emphasis. The degree programmes are planned so that they meet the requirements and development needs set by working life. In all fields, the curriculum comprises basic and professional studies, elective studies, practical training and a Bachelor's Thesis.

The three-year Master's degree experiment in Finnish polytechnics (an equivalent degree was rewarded to students) finished recently and the parliament gave a permanent status for the new polytechnic Master's Degrees in 2005. This was preceded by an international evaluation, which indicated that the Master's degrees correspond to the European master level. After the new permanent legislation was accepted, the polytechnics have started more Master's programmes. They are working-life oriented programmes of higher education, which enrich students' professional skills and expertise as well as develop working life. The programmes consist of 60-90 credits, depending on the completed polytechnic degree, and can accordingly be completed in 2 to 3 years. A professional development assignment of 30 credits is an essential part of the studies. At least three years of work experience after a relevant polytechnic or other third degree education is required, before the student can be eligible for education at the Master's level.

Governance and regulatory framework of HEIs

Parliament passes educational legislation and decides on the overall lines of education and research policy. The universities are governed by the Universities Act and polytechnics by the Polytechnics Act. The role of the government is also significant, and higher education and research are included in the Government Programme. The main policy guidelines and development targets are determined at a general level in the Development Plan for Education and Research which is adopted by the Government for a six-year period every four years. Performance management and target outcomes constitute the most important tool for the Ministry of Education in steering the operations of the universities and the polytechnics. This is strategic steering, which implements the national higher education policy. Each university and the Ministry of Education conclude a three-year agreement on the targeted outcomes to determine the operational principles. The Ministry of Education concludes a three-year agreement also with each polytechnic to determine the objectives, intakes and level of results-based funding.

The general goals for developing the administration of education and science, and indeed all public administration, are to review steering systems, delegate authority, shift emphasis to performance and streamline the hierarchy and administrative procedure. In recent years, regulations have been lifted and authority transferred from the Ministry of Education to the higher education institutions. A key element in Ministry-higher education institution relations is the consultation procedure by which the Ministry and the institutions jointly set the objectives for each institution.

The *Science and Technology Policy Council of Finland* has an important role as it is responsible for promoting major issues related to science, technology and scientific training. The Council advises the Government and Ministries on the orientation and coordination of science and technology policy, the general development of scientific research and training, and Finnish participation in international scientific and technological cooperation. The Prime Minister acts as chairman of the Council and the other members comprise the minister responsible for higher education and science, the minister in charge of industrial affairs, the minister in charge of financing, two other ministers and ten non-ministerial members who are experts in scientific research and development or technology.

The *Finnish Higher Education Evaluation Council* (FINHEEC) was established in 1996 to advise the Ministry of Education and to assist the higher education institutions with self-evaluation. The Council comprises 12 experts appointed for a four-year term. The majority of its members are staff of HEIs but also students are represented. FINHEEC organizes audits of quality work and institutional, programme, and thematic evaluations. Furthermore, it provides advisory and consultancy service in the implementation of the evaluations, develops evaluation methodology, and disseminates good Finnish and international practices to higher education institutions and the Ministry of Education. The evaluations conducted by FINHEEC can be divided into three rough categories: (1) Evaluations of higher education institutions including audits of quality assurance systems of higher education institutions, (2) Programme and thematic evaluations (focusing, e.g., on higher education policy), and (3) Certain kind of accreditation of some extensive professional courses offered by higher education institutions. FINHEEC can make an agreement with the Ministry of Education on evaluation assignments as has been done with the selections of the centres of excellence in education and adult education in the university sector, as well as centres of excellence in education and regional impact in the polytechnic sector (regularly, every three years).

The *Academy of Finland*, the Finnish Research Council organization, operates under the aegis of the Ministry of Education. Its purpose is to further scientific research and its utilization, promote international cooperation, serve as an advisory body on science policy issues, and allocate funds for research and other scientific purposes.

In order to gather relevant data on the institutions of higher education two databases have been established, one for the universities and one for the polytechnics. The universities and polytechnics report on the attainment of their objectives in their operating reviews by entering the relevant statistics into the databases maintained by the Ministry of Education: KOTA database for universities (<http://www.csc.fi/kota/kota.html>) and AMKOTA database for polytechnics (<http://www.csc.fi/amkota/>). Moreover, the educational information collected by Statistics Finland is of special significance.

Quantity-based funding structure

In Finland, public education accounts for 12.5% of all public expenditure. Some two thirds of this consist of State funding and one third of municipal funding. The total sum of the public expenditure on education in Finland is at the average OECD level. Finland's total input in higher education is remarkable, since an exceptionally high proportion of an age group receives an academic education.

In 2004, 64% of the universities' budget came from the State budget through the Ministry of Education. The operating expenditure agreed upon in the results negotiations between the ministry and universities comprises core funding (90.9% in 2006), project funding (6.7%) and performance-based funding (2.5%). In addition to these, earmarked funding for national responsibilities and programmes is assigned. The agreement is signed for a three-year period but it is checked and negotiated every year. Performance-based funding is used to reward universities for efficient as well as high-quality education and research. The State university budget is allocated according to a formula-based funding system, which allocates core funds to universities primarily according to their target numbers for Master's degrees and doctorates weighed by field of study. Lagging behind the targets is also taken into account in the formula. In the financial model of universities for the period of 2007-2009 the research will probably be more strongly emphasized by adding new criteria of research activities for the core funding and increasing the relative share of performance-based funding (Ministry of Education, 2005c).

In addition to the university budget set by the State, the universities are increasingly procuring external funding and expanding their chargeable services. The Academy of Finland is the main external funding body of university research and, along with the universities themselves, bears the main responsibility for basic research. Public funding for technology and development is channelled through the National Technology Agency (Tekes), which also plays a major role in the external funding of the universities. In addition to these, the external funding is granted by different foundations, public sector offices or enterprises, as well as through international financing.

Finnish polytechnics, which are either municipal or private, are co-financed by the government (57%) and the local authorities (43%). The Ministry of Education and each polytechnic conclude a three-year agreement on targeted outcomes to determine the objectives, intakes, and project and performance-based funding. The financing is based on annual unit costs. For the purpose of basic funding, the central Government defines a unit cost per student for each polytechnic, based on the calculated unit cost of each degree programme. The annual basic funding (within limits of the government budget) is then decided by multiplying the unit cost for the polytechnic by the number of students who are passing their studies within the official time period. The central Government also grants additional funding to polytechnics. Most of this is project funding, which at present is largely intended for R&D activities, virtual learning, open polytechnic activities, regional development projects and cooperation between polytechnics. Part of the additional funding is allocated on the basis of performance. Polytechnics also have external funding sources like the National Technology Agency, Finnish and foreign businesses and EU financing. The national funding system of polytechnics will be changed in 2006 and the new system will resemble that of universities.

The EU Structural Funds have had a very important role in supporting the measures designed to enhance the regional engagement of HEIs. The experience gained of the EU's Structural Funds and their significance for regional development in Finland has been encouraging. Structural Fund projects have been designated to develop links between working life and education, promote lifelong learning, boost competence in applied science and technology, enhance the cultural environment and the culture industry, and advance the information society. The Structural Fund projects have successfully promoted innovative thinking and development in individual areas of expertise, and networking between the actors. At their best, the projects have built up good practices which can be further developed and adapted to new sectors and broader networks.

Towards internationalization

International student mobility became an important objective in Finnish higher education policy in the early 1990's and student mobility is one of the quantitative targets set for the performance management period of 2004-2006. In 2004, Finnish higher education institutions sent out nearly 8 250 students, 4 279 from universities and 3 962 from polytechnics. Finnish HEIs have also paid great attention to developing their capability to receive students from abroad. The universities and polytechnics offer special programmes where instruction is given entirely in English. An increasing part of standard degree programmes can also be studied entirely or partly in English. Doctoral studies at universities can be pursued in English in all fields of study. The past years have been a success story regarding the balance between incoming and outgoing mobility. In the university sector, the incoming student flows have now exceeded those of outgoing flows. In the polytechnic sector, the ratio of incoming students to the outgoing is about 74%. This is attributable to practical training in which the vast majority of foreign trainees go straight to the companies leaving trainees outside the statistics. Student mobility as such is in balance also in the polytechnic sector. Student mobility in Finnish higher education is strongly Europe-centred, and for example in 2004, over 80% of all mobility took place in Europe. By far, the most important mobility programme used has been the European Union's Socrates/Erasmus programme. (Jortikka & Zirra, 2005.)

In addition to student mobility the teaching staff and researchers of HEIs participate in international exchange programmes. In polytechnics the number of short (less than one month) teaching visits of the staff to institutions abroad has increased in the past years amounting to 2 500 in 2004, whereas the number of visitors coming in Finland was half of that. In turn, according to the university statistics the number of international visits has decreased in the past ten years. In 2004, the number of long and short term visits of researchers and teaching staff was nearly 1 300 in total, and 1 740 visits from other countries to Finland were recorded.

3.2 Regional dimension within the national higher education policy

In the development of education activities, the present aim is still to ensure sufficient basic resources in the different parts of the country, so that all prospective students have equal opportunities for study, regardless of where they live. The Ministry of Education has devised a regional strategy for its administrative field up to 2013. In the strategy, the Ministry outlines the following visions for regional development:

Regional development of education and research: *Finland has high-standard educational, research and cultural services covering all parts of the country, which promote welfare in Finnish society and the welfare and equality of its citizens and are responsive to changes in the operational environment.*

Regional development of the higher education sector: *A regionally comprehensive higher education system of an international standard works in interaction with society at large and constitutes a strong influence on regional development.*

According to the strategy, it is important to reconcile development objectives set in national and regional policies with development targets set for regional development, with an emphasis on the different strengths and development needs of the regions. The polytechnic network will be developed on the basis of a skeletal structure of large units and a supplementary structure of regional service networks. The universities' activities in the regions will be strengthened through particular measures to enhance the existing network and further develop the existing regional university centres. The regional networks of universities and polytechnics will be developed to respond to educational needs in the regions. With a view to strengthening the network, open university and polytechnic studies, other adult education, and education relating to educational and cultural self-development will be enhanced with reference to the needs of business and industry and working life in general. Moreover, the strategic policy lines emphasize that the special characteristics of the regions will be taken into account in anticipation of access to the graduate labour market. The response to the educational needs of the regions will be based on the use of universities' and polytechnics' current knowledge and service reserves and the further development of their adult education supply.

3.3 Strategies involved in regional role of HEIs

The interaction between HEIs and regional actors has been defined in the strategies at international, national, local and organizational level. The strategies at different levels cannot be devised without taking account of the regional policy lines formulated by others.

International level. The Lisbon Strategy is a commitment to bring about economic, social and environmental renewal in the EU. In 2000, the European Council in Lisbon set out a ten-year strategy to make the EU the world's most dynamic and competitive economy. The Lisbon Strategy touches on almost all of the EU's economic, social and environmental activities. The member countries are under an obligation to take these objectives into account in their own policies, concerning, e.g., education and technology issues.

Innovation is a cornerstone of the Lisbon strategy. According to the updated innovation strategy, the Member States must adopt an approach that is well coordinated across all government departments with areas of responsibility having a bearing on the conditions for innovation. Also, the role of regions is recognized to be important and their specific strengths, weaknesses and ambitions should be taken into account in the innovation process. The strategy encourages the cluster development, stating that *the development of clusters of excellence, when there is a conjunction of factors such as infrastructures, availability of skills and expertise, research and technology centres, and enterprises with innovation potential, is of paramount importance for innovation performance.*

National level. The legislation and policies related to higher education now place a stronger emphasis on the role of the institutions of higher education for regional and business development, societal service and transfer of innovations into production and service development. The universities and polytechnics are also expected to play a stronger role in the pursuit of internationalising their surrounding regions and the companies operating in them.

According to a report published by the ministerial working group in 2001, the capacity for effective utilization of research findings is a requisite for efficient work both in ministries and at the government level. Achieving the aims set requires that decision-making on information and knowledge systems is sufficiently centralized and the ministries are able to operate as a network. The Science and Technology Policy Council of Finland emphasizes the growing role of ministries as strategic technology development agencies in their own sectors. The Ministry of the Interior is responsible for the preparation of regional development objectives together with the other ministries and Regional Councils.

The *Regional Centre Programme* and *Centre of Expertise Programme* represent the key policy initiatives of promoting a more regionally oriented development. The Ministry of the Interior is the main responsible authority of the Centre of Expertise Programme, which started in 1994. It is a fixed-term special programme that in accordance with the Regional Development Act aims to identify regional strengths and create economic growth based on existing knowledge and expertise. Locally, a key purpose of the Centre of Expertise Programmes is to bring leading experts in research, education and private enterprises in a region or network into close interaction. The national Committee, consisting of experts in the fields of economy, research and education, as well as professionals working in regional and local administration, monitors and coordinates the activities relating to the programmes in different regions. The Committee also functions as a wider forum for discussion regarding the development of regional innovation systems. In addition to the Ministry of the Interior, the other ministries involved in the programme include the Ministries of Labour, Education, Trade and Industry, Agriculture and Forestry, and Social Affairs and Health. The Centre of Expertise Programme has proved to be a successful policy instrument. The Regional Centre Programme is a special government programme launched in accordance with the Regional Development Act. The Ministry of the Interior is in charge of the national co-ordination of the programme in cooperation with other ministries. The programme aims at the development of a network of regional centres based on the particular strengths, expertise and specialization of urban regions of various sizes.

The current government's programme stresses the importance of localization in the globalized world. A strong base of regional know-how, entrepreneurship and employment is seen to contribute to the economic growth of the whole country. One way to support regional competitiveness is to strengthen the regional development role of higher education institutions. National higher education policy has changed in the past years, starting to emphasize the social and regional engagement of HEIs as part of the national innovation and competitiveness policy. The regional strategy for education and research of the Ministry of Education presents the visions and strategic policy lines, which underpin the efforts to boost the positive regional effect of education and research.

According to the Science and Technology Policy Council of Finland, the growing role of HEIs in regional development raises a challenge of merging national higher education policy and regional development policy together in a rational and expedient way. Universities meet the full force of expectations for social, cultural and economic development. The universities and the whole research system should be able to combine in-depth specialized knowledge with versatile expertise for the benefit of users and in contracted research and in joint projects with them. A question partly relating to this is the future of higher education on the whole: how its different parts will take shape jointly and separately. (Science and Technology Policy Council of Finland, 2003.)

Local level. At the local level, the Regional Councils (19 in Finland) are the authorities responsible for regional development under the Regional Development Act. The Regional Councils define the objectives of development for the region and the ways and means of implementing them - together with other regional authorities and numerous partners. Regional development organizations and science parks are also important actors in the regions and they devise their own strategies (key regional strategies are listed in Appendix 6). They have close contacts with universities, polytechnics, research units, large and small enterprises, financing bodies and providers of expert services.

There is a complex interplay between higher education policy, science and technology policy and regional development. Higher education institutions are expected to be active cooperation partners and mediators of new knowledge and know-how in their regions. The challenges raised from the environment have caused pressure both to the steering system of higher education institutions as well as to individual organizations. In

order to respond to the challenges of the changing environment HEIs have had to find new and flexible ways of organization.

3.4 Regional higher education system

The three strategic focal points of higher education institutions are (1) education, (2) university research and polytechnic R&D, and (3) social and regional development (Figure 3.2). This last key function has gained increased importance in recent years. It is closely integrated in the education and R&D functions, and mainly generated through them. The emphasis of these focal points varies between universities and polytechnics.

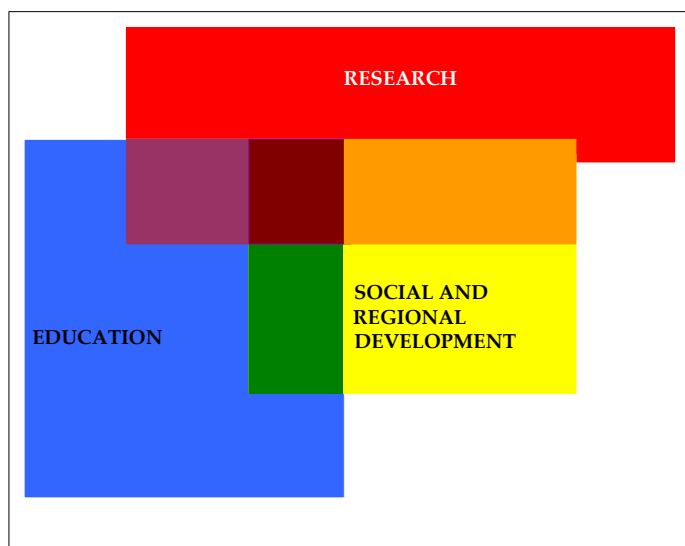


Figure 3.2 Key strategic focal points of higher education institutions

University of Jyväskylä

The University of Jyväskylä is a rapidly growing multidisciplinary university established in 1934. Today, the University of Jyväskylä has seven faculties. The previous College of Education received university status in 1966. At that time, the University already had the Faculty of Social Sciences and Education, Faculty of Humanities, Faculty of Mathematics and Science, and Finland's only Faculty of Sport and Health Sciences. The School of Business and Economics and Finland's first Faculty of Information Technology were founded in 1998.

The number of students at the University of Jyväskylä has increased from 10 000 in 1994 to nearly 15 000 in 2004 (for more statistical information, see Appendix 8). These figures do not include the students of the Open University or continuing education, those being 18 000 and 11 000 in 2004, respectively. The University of Jyväskylä is the fifth largest multidisciplinary university in Finland. The number of graduate students has increased by one-third in the past five years. In terms of applications, the University has been one of the most popular universities in Finland, and in 2004, for instance, the number of applications was second largest following the University of Helsinki. The number of Master's Degrees completed surpassed the University's goal by more than 6%, ranking the University of Jyväskylä for the third year running as the HEI to produce the second largest number of Master's Degrees in Finland. The number of students who graduated from programmes funded by the EU was almost 5% of the total number of degree students. The total number of doctoral degree candidates who graduated in 2004 was 113, which surpassed the national average of the number of degrees per professor, and which was almost 20% higher than five years earlier. The University's three EU-approved four-year Doctoral Schools are a testimony to the quality of the post-graduate programmes. Following the University of Helsinki, the Open University of Jyväskylä is the largest provider of adult higher education in Finland.

The favourable development of the University of Jyväskylä is based on strong strategic development, which also acts as the basis for the continued improvement of its key operations, including research, education for master's, licentiate and doctoral degrees, adult education and social services. Keeping up with the annual goals of the number of Master's and Doctoral Degrees requires continuous development and renewal, e.g., in the fields of student counselling, availability of a diverse choice of education possibilities and the development of the quality of teaching and permanent systems of quality assurance.

A central goal of the University of Jyväskylä has been to strengthen its position as a scientific community and to improve the quality of research. For a period of 2006-2011 five Centres of Excellence in Research operating within the University of Jyväskylä were nominated by the Academy of Finland. Besides these, two other Centres of Excellence (organized collaboratively with the University of Helsinki) selected earlier will continue until 2007 (see Table 4.4 in Chapter IV). An important new step has been taken in the field of nanoscience, which was incorporated into the Jyväskylä region's Centre of Expertise Programme. The funding from the Academy of Finland and National Technology Agency of Finland, as well the active involvement of companies through various collaboration projects, have a significant role in the development.

The University of Jyväskylä aims systematically at expanding and deepening its internationalization. The University has been active in a variety of international programmes, such as Socrates, Nordplus and ISEP, and in a number of international development co-operation projects, particularly in the Balkans, Southern Africa, and Latin America. It has also coordinated the university network for international development. In addition, the University of Jyväskylä has signed bilateral agreements on student exchange with 23 universities around the world. Altogether, the University is involved in student exchanges with more than 250 universities worldwide. Also, the international exchange of the teaching and research staff is encouraged. The University has conducted strategic work aiming at the development of the concept of an international campus.

The role of the universities in Finland is generally more national and international in nature than that of the polytechnics. However, the University of Jyväskylä is also known for its active role in developing innovations in education and research within the region. The EU Structural Funds have enabled the University to carry out important regional development projects. Moreover, the University of Jyväskylä provides various education and development services to the needs of regional working life, firms and organizations. The changes in the needs of the public sector have been taken into account, e.g., by launching large scale teacher training programmes. The University's regional effectiveness has been further strengthened through the implementation of regional development strategies drafted jointly with the Jyväskylä Polytechnic and Central Ostrobothnia Polytechnic.

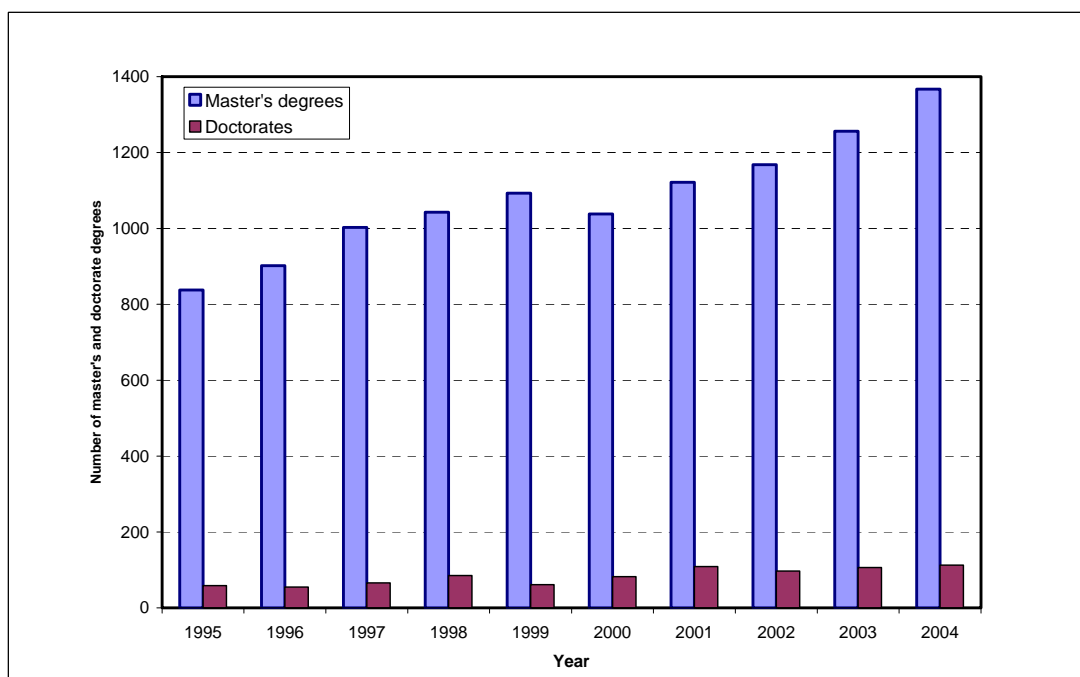


Figure 3.3 Number of master's and doctorate degrees at the University of Jyväskylä in 1995-2004 (Source: KOTA database)

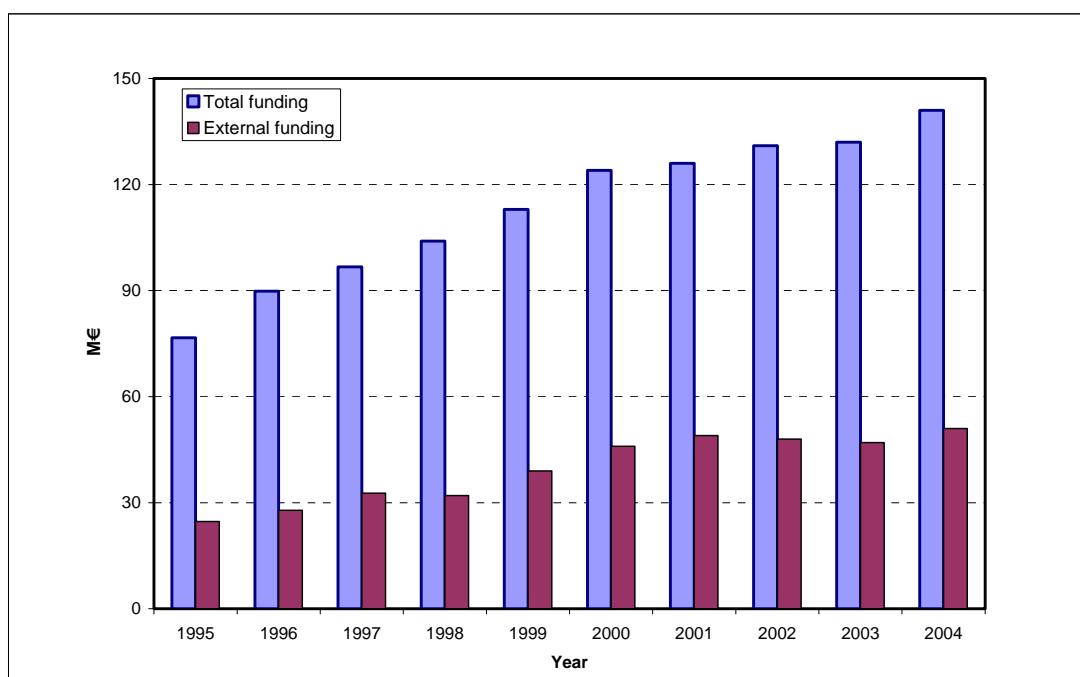


Figure 3.4 Total funding and external funding of the University of Jyväskylä in 1995-2004 (Source: KOTA database)

Jyväskylä Polytechnic

The Jyväskylä Polytechnic was established in 1992 as an experimental polytechnic. It became registered as a polytechnic in 1995 and got its permanent status in 1997. The Polytechnic provides a wide range of educational programmes as a more practical alternative to university education. Degree-granting education includes almost 30 high-quality degree programmes within seven schools: Institute of Natural Resources, Engineering and Technology, Information Technology, Business, Tourism and Services Management, Health and Social Care and Cultural Studies. The Vocational Teacher Education College, which is part of the Polytechnic, is a national centre of pedagogy offering a learning environment for the pedagogical studies of

vocational teachers, special needs teachers, and study counsellors. The strengths of the Jyväskylä Polytechnic include workplace-driven learning and close cooperation with working life and business.

The number of students in the Jyväskylä Polytechnic was approximately 7 500 (including degree-granting youth and adult education, professional specialization training and master's degrees) in 2004 (for more detailed statistics, see Appendix 8). The number of graduates has nearly doubled from 2000 to 2004 (Figure 3.5). In terms of the number of students, the Jyväskylä Polytechnic is ranked sixth among all polytechnics in Finland. Also, the applicants have voted the Polytechnic for consecutive years as one of the most popular polytechnics.

The tasks of polytechnics in Finland are primarily based on working life and its development. The research and development activities are determined by the needs arising in their sphere of influence and serve mainly local and regional business and industry. The activities are particularly aimed at the promotion of small and medium-sized entrepreneurship as well as the public sector, and the improvement of the preconditions for their operation. The R&D activities in the Jyväskylä Polytechnic include international and regional development projects together with companies, industries, expert organizations and other interest groups. These projects promote the operations, networking and internationalization of partners.

Research and development is implemented in all the Polytechnic's schools in accordance with the competence and strength areas of the polytechnic. The R&D work is based on nine multidisciplinary Centres of Expertise which were created to meet the regional needs of competence (see Table 4.3 in Chapter IV). Regional development, as well as the continuous development of the educational and project activities, are the main aims of the R&D activities of the Jyväskylä Polytechnic. The projects also offer students opportunities to advance their professional skills. As a whole, the R&D activities of the Jyväskylä Polytechnic have been successful compared with the other polytechnics in Finland, and it was rewarded for its performance by the Ministry of Education in both 2003 and 2004. In 2004, the share of Jyväskylä Polytechnic's R&D activities measured by the funding streams was 8.6% of the total polytechnic R&D in Finland.

The Jyväskylä Polytechnic promotes the internationalization of its operations, students and staff. The teachers can offer their expertise to the partner institutions by teaching there for short periods. The Polytechnic also carries out international and regional development projects funded by EU programmes (e.g. Sokrates/Erasmus and Nordplus). Furthermore, it has been coordinating the Polytechnic Network for East and Southeast Asia since 2000. The aim of the network is to develop and support polytechnic studies, teaching, expert activity, contacts with working life, internationalization, and mobility related to East and Southeast Asia. The network promotes multidisciplinary cooperation between polytechnics, as well as their division of work and specialization by increasing the exchange of information.

The development of both the number of students and the R&D activities of the Jyväskylä Polytechnic have been so fast that absorption of the effects and their full utilization in the region takes time. The focus points of the future development of the Jyväskylä Polytechnic are improvement of the quality of education, increase of the regional effectiveness of its R&D-activities and working life orientated internationalization.

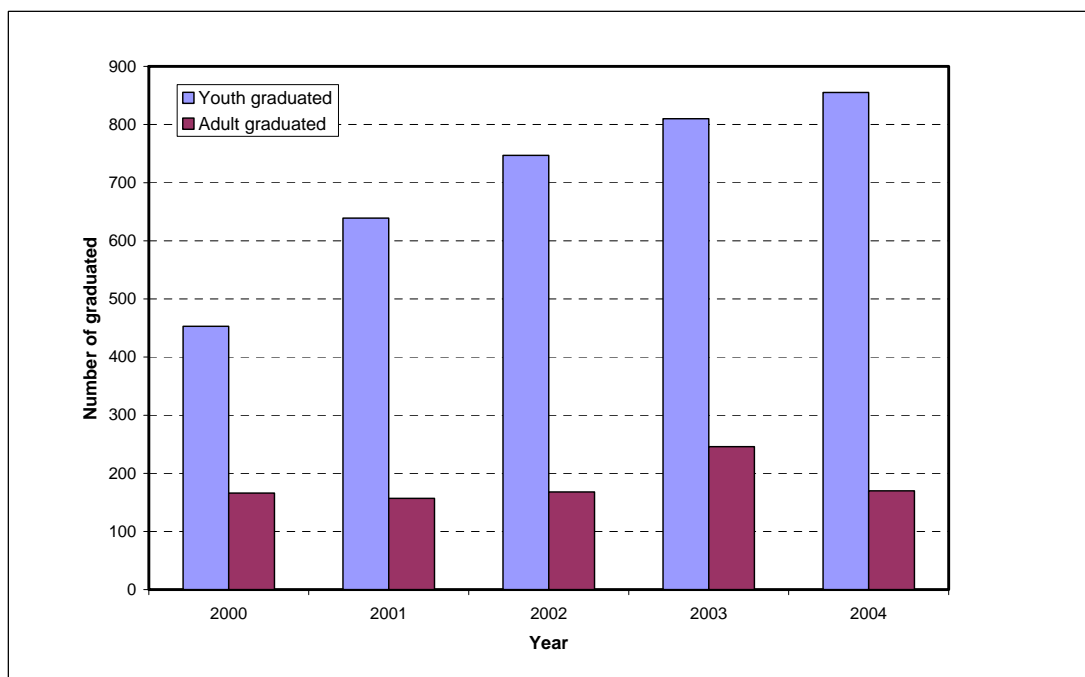


Figure 3.5 Number of graduates at the Jyväskylä Polytechnic in 2000-2004

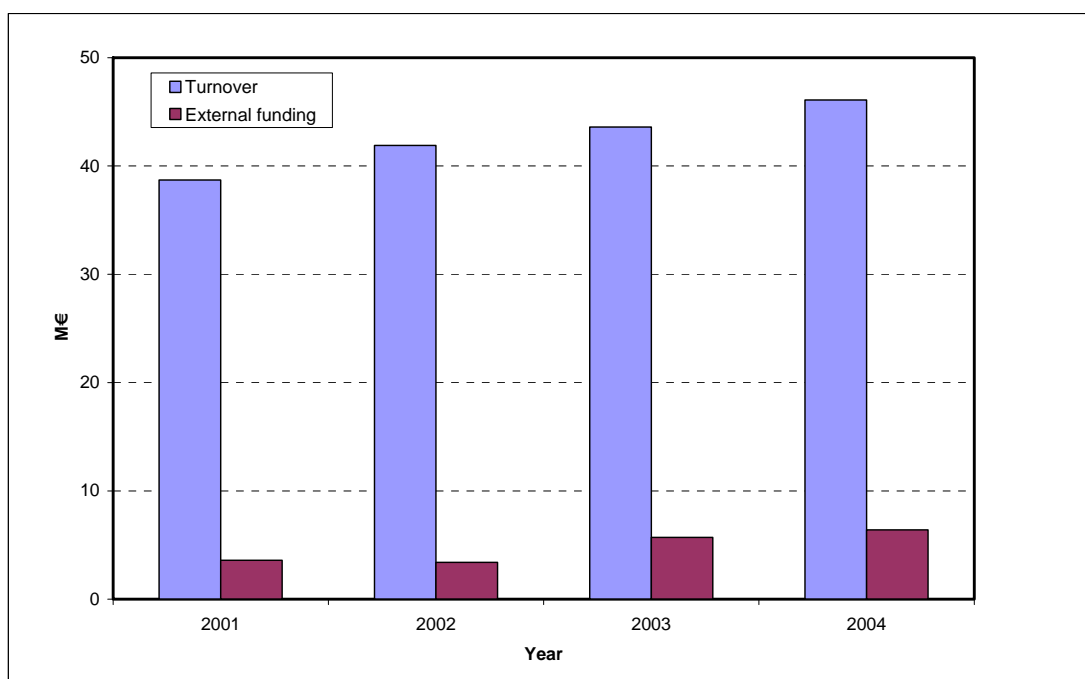


Figure 3.6 Annual turnover and external funding of the Jyväskylä Polytechnic in 2001-2004

3.5 Conclusions: Critical points relating to the characteristics of the higher education system

1. **National vs. regional level determinants of the regional contribution of HEIs.** The contribution of the Finnish HE-system to regional development can be determined at two different levels. Firstly, the basis of the regional contributions of HEIs is drawn by national level regional strategies and policies. HEIs are partly guided by the parliamentary system and national regional policy, and they are steered, supervised and their budget determined by the Ministry of Education. Secondly, the HEIs and their regional stakeholders form the regional level determinants of contribution. The regional strategies of HEIs are stated so as to increase the efficiency and concretize the HEIs' regional contribution. To sum up, the framework for the HEIs' regional contribution is set nationally

but the detailed contents are determined regionally. This two-level system is very reasonable as a whole, but it is also vulnerable to conflict. The national and regional level aspirations do not necessarily coincide, which may cause collision of national and regional strategies. Therefore, it is very important that national and regional level actors interact continuously and that the coherence of strategies is ensured by particularly careful preparations.

2. **The challenges of the Finnish dual system.** The Finnish higher education is based on a dual system of two different types of institutions: universities and polytechnics. The dual system is rather new, and the experiences gained of the system are still minor. However, a system based on two parallel sectors brings about both challenges and opportunities from the viewpoint of the regional contribution of HEIs. Firstly, intensive cooperation of the two parallel sectors is needed to ensure efficient allocation of resources. Herein, the question is not only about division of work between these two organizations, but also about how these organizations are able to complement and support each other in the regional arena. The key factors for successful cooperation are mutual respect and confidence. Without these cornerstones, the cooperation remains at the minimum level. Secondly, the dual system is based on different profiles and roles of universities and polytechnics. Hence, the contributions of the HEIs to regional development are determined endogenously by the dual system itself. The polytechnics are strongly connected to regional working life and industry. The dominating factor in the role of polytechnics in the social arena is their ability to respond to regional demand and develop their operations in a reciprocal manner with the local socio-economic environment. However, the universities are tightly connected to the national innovation system and international competitiveness of the nation. This aspect dominates the role of universities in the social arena. Therefore, the contribution of universities to regional development is strongly dependent on the definition of national policies. The role of universities in regional socio-economic systems is to contribute to the local utilization of their expertise based on national level aspirations. These different starting points of universities and polytechnics should be carefully considered in determining the regional strategies of HEIs. Thirdly, the evaluation of the contribution of HEIs to regional development involves special issues to be addressed in a dual system. The evaluation should focus especially on the interfaces and vertical structures of these separate institutions.
3. **The changing environment of HEIs.** Until recently, the aim of ensuring opportunities for higher education regardless of the geographical location of individuals has been strongly emphasized by the national HE-strategies. This emphasis has led to the decentralization of HEIs and their operations as well as to aspirations for versatility rather than specialization in the individual HEIs. However, mainly due to strengthening globalization and strong demographic changes expected, the HE-system now confronts totally new challenges. Strengthening globalization intensifies competition between countries, regions and HEIs, and furthermore, also accelerates processes of specialization and learning economies. The globalization process has forced the HE system to reshape its priorities. Ability to be globally competitive is nowadays the topmost definition of the HE policy in Finland. In addition to globalization, the demographic changes also cause pressures for a renewal of the HE-system. The age groups entering education will gradually decrease in the near future. This will cause necessary reductions and require more focused activities of the HE-sector. Depending on the region considered, the phenomena described above may have considerable effects on the role of HEI in local socio-economic development. In any case, these margin conditions should be identified and taken into account when planning strategies and measures for improving the contribution of HEIs to regional development. In practice, this means further specialization, division of labour and prioritizing of activities. The major task is how the HEIs are able to manage simultaneously the increasing external pressures to make their operations more efficient and the growing expectations for their role in the social, cultural and economic development of society.
4. **Dynamics of HEIs.** HEIs are facing a vast number of demands and expectations due to the rapid changes in their environment. The higher education system can be considered to be quite inflexible compared to the fast changes in the local socio-economic environment they operate in. Naturally, some amount of rigidity is even necessary to ensure sustainability of the regional development processes. However, sometimes a fast reaction is needed and the HE system should be able to respond to the short run needs of the surrounding region. Anticipation and new ways of organizing the operations are preconditions for a more dynamic HE system. Anticipation should be able to

provide information for the basis of long run development processes, in both qualitative and quantitative terms. Social, organizational and process innovations are necessary tools for developing dynamics and ability to respond to the short run development needs. New ways of organizing education as well as research and development operations are in a key role when improving the ability to handle the acute needs and solve problems of the socio-economic environment. Simultaneous management of sustained development processes and short-run measures require active anticipation and innovation procedures from the HEIs.

5. **National management of the HE system.** The requirement for the regional contribution of HEIs is legislated in Finland. The Ministry of Education monitors the execution of the law by steering and supervising the regional contribution of HEIs. The regional contribution of HEIs is also included in the results-based management and steering system used by the Ministry of Education. Both universities and polytechnics have financial incentives to improve their regional contribution. However, the financial resources allocated for this purpose are rather minor compared to basic budget instalments. Strengthening of the national controlling effect would require a considerable increase of financial resources in this field. In addition to the management by performance-based system, the national level controlling effect is naturally integrated in the basic budget instalments in that the basic resources of education and research also form the basis for the regional contributions of HEIs. Aspects expressed above should be taken into account in building the regional strategies of HEIs.

6. **Regional governance of HEIs.** The University of Jyväskylä and Jyväskylä Polytechnic are both strongly connected to the other regional socio-economic actors of the Jyväskylä region, and the interaction between the HEIs and their regional stakeholders is reciprocal. The activities of the HEIs are integrated in the regional strategies, and the operations of regional stakeholders are accounted for in the strategies of the HEIs. Furthermore, the management organs of the HEIs include representatives of regional stakeholders and vice versa. Thus, the regional stakeholders can influence the regional governance of the HEIs. Hence, the basis for an effective regional involvement of the HEIs should be in order. However, the regional development strategies are numerous in the Jyväskylä region, causing confusion among actors. To clarify the “strategy-jungle” in the future, simultaneous strategy processes of stakeholders would be preferable. This procedure would ensure the coherence between the strategies and strengthen the role of regional stakeholders in the regional governance of HEIs.

IV CONTRIBUTION OF RESEARCH TO REGIONAL INNOVATION

Key figures of the Jyväskylä region:

R&D expenditure in 2004: EUR 180.8 million
Increase of R&D expenditure in 2002-2004: 13.9%
Patents in 2001: 0.73 per 1 000 inhabitants
R&D funding of HEIs in 2003: EUR 65.3 million
Research staff of the University in 2004: 558 person years

4.1 Policies and actors of the Finnish innovation system

Knowledge input has a positive effect on the development of regional industrial structures, employment and economies, and it generates other indirect – both social and cultural – effects. The vision of the Ministry of Education (2004) concerning the regional dimension of higher education institutions' research and development activities is the following: *Research and development is of a high quality in the different regions and its results are utilized in a versatile and effective way to strengthen the vitality and welfare of the regions. The regional innovation environments are based on university research and polytechnic R&D, which is geared to working life and regional development.*

Traditionally the three main sectors of knowledge production – higher education institutions, public sector actors and industrial R&D - have operated at arms length from one another. However, there is now taking place an increasing functional and institutional integration of the three sectors (so called "Triple Helix" – development). Increasing economic constraints have led to a situation in which universities are trying to capitalize on their research and education functions, by setting up direct contacts with markets and the industry. The new entrepreneurial activities have included, for instance, new technology and knowledge transfer functions, technology centres, research liaison offices, university-industry joint research projects as well as new services. Concurrently, international competition and a faster phase of technological development have made enterprises more receptive to external sources of innovation. They are now actively seeking out new knowledge and externalization of former in-house research activities. As a consequence, research groups within firms have become partners in joint research ventures, bringing them into contact with government laboratories and university-based research groups. Furthermore, the relatively stable boundaries between various disciplines and institutional actors, as well as between basic research, applied research and development, are losing much of their effects and visibility. (Nieminen & Kaukonen, 2001.)

For over a decade the science, technology and innovation policy pursued by Finland has been based on a broad definition of the concept of "innovation system" and the development of innovation environments has wide political support. The importance of innovations as a prerequisite for competitiveness is stressed in all relevant national strategies and in the operation of numerous actors in the field of science and technology. Knowledge-based development policy has been supported both by national programmes and by the EU Structural Funds. A particular tool – the Centre of Expertise Programme - was established to encourage different actors in the regions to gather their resources together in order to develop their chosen fields of expertise. The complexity created by the interconnections and number of actors in the Finnish national innovation system is illustrated by a policy-centred organizational map in Figure 4.1.

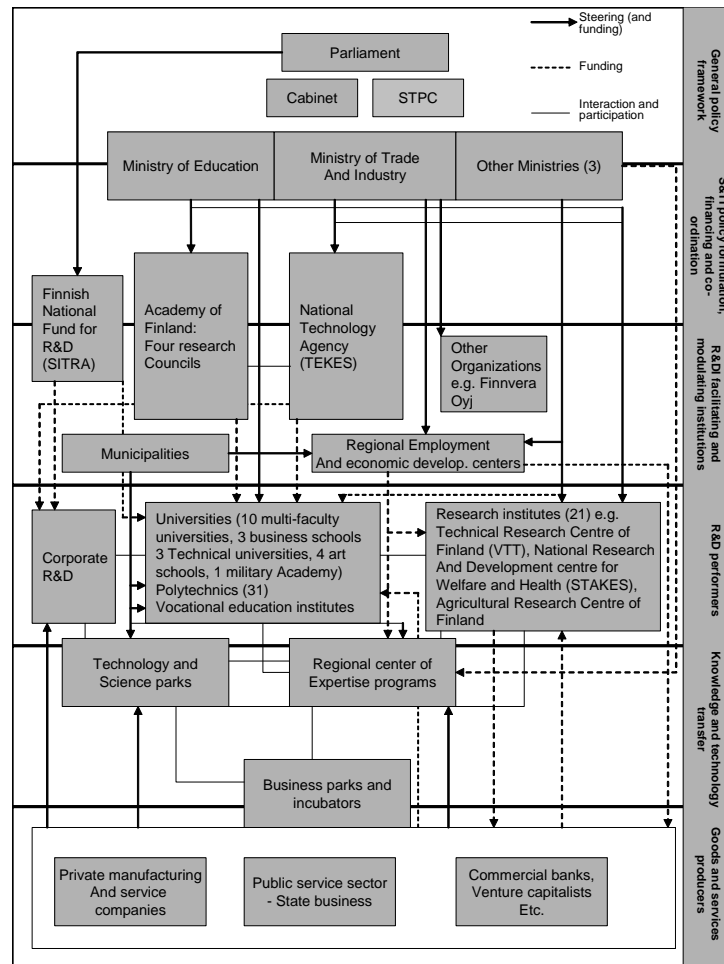


Figure 4.1 Finnish science and technology system (Nieminen & Kaukonen, 2001)

Economic growth has been most rapid in fields and regions where innovations have a solid scientific base. The role of HEIs both as innovative environments and as part of the innovation system is significant. HEIs are responsible for developing regional knowledge potential and increasingly also for making knowledge and know-how available to users through a collaborative effort. In its 2001 innovation policy statement, the Science and Technology Policy Council recommended reinforcing strategic basic research in universities and research institutes and increasing their cooperation. The internationally small volume of education and research in Finland makes special demands on networking and cooperation. From the standpoint of companies the profound body of knowledge found in universities, research institutes and polytechnics is a critical factor for cooperation. Not only knowledge but also researchers constitute a vital resource for business and industry. In fact, business enterprises are increasingly aware of the opportunities inherent in cooperation (value added), although the benefits to be gained from cooperation do not come automatically. Cooperation based on long-term and dynamic partnership requires from all parties structural reforms, strong commitment as well as changes in culture and attitudes.

The Academy of Finland appointed in 2003 a working group assigned with the task to prepare a proposal for actions that the Academy of Finland should take to promote researcher training and basic research that serves industry and business and to develop forms of cooperation between the Academy, industry and business. The final report of the working group was published in March 2005. The report recommends that cooperation and interaction between universities, research institutes and companies be deepened and intensified. The aim is that the researchers at universities, research institutes and companies would form flexible international platforms to carry out high-quality research and development projects benefiting all parties as well as train researchers. The working group further recommends that universities and research institutes take intensified measures to identify and realize the application and commercial exploitability of research results as well as encourage entrepreneurship among researchers and closer cooperation with business companies. Business companies should develop their core competences by utilizing high-quality research in their operations, by

supporting researcher training of their personnel and by hiring more employees with a doctorate than at present.

The Finnish government also stresses the importance of international research cooperation, and the important role which universities can play through cooperation with foreign universities and firms with regard to providing links between the regional and local economy and the global networks. This should be an efficient strategy for promoting the internationalization of local SMEs, as well as for providing access to global knowledge production and R&D for local SMEs. Thus, the international, national and regional missions of HEIs should not be seen as mutually exclusive but as potentially interlinked. A strong performance in the international and national level benefits the regions as well.

The operational and juridical framework in Finnish universities has not, however, been able to respond adequately to growing expectations. Particularly in universities, the nature of cooperation has changed from research undertaken by an individual researcher to extensive collaborative projects, with the participation of business and industry. One precondition for cooperation is that ownership and utilization rights are clearly defined with regard to all the partners. The current legislation concerning intellectual property rights dates from 1967, when there was no corresponding need to provide for large joint projects carried out by higher education institutions. Changes in research work have resulted in varying funding practices and complicated contractual arrangements. According to a Ministry of Trade and Industry committee (2002), the current statutes do not provide a sufficient basis for clarifying and enhancing the utilization of inventions made in higher education institutions. The committee recommended new unambiguous statutes to that effect. In practice, this will mean amendments to the Act governing in-company inventions and the Universities and Polytechnics Acts and enactment of totally new legislation. The new regulations concerning the property rights to the research results of HEIs are under preparation.

4.2 Core research funding

Since the mid-1990s, R&D spending in Finland has increased by close to 14% annually, compared to an EU average of less than 4% (Figure 4.2). In 2004, the share of HEIs of the total R&D expenditure was 20%, and R&D expenditure as a proportion of GDP stood at 3.5%. The rapid growth is mainly owing to an increase in business enterprise input as its share of total funding has grown from 55% in 1993 to 68% in 2003 (Figure 4.3). In the EU countries, the share of public R&D funding of the gross domestic product was the highest in Finland after France, 1.01% in 2003. The EU mean was 0.75%. In the case of basic research, public money is the primary source of funding in Finland.

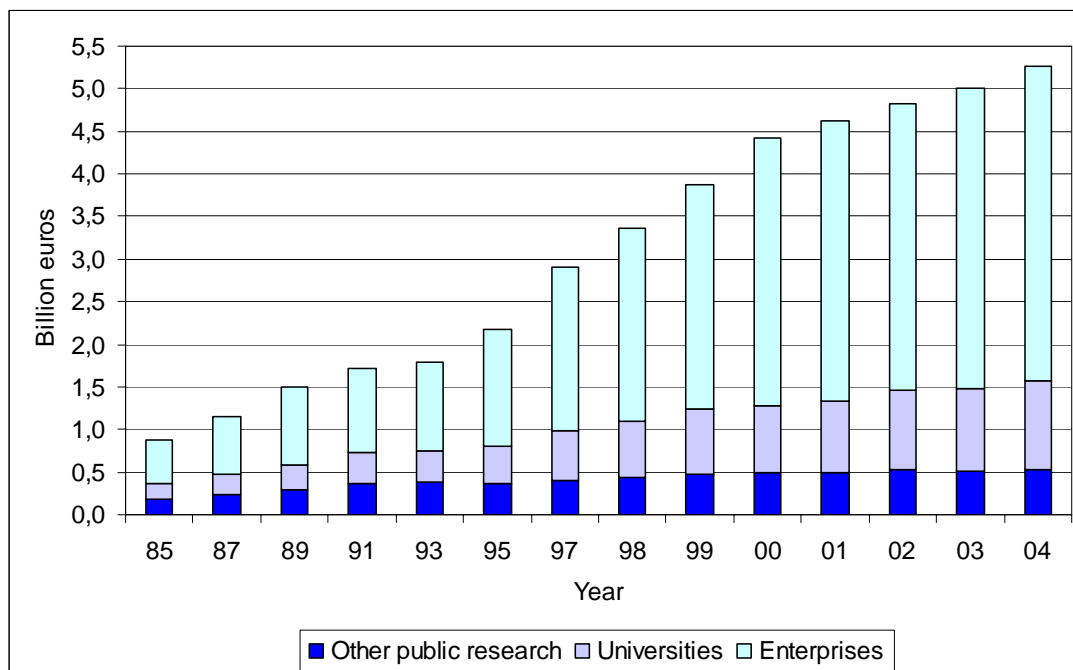


Figure 4.2 R&D expenditure in Finland in 1985-2004 (Source: Tekes)

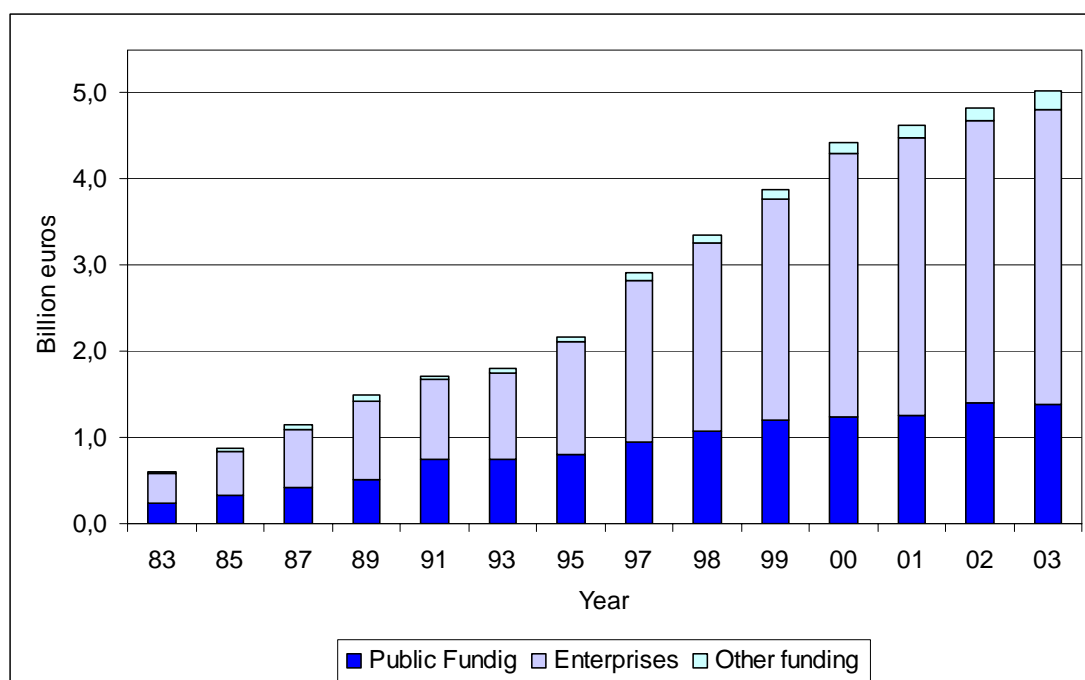


Figure 4.3 Funding of R&D expenditure in 1983-2003 (Source: Tekes)

The R&D activity is heavily concentrated on only a few regions in Finland. The capital region and four university regions (Tampere, Oulu, Turku and Jyväskylä) cover 80% of the total R&D expenditure in the country. Also, the patenting activity is mainly accumulated to the same regions. In 2001, the number of patents per 1 000 inhabitants was 0.73 in the region of Jyväskylä whereas in the whole country it was 0.32 (Appendix 9).

The *National Technology Agency of Finland* (Tekes) and *Academy of Finland* are the main external public funding organizations for research and development in Finland. Tekes funds industrial projects as well as projects in HEIs and research organizations, and especially promotes innovative, risk-intensive projects. Tekes funds come from the state budget via the Ministry of Trade and Industry. Tekes has an annual budget of EUR 400 million and it funds approximately 2 000 projects annually. The Academy of Finland, which operates under the administration of the Ministry of Education, provides funding for high-level scientific research. Annually the Academy issues funding decisions worth around EUR 200 million. More than 3 000 research professionals are engaged in Academy-funded projects at universities and research institutes.

About half of the research funding of Finnish universities comes from their internal budget and the other half is covered by external funds. In 2004, 58% (EUR 99.5 million) of the total public research funding of Tekes was allocated to the Technical Research Centre of Finland (VTT) and HEIs. The share of polytechnics was rather low, being 7% (EUR 6.6 million), but it is expected to increase in the years to come along with the strengthening of polytechnic R&D activities. The Tekes funding covered one fifth of the total external research funding of universities in 2004. The respective share of the Academy of Finland was 32%. Some 84% (EUR 174.5 million) of the total funding of the Academy of Finland was awarded to the universities and university hospitals. The EU-funding also forms an important external funding source of HEIs' R&D activities, particularly from the viewpoint of regional projects. Its relative proportion of the total external research funding of universities is approximately 9%. The distribution of funding of universities is presented in Table 1 in Appendix 10.

The R&D expenditure in the region of Jyväskylä was EUR 181 million in 2004, which is 6% more than in the previous year, and it covers 3.4% of the total R&D expenditure in Finland (Table 4.1). The R&D expenditure per capita in the Jyväskylä region was EUR 1 107, which exceeds the national average (EUR 1 003 million). In only four regions was the R&D expenditure per capita larger than in Jyväskylä. The share of the University of Jyväskylä and Jyväskylä Polytechnic was nearly 40%. Approximately half of the R&D expenditure was covered by private sector firms, which is less than in the whole country where the firms' share is approximately 70%.

Region	R&D 2002			R&D 2003			R&D 2004		
	EUR million	% of all	EUR per capita	EUR million	% of all	EUR per capita	EUR million	% of all	EUR per capita
Whole Country	4830	100,0	928	5005	100,0	959	5253	100,0	1003
Central Finland	182	3,8	685	192	3,8	723	211	4,0	788
Jyväskylä region	159	3,3	995	171	3,4	1057	181	3,4	1107

Table 4.1 R&D expenditure in the Jyväskylä region, Central Finland and in the whole country

The amount of external research funding the University of Jyväskylä in 2004 was nearly EUR 32 million of which the shares of Academy of Finland and Tekes were 39% and 12%, respectively (see Table 1 in Appendix 10). The former exceeds the national average for universities (32% in 2004) but the share of Tekes funding is below the national average (21.5%). The University of Jyväskylä was among the ten main receivers of Tekes funding in 2004 (Table 4.2). It is worth noticing that the number of the University's Tekes-projects was 20 which, in proportion to the received amount of funding, points to the small size of these projects. The Jyväskylä Polytechnic received Tekes funding for three projects in 2004. Increasing Tekes funding in the future is an important goal in the region of Jyväskylä.

	Funding, EUR MILLION	Number of projects
Technical Research Centre of Finland (VTT)	39.9	203
Helsinki University of Technology	29.8	130
Tampere University of Technology	16.6	74
University of Oulu	10.5	46
University of Kuopio	9.8	43
University of Helsinki	8.3	48
University of Turku	6.2	29
Lappeenranta University of Technology	4.3	23
Åbo Akademi	3.4	12
University of Jyväskylä	3.3	20
Total funding of public research	158.1	775
Share of 10 main receivers	84%	81%

Table 4.2 Main receivers of public research funding from Tekes in 2004 (*Source: Tekes*)

EU funding is an important contributor to the regional projects in both HEIs in the region of Jyväskylä (Appendix 10). At the University of Jyväskylä it covered one fifth of the total external funding and 35% of the EU funding was allocated to research in 2004. For the Jyväskylä Polytechnic the funding based on EU Structural funds is the main single funding source of its R&D projects. EU and state funding covered 72% of the total external R&D funding of the Polytechnic in 2004 (Table 2 in Appendix 10). The other important external funding sources of the HEIs are, e.g., ministries (also other than the Ministry of Education), municipalities, foundations and private sector companies.

4.3 Research personnel of HEIs

The research and development activities require a considerable effort from the skilled researchers and other staff. The number of person years of research staff in universities has increased markedly, by 31%, in 1999-2004. During the same period, the increase of research staff at the University of Jyväskylä has been moderate, being 14%. In the fields of humanities and science the number of research staff at the University of Jyväskylä has increased more than on the average in the country. In universities the professors also have a strong contribution in research activities. In polytechnics the R&D activities are integrated to the tasks of teaching staff and thus the number of staff focusing primarily on R&D is minor (their number has not been registered separately until lately). In the Jyväskylä Polytechnic the number of R&D staff is rapidly increasing as the R&D activities are more and more prominent in its operations.

The number of refereed articles is typically used to measure the volume and quality of research activities⁹. At the University of Jyväskylä the number of refereed articles has nearly doubled over the period from 1994 to 2004 (964 refereed articles in total, of which nearly 80% were international articles in 2004), which indicates that high level research is being carried out (Figure 4.4). The main part, nearly 40%, of the refereed articles is based on the research activities of the Faculty of Mathematics and Science. The number of refereed articles is used as one of the criteria for the allocation of performance-based funding between faculties and other units at the University of Jyväskylä.

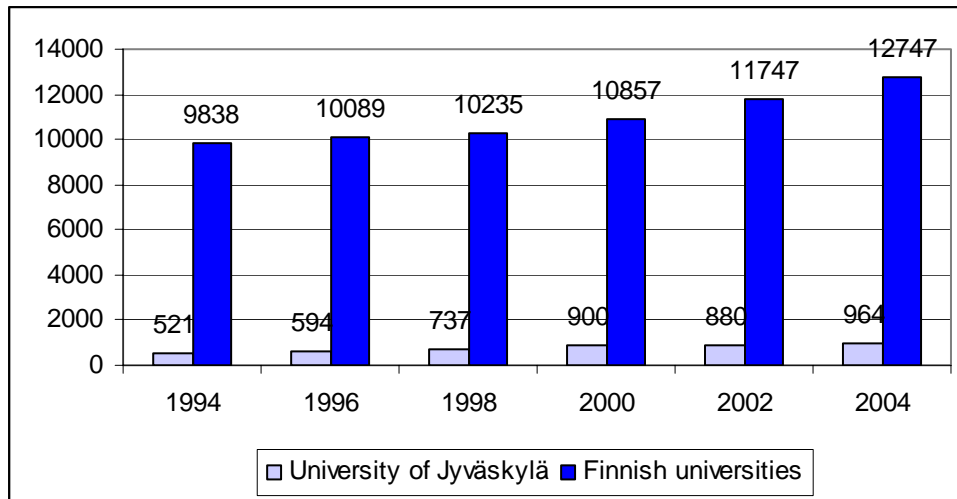


Figure 4.4 Refereed articles at the University of Jyväskylä in 1994-2004 (Source: KOTA -database)

4.4 Strategic focal points and fields of strength of the HEIs

The regional orientation differs between the research done at universities and the R&D of polytechnics. The role of polytechnic R&D is more directly focused on serving the regional needs whereas the universities are characterized as more national and international operators. This different kind of orientation forms a basis for the fields of strength of the Jyväskylä Polytechnic and University of Jyväskylä.

The Jyväskylä Region is involved in a national Centre of Expertise Programme with paper manufacturing technology, environmental, energy and nanotechnology along with information technology as its areas of strength (Box 4.1). Wellness technology is an integrated part of the Regional Centre Programme of Jyväskylä. The Jyväskylä Polytechnic and University of Jyväskylä participate actively in the development of these fields.

⁹ The University of Jyväskylä was ranked second in the national assessment of the productivity of universities. In the assessment the basic funding of the Ministry of Education and total funding of universities were used as resources, and basic and doctoral degrees, summarized articles (in international scientific journals based on the referee-method), and conference articles (in international conference publications) were considered products. (Neittaanmäki et al., 2005.)

Box 4.1 Cluster of papermaking technology

The papermaking technology cluster is the single most important export and employing industry in Central Finland. In the region, papermaking technology is also closely linked to the fields of energy, environment, ICT and nanotechnologies. The papermaking technology is one of the key areas of the Jyväskylä Region Centre of Expertise Programme. Jyväskylä region is the home of a global, major paper machinery supplier, many engineering and high-tech companies developing the latest innovations for the paper industry, two paper mills, one board mill and one pulp mill as well as numerous chemicals and additives suppliers.

Jyväskylä Science Park together with the HEIs and local VTT Processes is closely involved in the development of papermaking technology. Jyväskylä's unit of the national expert and research organization VTT has a strong knowledge base in this field. Research and education is also offered by the University of Jyväskylä (Applied Chemistry, Physics, Agora Center, Faculty of Information Technology and NanoScience Center) and Jyväskylä Polytechnic (Logistics Engineering, Paper Machine Technology). Paper industry is one of the polytechnic's Centres of Expertise. Key companies of the cluster include, e.g., Metso Paper Oy, UPM-Kymmene Oyj, M-Real Oyj and Tietoenator. Local paper and machinery companies are amongst the first in industry in exploiting the competitiveness of new enabling technologies, especially ICT and nanotechnology. In the course of the technology development numerous high tech firms have been created. Those firms have typically close contacts with the University and their joint projects have often been funded by the Centre of Expertise Programme.

There exists a mutual willingness between the actors to strengthen Central Finland's leading position as a networked operator and as a supplier, developer and user of new products, technologies and services in the future. The paper cluster aspires to use more strongly the know-how created in the fields of nano and fibre technology (new applications of production processes). These sectors may even become spearheads of the technology based development processes in the region. Moreover, the development of companies is of special importance, and small companies, particularly, will be supported. The development of information technology is one of the core functions of globally competitive papermaking technology, and Agora Center of the University has a major role to play in this field (PaperIT project). As the changes for the new period of the national Centre of Expertise Programme have not yet been settled, the role of the papermaking technology in the new programme period is still partly open. However, the development work in this key field will most likely continue based on the Centre of Expertise Programme or other alternative funding.

The Jyväskylä Polytechnic carries out projects which are part of the Centre of Expertise Programme in the fields of paper machine and information technology and participates in the BENET Bioenergy Network, which is a marketing consortium of Central Finland's enterprises and organizations operating in the field of bioenergy and managed by the Jyväskylä Science Park. The School of Tourism and Services Management of the Polytechnic hosts the regional focal point of the Networked Centre of Expertise for the Food Processing Industry (ELO) and of the Centre of Expertise for Tourism (Moske). The Network Centres act as initiators of field-specific research, education, and cooperation between businesses. Their function is to utilize internationally competitive knowledge and skills for the promotion of business activities, the creation of new jobs, and for regional development. The Jyväskylä Polytechnic also has an important role in the development of the wellness sector in the region and it coordinates the regional Wellness Dream Lab (WDL) –programme, which has promoted the creation of innovations and development of business activities related to wellbeing.

The Jyväskylä Polytechnic has outlined nine multi-disciplinary, workplace-driven centres of expertise, which were created to respond to regional needs for competence (Table 4.3). They are based on the needs of certain industries or firms, or they aim to strengthen the regional strategic choices. They are not separate parts of the institution but form cooperative groups supported and marketed by the Polytechnic. Some of the centres of expertise are well developed with a strong knowledge base in the region whereas the others are anticipated strategic choices which might create new knowledge fields to the region in the future (creative industries and logistics and transportation).

Centre of expertise	Supported regional development program
Paper industry	Paper manufacture management (Centre of Expertise Programme)
Bioenergy	Energy and environmental technology (Centre of Expertise Programme)
Information network technology	Information technology (Centre of Expertise Programme)
Creative industries	Development of creative industry in Central Finland
Wellness technology	Wellness technology and industry (Regional Centre Programme)
Health and welfare services	Wellbeing services (as part of Regional Centre Programme)
Well-being tourism	Regional node of Networked Centre of Expertise for Tourism
Food industry	Regional node of Networked Centre of Expertise for Food Processing Industry
Logistics and transportation	Innoroad centre of expertise of the future

Table 4.3 R&D centres of expertise at the Jyväskylä Polytechnic

The University of Jyväskylä currently (period of the years 2000-2005) houses five centres of excellence of research nominated by the Academy of Finland. Two of them will continue until 2007 and five new ones were nominated recently for the period of 2006-2011 (Table 4.4). The Academy Board appointed 23 centres of excellence in total for the national centre of excellence programme in 2006-2011. Centres of excellence are research units or researcher training units which comprise one or more high-level research teams that are at or near the international cutting edge of research in their fields. Thus, the regional orientation of these fields is not direct, but the regional effects might be created through the international competence, e.g., in the fields of nuclear and accelerator based physics (for the use of industry) and learning and motivation research (development of family and school environments).

Besides these, the central administration of the University of Jyväskylä has named six developing areas of excellence in research (Table 4.4). They are based on national and international competence but have reflections on the region as well. From the regional perspective, the research into gerontology and scientific computing with industrial applications might be stressed here.

Centres of excellence in research nominated by Academy of Finland*	Developing areas of excellence in research nominated by administration of the University of Jyväskylä
Evolutionary research Nuclear and accelerator based physics Learning and motivation research Political thought and conceptual change Study of variation, contacts and change in English <i>(jointly with the University of Helsinki)</i> Study of virus research <i>(jointly with the University of Helsinki)</i> Geometric analysis and mathematical physics, 2002-2007 <i>(jointly with the University of Helsinki)</i> History of mind, 2002-2007 <i>(jointly with the University of Helsinki)</i>	Gerontological research Language learning and teaching Cognitive musicology Political theory and analysis Structural chemistry Scientific computing with industrial applications

*For the period of 2006-2011

Table 4.4 Areas of excellence in research at the University of Jyväskylä

The fields of the Centre of Expertise Programme and wellness technology are also strongly supported by the research activities of the University of Jyväskylä. The University participates in the education and research projects and in the development of operative environments together with the research institutes and industries in all these spearhead fields of the region. The main objective of the University is the development of production chain processes which enable integration of multidisciplinary knowledge of different fields into the development activities. The latest field of development in the region of Jyväskylä is nanotechnology, which is heavily based on the competence of the University of Jyväskylä (Box 4.2)¹⁰.

¹⁰ 25 outstanding young researchers in Europe were awarded the European Young Investigator Award in autumn 2005. Among the awarded was Päivi Törmä, professor in nanoelectronics at the University of Jyväskylä. Törmä's experimental research is closely connected to molecular electronics and conducted at the transdisciplinary NanoScience Center in Jyväskylä, partly in collaboration with the industry.

Box 4.2 Nanotechnology – new field of expertise

The latest strategic field of expertise in the Jyväskylä region is Nanotechnology. The strong knowledge base in nanotechnology is being developed in the Faculty of Mathematics and Science of the University of Jyväskylä. The Nanoscience project launched in year 2001 aims at bringing together scientists from various disciplines i.e. physics, chemistry and biochemistry, sharing a common interest in the phenomena of nanoscale dimension. Year 2002 was an important milestone of the process. The first faculty position in Finland, fully devoted to nanoscience, was filled and planning of the new Nanoscience building started. Moreover, the first call for the International Master's Program in NanoScience was announced and several multidisciplinary research projects were initiated. The Nanoscience Center - an interdisciplinary research and business environment - was established in Oct 2004. Then eleven professors and their research groups altogether nearly 100 persons moved into the new premises furnished with state of art nanotechnology research equipment.

Nanotechnology is one of the focuses of the regional Centre of Expertise Programme of the Jyväskylä region. The main regional authorities and development organizations are committed to the development work. Nanotechnology opens up opportunities also for cooperation between the University of Jyväskylä and the Jyväskylä Polytechnic, particularly in the later phases of the process. The development of nanotechnology also supports the goals for a knowledge society and know-how -oriented business emphasized in the Lisbon strategy. Developing the knowledge base is a long process and the realization of its commercial effects takes years (at present three firms providing nanosolutions are operating in the region of Jyväskylä). The special value of nanotechnology is that it can be utilized in many fields allowing creation of horizontal innovations. The field of nanotechnology is expected to grown into a source of an impulse for world wide development, and Jyväskylä plans to be in the front line of expertise. The aim is for the Nanoscience Center to become a top-flight international unit and assume a significant role in business activity exploiting nanotechnology. The coming years will show how these huge expectations will be met.

The knowledge base of both HEIs in these different fields offer a breeding place for technical as well as social innovations. The R&D activities of the University of Jyväskylä and Jyväskylä Polytechnic are carried out by launching projects which form a part of a larger field of development (e.g., renewable energy, wellness technology or nanotechnology), or they focus on some narrow single field of competence (e.g., the WIRE-project aiming at social inclusion or the environmental project of restoring Lake Jyväsjärvi) or on the needs of firms or organizations (customized R&D services).

4.5 Main research units of the University of Jyväskylä

The University of Jyväskylä governs several separate research units which operate in cooperation with its faculties. One of these is the *Agora Center*, founded in 2002 as an independent and interdisciplinary research consortium at the University of Jyväskylä. It organizes research at which social and human sciences, including psychology, education, humanities, sport and health sciences, and economics, intersect with information technology. The Centre's research approach is based on a holistic view of the future knowledge society where humans and technology interact, with an emphasis on information and communication technologies. The City of Jyväskylä and local businesses have been active partners in developing Agora. Agora creates a bridge for research applications by providing office space for private enterprises working in the sector of information technology. This cooperation extends beyond the building itself to joint activities in the whole region, and includes the public and third sectors. The Agora Center carries out EU projects, centre of expertise projects and Tekes projects in the region. Its role in the region is to produce high level research and act as a pioneer in human tech and mental management. The Agora Center and its brand are well known outside the region as well, and several research laboratories are operating in the Agora. From the regional point of view the most important ones are the Game Laboratory and Innoroad Laboratory. The former coordinates and enhances game research, development, and training activities at the University of Jyväskylä. The laboratory also serves as a network for other actors in the field, and thus forms a link between the University, other game research networks, and private enterprises. The Innoroad Laboratory aims at constructing a basis for the multidisciplinary academic education and research in the field of transportation.

The *Institute for Environmental Research* provides scientific research, services and training in the environmental domain for authorities, private and public organizations and firms. The institute also offers accredited laboratory services. It has a strong national orientation and only one fifth of its operations are directed at Central Finland. Despite this, the institute plays an important role in the environmental cluster of Central Finland as a provider of scientific research, services and training in addition to laboratory services in the environmental field.

The *Institute for Educational Research* (established in 1968) is a national multidisciplinary research institute based at the University of Jyväskylä. Its strongest area is national and international assessment and evaluation of education. The Institute has close connections to the whole educational field and authorities in the region of Jyväskylä. Its main challenge, also from the regional perspective, is to transform the results and outcomes of educational research into product or service innovations.

Besides these separate research institutions there are other R&D units operating within the faculties. From the regional perspective, the *Information Technology Research Institute (ITRI)* and *Expert Division* of the School of Business and Economics are important actors. The *Information Technology Research Institute (ITRI)* is an independent unit of the Faculty of Information Technology and its operations are focused on the development and transfer of technological knowledge in the region. They It offers high level tailored research to its customers, including a large number of firms and public authorities, in their fields of expertise which are software engineering, organizational information management and educational technology. The institute operates in close contact with the firms of the Jyväskylä region.

The *Expert Division* operates as part of the School of Business and Economics. It focuses on fulfilling its societal service task by providing R&D services to public sector organizations and firms. Its fields of expertise include evaluation and effectiveness projects, regional economic research, labour market issues and research into the operations of enterprises. The customers of the Expert Division consist of both national and regional bodies.

4.6 Responding to regional needs and demands

Following the recession period in the early 1990s the Jyväskylä region has undergone a rapid growth and today it is one of the five growth centres in Finland. The crucial question today is how to maintain and continue this favourable development path in the dynamic and knowledge-oriented global environment. The diverse innovation potential of the HEIs in the region of Jyväskylä is not fully exploited in the region at the moment. One of the key challenges is to secure the continuation of the innovation process from the innovation resources (e.g. infrastructure and networks) to the realization of the innovations in the economy. The process of transforming research results and service ideas into commercial products is of special importance and should be rendered more efficient in the region of Jyväskylä. Instead of concentrating on the development of some specific industry, the role of new types of innovation (e.g., cultural and social innovations) and their horizontal exploitation as a prerequisite for regional growth and competitiveness should be emphasized. This implies that the traditional boundaries between different industries are breaking apart and that the region's ability to combine knowledge from different fields and to operate innovatively in their interfaces has become more and more important (i.e. networking). In the Jyväskylä region the development of wellness technology and extension of ICT to traditional industries are good examples of new horizontal openings (Box 4.3).

Box 4.3 Wellness technology as an integral part of regional development

Development of wellness technology is firmly integrated in the network city model of Jyväskylä and into the goals of the Regional Centre Programme. It is also included in the joint regional strategy of the University of Jyväskylä and Jyväskylä Polytechnic as a key field of development. One of the milestones of the development process has been the launch of wellness engineering education in the Jyväskylä Polytechnic in 1997. Over the period of the past four years or so the development of this field has been very intensive. The education and research activities in the Jyväskylä region are extensive and versatile, comprising expertise in the fields of sport, health and human sciences and ICT. Developing wellness technologies in the Jyväskylä region is focused, in particular, on horizontal and commercial exploitation of the expertise gained.

Viveca, developed and managed by JSP Facilities, is a wellness technology centre (established in 2003) designed to gather the experts and companies together and to support the development of the cluster of expertise in the field. At the same time the development project called the Wellness Dream Lab (WDL) was launched. The main objective of the project is to foster the creation of new profitable business activity in the field of wellness technology and associated services by utilizing the international level of expertise. The heart of WDL is a product development clinic. WDL integrates research, education, development organizations and product development of enterprises with international business. Students and research staff of both the Jyväskylä Polytechnic and University of Jyväskylä are connected to the development projects of enterprises through WDL. WDL is located in Viveca and managed by the Jyväskylä Polytechnic. The project is funded by regional development organizations and customer enterprises. WDL's operation has been successful and it has already created operational models for productization that could be utilized more widely. Further development of the project is planned for the period following this first one ending in 2006.

Combining the expertise of both HEIs in human sciences with their expertise in the fields of technology, ICT and applied sciences (biologic and nanosciences) is highlighted in the development of know-how in the field of wellbeing (horizontal innovations). On the other hand, creating new knowledge-oriented business activity and encouraging students and researchers of the HEIs into entrepreneurship are important goals directing the operations. The development of the wellness sector also promotes the creation of public sector innovations. The project supports goals set for sustainable development at both national and EU-level and conforms with the policies of the Lisbon strategy on commercializing innovations.

The regional development strategy of the Ministry of Education for Finland stresses the mutually complementary knowledge of the universities and polytechnics, which should be developed with an emphasis on the strengths of the regions. In order to meet the needs of the regions the higher education institutions have to pay special attention to developing their regional responsiveness through intensified cooperation with local businesses and industries and by facilitating transfer of expertise to working life. According to this strategy, an emphasis on regional development operations and innovation activities has been strengthened by the University of Jyväskylä and Jyväskylä Polytechnic, and the cooperation and division of work has been clarified on the basis of their joint regional strategy, which was updated in autumn 2005. The main emphasis of the updated regional strategies defined by the Ministry of Education is to develop cooperation between HEIs and their interaction with society on the basis of a clear division of work. This requires that both institutions are capable of identifying their strengths, renewing their action cultures and increasing their confidence in each other and in regional actors. More intensive and systematic cooperation between HEIs allows more effective use and allocation of resources and improved opportunities for participating in regional networks as a supplier of skilled workers and R&D know-how.

R&D activities and transfer of knowledge

The research activities of the University of Jyväskylä are one of the main sources of innovations in the high technology innovation processes which are largely based on the basic and demanding applied research. In turn, the Jyväskylä Polytechnic is an important actor in the innovation processes which aim at continuous

and systematic gradually progressing, development of products, services and other business activities (incremental innovations¹¹).

The interviews at the University of Jyväskylä revealed that the contradiction and disparity between scientific research and applied regionally oriented research might cause some difficulties and that balancing between them is seen as a challenging task in some faculties and departments. The basic scientific research does not serve firms directly and thus, its regional effects are harder to recognize. Moreover, a long tradition of independent work and lack of know-how on how to deal and establish a good dialogue with the firms may be difficult for some university departments. However, the regional engagement dimension has become increasingly linked to the research activities of the University of Jyväskylä. From the regional perspective, one of the most successful operations of the University of Jyväskylä has been the launch of the development programme in applied natural sciences in 1989 by the Faculty of Mathematics and Science. It mapped out the needs of regional actors and intensified notably departmental cooperation with companies and research centres located in the Jyväskylä region. The networks created during that process are viable even today.

According to the results of the internet-questionnaire less than half of the University's research activities seem to be directed to the region of Jyväskylä¹². In turn, half of the representatives of the polytechnic estimated their regional activities to cover more than 60% of their R&D operations. In 2004, a main part (80%) of the Polytechnic's ongoing projects was, at least partly, directed to the region of Jyväskylä¹³. The HEIs in the region of Jyväskylä carry out joint R&D -projects with firms and other regional organizations in which the HEIs can provide their special expertise. The forms of cooperation include, for example, research and development projects, training customized according to the individual needs of clients as well as consulting. The projects are done directly with firms or in cooperation with intermediate organizations. The university persons interviewed stress that their basic objective is to participate only in long-term projects in which research has an important role. This refers again to the different operational aspects of the university and polytechnic. The former places more emphasis on the research based projects, whereas the latter prefers the development-oriented projects. The volume and intensity of university research and polytechnic R&D -activities vary between the faculties and schools. The Jyväskylä Polytechnic's applied research has a significant role in the fields of health and social care, engineering and technology, and information technology, whereas the development activities have a special importance in tourism and services management. At the University of Jyväskylä the focus of regionally oriented research projects in recent years has been on the information and wellness technology, industrial physics and environmental technology including renewable energy. The renewable energy is a good example of how the areas of strength of the HEIs fit with the regional development plans in the field of future energy solutions (Box 4.4). Besides these, both institutions have accomplished projects in the fields of communication and internationalization.

¹¹Typically, the innovations can be divided into two basic types: (1) Radical innovations - something that is based on a markedly different technology or idea than previous products, and (2) Incremental innovations - something that is based on only a slightly changed technology or idea than previous products. The latter one, which focuses on cost or feature improvements in existing processes, products or services (progressing in small steps), is more and more emphasized in HEIs and particularly in the polytechnics.

¹²Due to the national and international emphasis of the University of Jyväskylä the regional dimension of R&D activities has not been registered separately so far.

¹³ Regional distribution of projects of the Jyväskylä Polytechnic in Central Finland (the same projects can have effects on several regions): 104 in the Jyväskylä region, 40 in the Jämsä region, 27 in the Joutsa region, 33 in the Keuruu region, 43 in the Äänekoski region and 35 in the Saarijärvi-Viitasaari region.

Box 4.4 The cluster of expertise in renewable energy

In the initial phase of the Centre of Expertise Programme in the mid 1990s the professorships of environmental technology were created at the University of Jyväskylä with the financial support of project and private sector funding. This was followed by the allocation of project funding to the development of expertise in biogas technology by getting pilot equipment and instruments for forming a research environment. This process has allowed the development of expertise in the field of renewable energy, and businesses connected to it are expected to increase in number and to extend even internationally in the future.

A large group of actors cooperates in the field of renewable energy in Central Finland. In addition to the HEIs, this group includes the VTT Technical Research Centre of Finland, Jyväskylä Science Park, municipalities and enterprises. The Jyväskylä Polytechnic's Institute for Natural Resources is a significant provider of education in the field of bioenergy within the province and has notable expertise in project work. It also functions as an expert for an international centre of expertise in bioenergy. The University of Jyväskylä has established a Study and Research Programme in Renewable Energy, which relies heavily on the expertise in the Faculty of Mathematics and Science. Research focuses on biogas, liquid biofuels, solar heat and electricity, local hybrid solutions and hydrogen technology. The programme is a joint educational and research effort of three faculties of the University of Jyväskylä (coordinated by the Chemistry Department), and it received EU structural funding in the amount of EUR 1.5 million for the years 2003 – 2006. The cluster of expertise in the area is strengthened by BENET, a bioenergy consortium of enterprises and public organizations of Central Finland managed by the Jyväskylä Science Park. BENET aims at combining the resources of regional enterprises and carrying out larger and more challenging development projects than the member organizations could manage on their own.

Energy technology is one of the key fields of the Jyväskylä Centre of Expertise Programme. Emphasising renewable energy supports on its part the much needed prioritization of activities. The multidisciplinary challenges and horizontal innovations involved in the field of renewable energy require cooperation of many different types of experts. The aim is to transfer this expertise to the use of region's business life through project work, thus creating new business that would further strengthen the cluster of expertise. The development of the renewable energy field supports goals set for sustainable development at both national and EU-level and conforms with the policies of the Lisbon strategy on commercializing innovations. The project is expected to have significant regional effects in the future. Knowledge development and the networked based operation aiming at the development of business are in a key position.

Two aspects are important to consider when analysing the transfer of R&D knowledge of HEIs to regional actors. Firstly, it is essential to meet the emerging needs and demands of firms (demand orientation), and secondly, the HEIs' expertise should be easily accessible (availability). According to the findings, mapping out the R&D needs and demands of firms and other regional actors is not systematically organized in the HEIs of the Jyväskylä region even if its relevance is well acknowledged among the staff. There is also significant variation in the level of demand orientation between the fields of study of both institutions. One important step towards more systematic information gathering was the launching of the learning network team of Central Finland – OPTIIMI, in 2004. It aims at mapping out the future needs of firms and other organizations in Central Finland. However, the possibilities of OPTIIMI to concentrate on the needs of individual firms are limited and thus remain in charge of the faculties and schools.

Due to the more regionally oriented role of polytechnics, the Jyväskylä Polytechnic seems to be more active in surveying the regional needs. To support the continuing interaction with the regional actors the Polytechnic has developed a system of advisory councils, which allows for the representatives of firms, regional organizations and other important partners to discuss the new development ideas and needs. The experiences of this type of an activity have been quite positive.

The representatives of both HEIs are unanimous in their opinion about the importance of networks. Effective interactive networks based on partnership and common goals among firms, HEIs and other regional actors

are seen to be very important channels for the transfer of information about the needs and demands of firms and other regional actors. However, the interviews revealed that information gathering through networks is not systematically organized in the HEIs, and that the existing networks are mainly based on informal personal contacts. Thus, the networking activities involve significant potential which is so far underused. In addition to the transfer of information from the regional actors to the HEIs, the networks could be used more effectively as a channel to the opposite direction. In other words, the information on the knowledge base and R&D activities offered by HEIs could be transferred to the other actors of the region.

Constructing some kind of a customer management system might be one possible solution for eliciting the relevant information. The development of networks is one of the strategic themes of the Jyväskylä Polytechnic at present and it is included in their balance scorecard, which attempts to measure and provide feedback in order to facilitate the implementation of strategies and objectives. The schools list their partners and evaluate the coverage and development needs of their networks. This is followed by the definition of level estimates and discussion of probable measures that might be needed. At best, this procedure will lead to a more effective utilization of networks at the Jyväskylä Polytechnic.

Challenges in creating cooperation with firms

Even if the HEIs were able to provide the best possible know-how for the use of firms and other regional organizations there is no guarantee for its effective utilization in the region. This implies that the potential customers and/or partners should also be capable of receiving and processing the know-how based on the activities of the HEIs.

The representatives of the HEIs were asked to estimate on a scale from 4 to 10 the readiness of regional firms to benefit from their research activities and expertise. The results indicate that this readiness is at an average level or below, i.e. the research activities get the mean value of 6.6 and expertise 7.3. Familiarization with the R&D activities of the HEIs among the regional actors varies between the faculties and schools. Typically, the polytechnic activities are better known in the region than those of the university.

In a recent study by the Employment and Economic Development Centre of Central Finland (2005) the views on the operational environment and development prospects of a sample of small and medium sized firms (n=211) in Central Finland were surveyed. One part of the survey focused on the cooperation patterns of firms. The firms were asked, for instance, to mention the main reasons for their cooperation with universities and polytechnics. According to the responses, the main purpose of the cooperation with universities is to stimulate the growth of markets and extend the knowledge base. In turn, active cooperation with polytechnics aims, particularly, at complementing resources, extending markets and raising the level of knowledge.

The quality and quantity of HEIs – industry -relationships vary between the Jyväskylä Polytechnic and the University of Jyväskylä and within them as well. Some large companies like Metso, Nokia and Tietoenator make a significant contribution to the region of Jyväskylä (employing approximately 3 000 workers) and they are important partners for both HEIs. In addition to the education of competent workers, the HEIs carry out joint R&D projects with the large companies (e.g., aiming at improving the internal processes of those companies). A great challenge of the globalizing world is to ensure a competitive operational environment for these key firms in the region of Jyväskylä also in the future. The cooperation between HEIs and SMEs in the region is fairly random and poorly developed, with the exception of joint projects with some high technology firms, especially IT-firms.

The HEIs in the region of Jyväskylä face certain difficulties in their attempts to cooperate with firms, particularly with SMEs. Due to the rather small size of the Jyväskylä region there are not enough firms to profit from the knowledge and R&D capacity of the HEIs. Particularly the firms with a significant growth potential and willingness to work actively in R&D are lacking in the region. The firms' share of R&D expenditure of the region of Jyväskylä in 2003 was 54% whereas the national average was 70.5%.

There are a large number of small firms in the region but their problems are that they usually cannot predict or recognize their long term needs and individually, they do not have enough resources to join the research projects of the HEIs. In fact, any large-scale projects might become too burdensome for small firms due to

the organizational complexity and lack of knowledge about funding opportunities and their availability. Small firms might also see the University of Jyväskylä as an inappropriate partner because they do not have enough information about what opportunities there might be to utilize the research and knowledge base generated by the University and what the value added received from cooperation might be. Thus, for those firms the Polytechnic is often easier to approach. However, the R&D -activities of the Jyväskylä Polytechnic are rather new and still taking shape and more time is needed to fully integrate them into the region, which has partly restricted the extension of firm-level cooperation. As a whole, according to the interviews the operations of the HEIs are rather poorly known in the region of Jyväskylä, which prevents firms and other regional actors from engaging in R&D cooperation effectively.

The main challenges recognized by firms, other regional actors and the HEIs themselves are how to make the HEIs' activities and output externally more visible and concrete in an attractive way and how to approach a firm as a whole. Firstly, the HEIs should clearly identify their priorities and define their profiles. Secondly, they should seek to better inform the firms and other regional actors on their knowledge and know-how. In the process of information transfer, the intermediate organizations could also have an important role. According to the results of the questionnaire the most useful channels for the transfer of information are considered to be the intensive cooperation and interaction with regional actors, more effective communication and active participation in the seminars and other meetings where it is possible to present their own activities. However, it is clear that the increasing information transfer is only one part of the relationship building. In addition, the actors have to identify a common mission, mutual trust and added value generated by the cooperation.

One drawback of the R&D -projects of the Jyväskylä Polytechnic and University of Jyväskylä is their loose tie to the development of the firms' processes as a whole. In general, firms need an individual-level approach which focuses on the firm as a whole. Only this allows recognizing those specific needs of the firms which cannot be expressed or recognized by the firms themselves. The differences between expressed and latent needs/potential often stem from the difficulties that many small and medium-sized firms have in diagnosing the external support requirements of their business. Customized support and services for different types of firms, which take account of their life-cycle path, their economic and personnel resources, the capability of their owners and managers (concerning the knowledge in the fields of substance, business and entrepreneurship) are becoming more and more important. This could be supported by the development of some kind of a customer management system.

It would be essential to solve the obstacles which the HEIs and firms are struggling with and stimulate cooperation between them. Besides the collaborative efforts of the HEIs more intensive cooperation also requires that the firms themselves are committed to the process and share a common goal. At best, the cooperative research projects between the HEIs and firms in the region allow for both of them to go beyond their own resource limits, which also means that they can spread their risks and take advantage of a number of funding opportunities.

4.7 Interfaces facilitating knowledge utilization and transfer

The regional innovation system consists of several actors taking care of the various phases of the innovation process. The main actors are the HEIs, intermediate organizations and firms. The Ministry of Education places a strong emphasis on the cooperation between polytechnics and universities based on their complementary functions and the strengths of each institution. The cooperation between HEIs and intermediate organizations is also seen as a challenge. The Ministry of Education encourages regional actors to create an operational mode based on the science park concept, which gathers firms, intermediate organizations and HEIs together in an effective way (discussion with the representatives of the Ministry of Education, 12 Sep 2005).

The university should be seen as a producer of high level basic research and education. In turn, the polytechnic is more acquainted with professional education, development of working life and testing processes. The intermediate organizations are responsible for the commercialization and diffusion of research based innovations into the market. In the region of Jyväskylä the division of work between the different actors is considered necessary but it is still taking shape.

Internal support units of HEIs

The Finnish HEIs have established separate support units to respond to the increasing importance of innovations and their commercialization and management of project activities. The general aim of these units is to assist the staffs of faculties and schools in certain issues which do not necessarily belong to the basic professional skills of staffs.

At the University of Jyväskylä a supporting system for innovations was launched in 2001. The Research Services unit is responsible for research administration and assists researchers with issues relating to project planning, cost calculation and collaboration agreements as well as exploitation of research results. It acts as a link between the University and companies and other organizations. The Innovation Manager promotes innovativeness in general, gives advice on industrial property rights and innovations, seeks for innovative projects and evaluates them as well as contributes to the technical, productive and commercial exploitation of innovations. The Research Services unit cooperates with the Jyväskylä Science Park, which disseminates its expertise, e.g., in the cases of new entrepreneurship. In the period of 2001-2004, ten firms based on the research carried out at the University of Jyväskylä were established with the assistance of the Research Services.

The targets of Research Services at the University of Jyväskylä are transformation of inventions into practical applications through a gapless innovation process, which will make possible the maximal exploitation of research results, appropriate administration of agreements, improvement of cost correlation within externally funded projects, as well as intensified cooperation with companies. In addition to technological innovations, exploitation of social and cultural innovations is encouraged. The general goal of all activities is project management respecting the interests of the University as a whole. The University interviews revealed that the services provided by the Research Services unit are rather unknown and the role of the service unit in the innovation process is not clear. This implies that its mission should be specified particularly in relation to the regional intermediate organizations.

In the Jyväskylä Polytechnic, the support unit for R&D was established in 2001 to coordinate and develop the project activities. Its tasks include, for instance, assisting in funding issues, devising the Polytechnic's R&D strategy, planning and coordinating joint projects and defining the knowledge fields and clusters. The quality assurance of R&D is also an integral part of the overall quality assurance system of the Polytechnic. The R&D quality assurance is based on the handbook of process descriptions and guiding principles, which comprise various operational tools for project activities and on evaluation practices, indicators, education of staff and continuous development of the assurance system.

The Jyväskylä Polytechnic has also recently employed development managers for each school. Their tasks include systematic organization and coordination of development and innovation activities. Among the staff, the support unit for R&D is considered useful, particularly as provider of assistance in project management. The role of development managers is seen more as a link from the school to external actors, like the firms and other stakeholders. They should be familiar with the projects in progress and able to coordinate the projects of their school as a whole.

Division of labour between the HEIs

Due to the rather artificial division between basic and applied research, particularly in branches serving the labour market and business, the complementary roles of HEIs in the region of Jyväskylä provide an excellent opportunity to respond to regional needs and benefit from synergies. The higher education institutions in the Jyväskylä region produce a large body of high-level knowledge in different fields. The different knowledge bases within the HEIs and between them should not be seen as separate and isolated units but their interfaces should be considered potential development fields which might open up excellent possibilities and breeding places for new innovations.

Currently, the cooperation between the University of Jyväskylä and Jyväskylä Polytechnic differs markedly between their various units. In certain schools or faculties/departments the cooperation is advanced and it is actively developed, whereas in some other parts of the HEIs such cooperation has only a minor role or it is totally neglected. Promising experiences of closer cooperation between the HEIs have been gained in the

field of renewable energy, wellness technology, information technology and gerontology (Box 4.5). Some effort towards a more cooperative direction has also been made in the development of the Agora concept and in nanotechnology.

Box 4.5 Collaborative effort to respond to the challenges of ageing population

Gerontology has a strong multidisciplinary knowledge base in the field of education and research at the University of Jyväskylä. The degree studies in the field of gerontology have been organized since 1991 by the Faculty of Sport and Health Sciences in close cooperation with the different departments of the University. The School of Health and Social Studies of the Jyväskylä Polytechnic is focused on nursing, rehabilitation and social services, and on developing all these services and future services concerning for example health promotion and rehabilitation of elderly inhabitants.

The multidisciplinary, multi-level know-how regarding ageing population in Central Finland is the starting point of operation of the research and development centre GeroCenter. GeroCenter is still in an initial phase of operation, but it aims at carrying out R&D work as well as education, information, consulting and service activities in an authentic service environment. GeroCenter is launching its operation gradually in 2005 by establishing the positions of director general and research secretary. Wider operations and fund raising will be carried out in 2006 and the expansion of the centre's activities is expected to start in 2008. The starting points of the centre's operation are utilising the knowledge acquired from both basic research and needs for developing and implementing good operational models, rising from social practices. The participants in the project are the University of Jyväskylä, Jyväskylä Polytechnic, Central Finland Health Care District and municipalities. Furthermore, the role of third sector organizations and associations is essential.

The different basic tasks of the actors and various action cultures and contexts of research, education, and development work are combined in the GeroCenter concept. The operation is based on the collaboration of the actors and on an innovative combination of their areas of strength. In addition, customer-orientation, sustainable development and ethical activities are stressed.

The operational concept of the GeroCenter aims at responding to the challenges set by the ageing population both regionally and nationally. At best, the operation can combine the basic research conducted at the University of Jyväskylä and the Jyväskylä Polytechnic's competence in applied fields. Operating within a concrete service environment helps direct the expertise of the HEIs towards regional needs. Through social and service innovations, the operation of GeroCenter can not only create significant additional value regionally, but also nationally and internationally. The GeroCenter concept is one of the key fields of expertise emphasized in the joint regional strategy of the University of Jyväskylä and Jyväskylä Polytechnic.

As a whole, institutional cooperation is mainly based on individual contacts of the HEI staffs and their own activeness, as the systematic coordination of this work is weak. In some cases, crossing of institutional boundaries has proved to be very troublesome. The interviews and the results of the questionnaire revealed that the principal problems are unclear division of work, lack of trust and openness, and resulting unhealthy competition. The personnel of both HEIs are rather unanimous in saying that they are willing to cooperate but the operative mechanisms are lacking. Worth mentioning are the partly divergent views on existing relationships and development of cooperation between some faculties of the University and schools of the Polytechnic operating in the same field (see the summaries in Appendix 2). The executive group consisting of administrative personnel from both institutions was established in the course of their first joint regional strategy process in 2002 but its role in encouraging and coordinating the collaboration between the faculties/departments of the University and schools of the Polytechnic has not been very strong so far.

Mapping out and recognizing own strengths and knowledge fields would be useful and indispensable for the actors of the HEIs. After that it might be possible to profit from potential synergies by combining the operations and avoiding any overlapping activities. The division of work in joint projects should be clearly defined on the basis of each other's strengths: the university taking care of research activities and polytechnic working with the development of applications and business adaptations. According to the views

of interviewed HEI staffs, the cooperation could be connected with, e.g., joint projects and graduate theses of students.

Role of regional organizations

The *Regional Council of Central Finland* is a joint municipal authority which works to promote the prosperity of whole Central Finland. Together with the City of Jyväskylä they see their roles as regional coordinators, whose main tasks include bringing the different actors together and creating for them an arena where to cooperate. The Regional Council defines the objectives of development for the region - being responsible for the strategy and programming work and the ways and means of implementing them - together with other regional authorities and numerous partners. The Regional Council of Central Finland aims at participating actively in the development of the HEIs' regional role. For instance, it was acting as an expert in the preparation of the joint regional strategy of the Jyväskylä Polytechnic and the University of Jyväskylä. Also, in the faculties and schools the Regional Council is seen as an important partner. However, the cooperation is often based only on the funding issues of R&D -projects. Therefore, the Regional Council of Central Finland would like to raise its profile as a partner capable of more constructive and substance-oriented cooperation.

There are several intermediate organizations in the region of Jyväskylä which support and facilitate the commercialization of innovations and technology transfer. Some of these organizations direct their operations to Central Finland as a whole and others are focusing their operations mainly to the region of Jyväskylä. The actors of the HEIs see that the intermediate organizations in the region of Jyväskylä should have special expertise in marketing, communication and business knowledge in general. Also, managing the funding issues from the search of funding sources to the application phase should be an inherent part of their activities, more than at present. The intermediate organizations could also act as managers that bring the small firms together allowing them to participate in the joint development projects with the HEIs. According to the interviews, those HEI units that practise cooperation with intermediate organizations feel that it works rather well in comprising regional strategy work, exchange of expertise and advisory services, funding and international issues and project planning. However, there is an information gap which inhibits intermediate organizations to utilize effectively the R&D activities and expertise of the HEIs, and on the other hand the HEIs are not familiar with all the services and support offered by these intermediate organizations. Moreover, the partly unclear division of work between the region's intermediate organizations does not allow frictionless cooperation. At best, the chain formed by the HEIs and intermediate organizations can provide a well functioning mechanism for transforming research results into business applications. The main intermediate organizations are shortly presented in the following.

The aim of the *Jyväskylä Science Park (JSP)* is to generate business activity which is based on new knowledge and expertise. If the business idea is considered worthy of development, a business plan is drawn up. Further technical development of the idea can be assisted through seed funding and the enterprise's founder can obtain business incubator support in the form of funding, training and facilities. The most promising projects are transformed into commercial business actions within a new company or if necessary within one already in existence. Annually some 150-200 business ideas are evaluated by the Jyväskylä Science Park and approximately 10% of them will be developed into a business. Through the incubator process more than 150 firms have started their operation and employing approximately 800 persons in total. In the period of 1992-2005, 6.2% of all new jobs in the Jyväskylä region were created by firms which have gone through the incubator process. Many of these firms have their roots in the research done in the HEIs, particularly at the University of Jyväskylä. There is no exact information on that but it is estimated that approximately 60% of the incubator firms are based on the know-how of the HEIs. Moreover, the Jyväskylä Science Park organizes annually a contest for the best business idea. It provides an opportunity to present ideas and allow them to be evaluated by experts from the business point of view. At best, this might lead into profitable business. Participation of both students and staff of the region's HEIs has been rather active. The Jyväskylä Science Park also promotes cooperation between the HEIs and firms through implementing joint development projects and programmes, and networking, which is further supported by the use of shared premises (e.g. Viveca). As a joint effort the University of Jyväskylä, Jyväskylä Polytechnic and Jyväskylä Science Park organized in autumn 2005 a training programme, Launch Pad, that aims to provide new techniques and tools to develop high tech business entrepreneurship and to improve technology companies' chances of succeeding in the global business arena. The programme offered valuable information for starting

entrepreneurs, research groups with a technology based business idea and for the experts of business development operating in the Jyväskylä region.

The Jyväskylä Science Park has good experience of developing business networks. Allocated business training programs have been developed for the generation of competitive SMEs to be fitted in the different fields of business. The Science Park's role is also to direct the education towards the goals of business operations and the amount of skilled labour force. The best know-how can be found in the following areas: information technology, paper making technology, energy technology, environment technology, wellness technology and nanotechnology. The high technology sector is heavily concentrated on the Jyväskylä region and thus forms the main operational area of the JSP, but through resulting industrial developments it has significant reflections on the other parts of Central Finland as well.

In addition to the above, enterprises are offered facilities that are packed with a whole range of services. JSP Facilities provides technology companies an optimal environment and infrastructure for their business operations. It offers flexible alternatives for setting up or expanding business operations in the Jyväskylä Region. The JSP Facility service concept helps customers to focus on their core business.

The *Jyväskylä Regional Development Company Jykes Ltd.* is a business development company of the Jyväskylä region owned by five municipalities in the region, and it has a cooperation agreement with the other four surrounding municipalities. Jykes offers a wide range of tailor-made services for companies at all stages of their development. Its operations are focused more on firms representing traditional industries, whereas the Jyväskylä Science Park is specialized in high technology firms. Jykes promotes new forms of business and internationalization of companies and provides information, e.g., on financing options, marketing and opportunities for cooperation and networking. Jykes co-operates with enterprises and organizations at the international, national and regional level together with the establishments of higher education.

Jykes Real Estate Company Ltd is specialized in facility services and focuses on managing real estate projects related to business services in Jyväskylä's four districts. In addition to building and renting office premises, the company is offering building lots that are ready for construction and it also develops business parks. Jykes Real Estate Company has developed a partial ownership model for facilities, which lowers the threshold for businesses to acquire their own facilities.

The *Employment and Economic Development Centre of Central Finland (TE-Centre)* is part of a national organization participating in the regional development of whole Central Finland in general. It supports and advises SMEs at the various stages of their cycles including technological development, export activities and internationalization. Its task is also to plan and organize adult training within the official labour policy framework. The technology unit of the TE-centre acts as a mediator for the financing and expertise services provided by Tekes (National Technology Agency of Finland), as part of the Tekes network.

Also the business promoting organizations operating in Central Finland – *Central Finland Chamber of Commerce* and *Central Finland unit of Federation of Finnish Enterprises* – can be considered some type of intermediate organizations. The Central Finland Chamber of Commerce promotes the business environment and competitive position of Central Finland's companies. It provides e.g., training, up-to-date information on economic management, legal advice, tax counselling, as well as export documents. The Federation of Finnish Enterprises with 21 regional organizations is the largest central business organization in Finland. Out of all its activities, the interests of small- and medium-sized enterprises are covered most extensively. Training, information and advisory services in regional policy issues are offered for member firms. The businesses and organizations representing various fields and branches of trade and industry are members of these support organizations.

R&D cooperation with the research institutions in the region

The HEIs also cooperate with certain independent research and development organizations which are situated in the region of Jyväskylä. One of the technology partners is VTT Processes - a unit of the Technical Research Centre of Finland (VTT) located in Jyväskylä – which forms a part of the energy and forest clusters. It has operated in the region since the beginning of 1980s and has an important role in the focus

areas of the region's Centre of Expertise Programme. VTT is cooperating closely with the University of Jyväskylä and Jyväskylä Polytechnic, e.g., in the field of renewable energy. The joint research projects of VTT Processes and the University of Jyväskylä have become an established form of cooperation.

The Niilo Mäki Institute (NMI), established in 1990, is an important partner of the Department of Psychology of the University of Jyväskylä. It aims at advancing the neuropsychological research and remediation of children and adolescents. The Institute is active in the domains of research and training as well as providing clinical and information services. The Faculty of Sport and Health Sciences cooperates with the Research Centre for Sport and Health Sciences (LIKES) and Research Institute for Olympic Sports (KIHU). The former aims at supporting sports activities and national health and their scientific research. The latter is a nationally and internationally respected, customer-oriented interdisciplinary research, development and service organization for elite sports. These contacts offer an opportunity to transform basic research findings into a more applied form directed toward practical professional fields, and allow students to carry out the graduate theses dealing with current research topics in the field. Although the research activities of these institutions are more national and international than regional, their importance in increasing the regional knowledge base cannot be neglected.

The decision to locate one division of the National Research and Development Centre for Welfare and Health (STAKES) in the region of Jyväskylä has opened up excellent possibilities for the HEIs. This division will cooperate with both HEIs in the region and may also contribute considerably to the cooperation forms between the HEIs.

4.8 Conclusions: Critical points relating to the contribution of research to regional innovation

- 1. Collaboration and division of work between the HEIs in the region.** The University of Jyväskylä and Jyväskylä Polytechnic have both integrated in the regional innovation system very tightly. They both operate in the fields of technological, business and social innovations emphasizing their incremental nature. However, their role in the regional innovation system differs remarkably. Both institutions provide know-how capacity to the innovation system, though there is a different emphasis in the expertise provided. In the HEIs' mutual regional strategy the R&D activities of the HEIs are aimed at constructing a mutually supporting and complementary entity. The University of Jyväskylä is focused mainly on providing internationally competitive basic research, supporting the purposes of both national and regional innovation systems. Additionally, the University of Jyväskylä operates in the transformation of innovations (generated by basic research) into practical applications. The role of the Jyväskylä Polytechnic in the regional innovation system is strongly connected to practically orientated research and development processes of the enterprise and public sector. Accordingly, the Jyväskylä Polytechnic focuses on applied research and development projects supporting progressive innovation processes and diffusing innovations into production of goods and services. The division between basic and applied research is, however, rather artificial. Hence, the different knowledge bases and expertise of the HEIs should not be seen as separate and isolated units. Instead, their interfaces should be considered as a potential to contribute seamless innovation processes from the basic research and testing process to commercialization of innovations. This kind of an innovation process requires profound cooperation between the operating units. Currently, the collaboration between the University of Jyväskylä and Jyväskylä Polytechnic differs markedly between the different units. In the individual sphere of activities the cooperation between units is advanced and fast developing, whereas in some other parts of the HEIs the cooperation has a minor role or it is totally neglected. The complementary roles of the HEIs in the region of Jyväskylä would provide an excellent basis to respond to regional needs and benefit from synergies to a much greater degree than has so far been done. This potential is also promoted by the joint regional strategy of the HEIs:

“The collaboration between the HEIs based on their different profiles will be increased and deepened particularly in regard to education, applied research, and development activities serving economic life and regional development.” (Regional strategy of the Central Finland's HEIs 2005-2009.)

- 2. Collaboration and division of work between the HEIs and the regional stakeholders.** Both the University of Jyväskylä and Jyväskylä Polytechnic are engaged in active collaboration with regional stakeholders, involving firms, supporting services/agencies and intermediate organizations. The collaboration with the stakeholders operates in a recursive manner. The functions of the HEIs generate new needs among the stakeholders, and vice versa, processes adapted by the stakeholders change the expectations and needs confronted by the HEIs. The collaboration often takes the form of mutual projects or it is based on a financial relationship. Thus, the collaboration is mainly based on single operations instead of comprehensive mutual agreements or strategies. This causes inefficient use of the potential opportunities of contributing to the regional innovation system. In addition, lack of comprehensive agreements also causes conflicts of strategies and uncertainty regarding the roles of different players in the regional innovation system. Inefficient use of opportunities, conflicts of strategies and uncertainty concerning division of work result in overlapping activities, inefficient use of resources, weakening of the development ethos and missing of synergy benefits. Clarification of roles and tasks of different actors and improvement of the transparency of strategies and operations are needed in the Jyväskylä region to enhance the HEIs contribution to the regional innovation system. A particularly urgent question is where the interface between HEIs and intermediate organizations should be set in the innovation chain, and how to ensure a seamless innovation process through the collaboration of the different innovation system agents. Deepening the collaboration between the HEIs and their regional stakeholders is one of the key objectives of the new joint regional strategy of the University and Polytechnic:

“The division of labour between the HEIs and regional intermediate organizations will be clarified according to the changing legislation and goals set for the HEIs.” (Regional strategy of the Central Finland’s HEIs 2005-2009.)

- 3. Failures of the innovation environment.** The region of Jyväskylä forms strong know-how clusters in certain lines of activities (such as sport and health sciences, education and energy), based mainly on education and basic research activities of the public sector, including the HEIs. However, these clusters of know-how have not generated business activities and employment in the region in an expected way. From the viewpoint of regional development, the efforts of basic research and education are partly leaking away. To improve the HEI input in these pools of know-how in the regional innovation system, contributing applied research and supporting actions of commercialization are needed. The whole innovation chain from basic research and identification of potential ideas to functional business operations should be assured. One weak link in the chain may cause collapse of the whole promising structure. A strong innovation process requires seamless collaboration between actors. The HEIs and the intermediate organizations of the innovation system should integrate their efforts still more efficiently to avoid possible gaps in the innovation processes. From the point of view of entrepreneurship, the building of know-how clusters should be based on the existing entrepreneurial activity of the region instead of being separate. This would enable the firms to benefit from the increase of know-how and its transfer from the very beginning. If entrepreneurship were more pronounced in the strategic focus of the innovation process it would contribute to a more market and customer -oriented approach. The joint regional strategy of the HEIs encourages the development of concrete measures to promote the innovation process in the region:

“New operational modes will be developed by launching concrete pilot projects which aim to effectively combine the university research, polytechnic R&D, networks of intermediate organizations and growth firms of different industries. This would allow research-based knowledge to transform into business and transfer of information on the practical needs of the regional actors to the HEIs.” (Regional strategy of the Central Finland’s HEIs 2005-2009.)

- 4. Horizontal innovations.** Globalization sets new challenges for regional innovation systems, particularly in the case of small open regions like Jyväskylä. To be globally competitive, top level know-how based on strong research and development activity is required. For a small region this usually means specialization and efficient use of strengths available in the region. In the case of the Jyväskylä region the innovation system also needs a new edge. The innovation

system of Jyväskylä and the HEIs of the region include some strong horizontal lines of business (such as ICT and education sector), which form a good seed-bed for horizontal innovations. This potential for horizontal innovations could be more efficiently used by an active identification of the possibilities to apply innovations, developed in the region or imported outside, in some new lines of activities. The horizontal innovations could act as a stimulus for specialization as well. However, the actual outcome of horizontal innovation requires profound and intensive collaboration between the University and the Polytechnic, as well as between the HEIs and their stakeholders. The mutual operations of HEIs and their regional stakeholders for supporting horizontal innovations are dawning in the Jyväskylä region and first significant steps towards new application fields based on regional strengths are being taken. Wellness technology, combination of paper and information technology, learning and psychology integrated to ICT-applications and new types of bioenergy applications are some examples of this next generation of innovations emerging in the Jyväskylä region.

5. **Top down vs. bottom up inspirations – regional confronting of the “triple helix”.** The national innovation system of Finland is based on a “triple helix” interaction between the government, industry and HEIs. This interaction forum constructs the top-down guidelines for the national system of innovation. Herein, the key question is how this top-down based national system interacts with the bottom-up initiatives of individual regions (cf. OECD, 2005). Accordingly, the challenge confronted by the national innovation system is to be able simultaneously to contribute both to national innovative performance and to aspirations for a more balanced regional development. From the viewpoint of regions, the critical question is how these national ambitions match with the strategic tendencies of the regional innovation system. In the Jyväskylä region the current national framework and short-run future strategies of the national innovation system meet the regional aspirations quite well. However, it is very important to evaluate the possible regional conflicts of the top-down strategy, where the regional and the national aspirations are not convergent, causing the conflicts in strategies and actions between regionally coordinated actors and actors representing ministries and national innovation agencies involved directly in triple helix system. Generally, adjusting the national and regional priorities is needed to make the tripartite interaction efficiently espoused and executed in the regional innovation systems.
6. **Capability to exploit the know-how of HEIs.** Even if the HEIs make the best possible know-how available for the actors of the regional innovation system, it does not guarantee its effective utilization in the region. The potential customers and/or partners in business and the public sector should be capable of receiving and processing the know-how based on HEI activities. However, there seem to be many obstacles preventing an effective use of the expertise provided by the HEIs. Firstly, the potential users may be uncertain or have confusing information on the kinds of services offered by the HEIs. Secondly, the expertise offered by the HEIs can be in an inappropriate form compared to the capability of the potential customers to use it, and hence, would need modifying for easier utilization. Thirdly, the expertise available can be far too expensive, especially for small enterprises to utilize. Despite the obstacles behind poor exploitation of the knowledge and know-how provided by the HEIs, they can be usually removed through closer collaboration between stakeholders and HEIs, and by developing new ways of providing and delivering the expertise, i.e., through organizational, process and social innovations.

<p>Strengths</p> <ul style="list-style-type: none"> + National and regional aspirations of innovation systems are coherent in baselines, and thus form a potential for regionalizing the national “triple helix” + Regional innovation system includes a strong intermediate organization sector which supports the application and utilization of research results + Many HEIs’ research activities (e.g. ICT, renewal energy, gerontology, wellness technology) have a strong connection to enterprise or public sector in the region + The actors of the innovation system have a mutual development ethos + Significance of HEIs’ research activities is realized by innovation system stakeholders + Interaction between HEIs and their stakeholders is versatile facilitating the construction of mutual research and development orientated projects + Division of labour and guidelines for collaboration between HEIs are based on a mutual strategy including concrete development plans 	<p>Weaknesses</p> <ul style="list-style-type: none"> - Enterprise sector is small and lacks fast growing enterprises which form the best seedbed for application of new innovations - Lack of R&D efforts due to only a few market leaders or global companies operating within the Jyväskylä region - Existing uncertainty among stakeholders and potential customers regarding expertise offered by HEIs - Expertise offered by HEIs is not necessarily in an appropriate form for exploitation, e.g., in small firms - Research inputs do not generate expected results in enterprise sector (value added) and employment - Roles and division of labour in the regional innovation system are not clarified or mutually accepted causing inefficient use of resources - Profiling of the innovation system is not sharp causing excessive dissolution of limited resources - In practice, the collaboration in research and application tasks between HEIs and regional stakeholders is based on single projects, missing the comprehensive nature needed to develop the regional innovative system
<p>Possibilities</p> <ul style="list-style-type: none"> + The regional innovation system has a very good research base for the application of horizontal innovations + Combination of university and polytechnic forms a good basis for contributing to the application of research results, e.g., by integrating basic research, applied research and testing procedures + Renewing public sector processes raises potential for utilising the technological and social innovations provided by HEIs + Active role in lines of activities based on new technology (e.g., wellness technology, nanotechnology) arouses possibilities of commercializing + New technologies (e.g. nanotechnology) provide long term future possibilities + Active role in the new markets of new EU members, Russia and Far-East gives opportunities for large-scale profit of innovations + Good use of national strategies and operations based on “triple helix” gives opportunities for building internationally competitive innovations + Strong education cluster, intensive sector of intermediate organizations, positive image and functional infrastructure raise favourable possibilities for external investments 	<p>Threats</p> <ul style="list-style-type: none"> - The regional innovation system focuses too much on immediate results at the cost of sustained innovation processes (based on basic research) carried out by HEIs - National and regional priorities do not necessary match in the future and the innovation processes started can be threatened - Basic research is threatened due to failing in competition for national resource allocation - Innovation process is not seamless and due to that the resources invested leak to other regions instead of activating the enterprise sector and employment in the local markets - Due to failure to face deepening globalization (productivity of labour and investments are not good enough), top enterprises will be lost to other markets - Role of the Jyväskylä region as a “grower team” intensifies, causing continuous loss of growing innovative talent (both individuals and enterprises) - Due to minor private investment in research and development activities, the applicative role of regional innovation system fails

Table 4.5 SWOT -analysis on contribution of research to regional innovation system (in the Jyväskylä region)

V CONTRIBUTION OF TEACHING AND LEARNING TO REGIONAL LABOUR MARKET

Key figures of higher education in the Jyväskylä region:

Number of HE degree students in 2004: 19 459

Doctoral students in 2004: 1 616

Foreign degree students in 2004: 391

Number of graduates in 2002-2004:

 Master's degrees (University): 3 771

 Bachelor's degree – youth students (Polytechnic): 2 412

Number of teaching staff in 2004: 1 029

Number of the HE staff in total in 2004: 3 174

5.1 Starting points for the educational role of HEIs

The regions are increasingly defined by the same criteria and elements that comprise a knowledge-intensive firm - continuous improvement, new ideas, knowledge creation, and organizational learning. Regions must adopt the principles of knowledge creation and continuous learning; they must, in effect, become learning regions. Learning regions provide a series of related infrastructures that can facilitate the flow of knowledge, ideas and learning. (Florida, 1995.)

Regions possess a basic set of ingredients that constitute a production system. They all have a manufacturing infrastructure - a network of firms that produce goods and services. Regions have a human infrastructure - a labour market from which firms draw knowledge workers. The education and training system must be a learning system that can facilitate life-long learning and provide the high levels of group orientation and teaming required in working life. Regions possess a physical and communications infrastructure, upon which organizations deliver their goods and services and communicate with one another. Regions also establish mechanisms for industrial governance - formal rules, regulations and standards, and informal patterns of behaviour in and between firms, and between firms and government organizations. (Florida, 1995.) The three learning regions' partly overlapping processes include production, diffusion, and the realization of knowledge. These are shown in Figure 5.1.

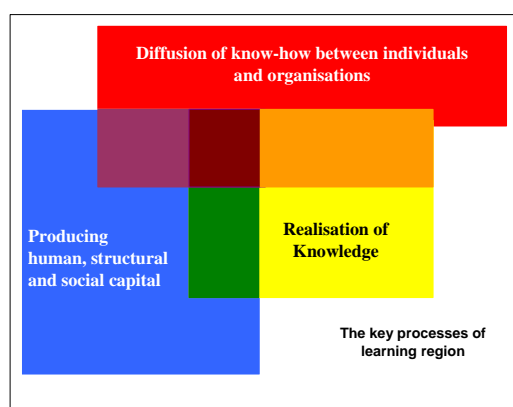


Figure 5.1 The key processes of the learning region (cf. Ritsilä & Haukka, 2005)

5.2 Localizing the learning process

Both the high volume and diverse supply of higher education, as well as the attractive image of the region's HEIs, have guaranteed that Jyväskylä Polytechnic and the University of Jyväskylä have year after year been among the most popular HEIs in Finland, in terms of the number of applications received. The talented students come from all parts of Finland and, thus, the accumulation of human capital benefits the Jyväskylä region and the whole of Central Finland. One fourth of the University *applicants* come from Central Finland and approximately 35% of students stay in the region after their graduation. At the Jyväskylä Polytechnic, more than half of *new students* (54% in 2004) come from Central Finland and approximately 60% of the graduates stay in in the region.

Approximately 60% of the students in both institutions are female, but their distribution varies between the faculties and schools. The University of Jyväskylä covers 8% of all university study places in the country and in 2004, 9% of new university students started their studies in Jyväskylä. In the polytechnic sector, the share of Jyväskylä Polytechnic's student intake (youth education) in 2004 was 4.6%, whereas the share of graduates was 5.2%. Figure 5.2 represents the number of higher education students per 1 000 inhabitants in the provinces of Western and Southern Finland (based on the available information). Central Finland is one of the provinces where the number of higher education students, in relative comparison to the wider population, is the largest. When compared to the whole country, the number of higher education students per 1 000 inhabitants in Central Finland exceeds the national level by 19.5 students. The number of students in different fields of study is represented in Appendix 11.

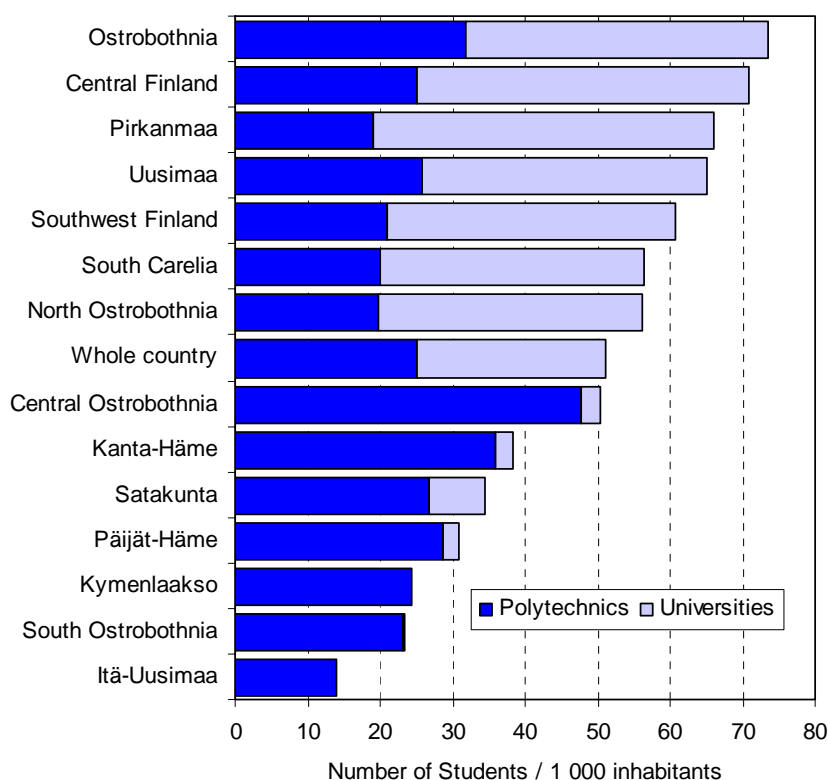


Figure 5.2 Number of higher education students per 1 000 inhabitants in the provinces of Western and Southern Finland (Laakso et al., 2005)

The diverse and wide supply of higher education can be seen as a definite strength. Yet, on the other hand, in the globalizing world, the top-level knowledge can only be achieved by prioritizing and specializing in a few core areas. Also, the regional influence is increasingly determined by performance at the national and international level. The Finnish Ministry of Education stresses that there is neither adequate need nor

resources to establish new activities, but instead only enough to get the existing activities and structures working effectively (see e.g., Ministry of Education, 2005b).

By educating and training people to meet the needs of a more demanding and knowledge-based labour market, higher education institutions are vital in the process of upgrading regional skills. The learning process needs to encompass transversal skills (such as teamwork and entrepreneurial understanding) in addition to specialist knowledge. The integration of graduates into the professional life of a region is a challenging task for the HEIs and regional actors. This might be supported by taking the regional development aspect into account when planning the degree education modules and through the organization of new, dynamic education programmes. Furthermore, in educating teachers, the increasing expectations of the surrounding society should be taken into account by strengthening their entrepreneurial thinking and expertise in economic life.

Education serving as a tool for labour market integration

The results of the questionnaire indicate that the majority (75%) of the sample, taken from the University of Jyväskylä and Jyväskylä Polytechnic staff, thinks that the regional effects of HEIs are generated by education. Approximately half of the respondents agreed with the statement that meeting the needs of the regional labour force is emphasized in their operations. However, the degree of importance differs considerably between the university and polytechnic.

The basic task for polytechnics is to serve the needs of the regional labour market. At the Jyväskylä Polytechnic, the teaching is strongly tied to regional development and the needs arising from working life. Interplay with regional employers has been supported by the introduction of advisory councils in each school. These working-life oriented groups, consisting of representatives from firms and other organizations, participate in the content development of the study modules. The Jyväskylä Polytechnic also provides education in several other fields that are mainly oriented towards the national labour market (e.g., paper machine technology).

The new polytechnic Master's Degrees will educate new kinds of workers and experts who aim at enriching students' professional skills and expertise as well developing their working life. Master's degrees are aimed at people who are employed (three years work experience is required after a higher education degree), and the studies are organized so that they can be completed alongside the students' work. These working-life oriented higher education programmes should be seen as a promising opening for both the region's firms and the students themselves. They provide an excellent opportunity for the polytechnics to further contribute to their regional engagement. It is important to clarify to the regional employers in the very beginning what the basic purpose of these new programmes is and how they differ from the university master's degrees. Currently, the Jyväskylä Polytechnic offers master's degree programmes in Health Promotion (20 students) and Technology Management (17 students), and in 2006 it will launch two new programmes in Automation Technology and Hospitality Management.

At the University of Jyväskylä, the education of skilled workers for the national labour market as a whole is strongly emphasized. For instance, the Faculty of Sport and Health Sciences is the only university level institution in Finland, educating experts in the field of sport, and the Faculty of Humanities is the only one providing higher education in Art Education, thus they have a strong national mission. According to the data, at the University of Jyväskylä, the regional engagement of teaching largely depends on the faculties and departments in question. In some faculties, such as those of Information Technology and Sport and Health Sciences, the teaching is partly organized in cooperation with regional actors, with the aim of meeting the regional needs. The department of Teacher Education and Social Work within the department of Social sciences and Philosophy, are also directed to working-life oriented teaching and the provision of a skilled labour force, designed to meet the growing needs of the region. Rural areas as economic and social platforms is a special programme in the School of Business and Economics, which aims to closely integrate students into the development of rural areas in Central Finland (e.g., through their graduation theses) (see Box 6.4 in Chapter 6).

Cooperation between HEIs, as well as their interplay with the other educational institutions, could improve the possibilities for the provision of more regionally-oriented education. New modes of action, for example,

in terms of jointly organized special courses and/or education programmes, might support the more effective use of both financial and personnel resources, and enable institutions to extend their regional networks.

Placing graduates in the regional labour market

The Career service unit at the University of Jyväskylä annually monitors the flow of Master's degree graduates into working life, covering each faculty separately. This process is carried out through the posting of a questionnaire for graduates during the observation period. The questionnaire maps information, such as about the person's current status in the labour market, and his/her province of residence at the time of the response. Due to the time lags, the working time of graduates varies from one to two years. The reliability of these results is rather weak due to the low response rate, which, in 2004, was 55%. However, according to the results, approximately 80% of students were employed *1-2 years after their graduation* and 35% of all respondents were still living in Central Finland. The rate of graduates staying in the region varies between the faculties. According to the most recent survey, more than half of the graduates from the Faculties of Information Technology and Mathematics and Science were living in Central Finland 1-2 years after their graduation, whereas only one fourth of graduates from the Faculty of Sport and Health Sciences remained in the region after their graduation.

The Jyväskylä Polytechnic also systematically gathers information about their graduates. The statistics from the latest survey cover more than 90% of the graduates. In 2004, 61% of graduates were employed *at the moment of their graduation*, of which two thirds worked in Central Finland. The share of students graduating from the fields of Information Technology, Business, and Health and Social Studies was the highest (exceeding 70%) among those who had been employed within Central Finland. Due to the different periods of observation and the differences in response rates, the results from the Polytechnic and University surveys are not comparable.

In addition to the HEIs' own surveys, other studies have also focused on this area. A recent study made by the Employment and Economic Development Centre of Central Finland (2005) has gathered information on the students graduating from Central Finland's educational institutions in 2000-2003, their labour market status, and province of residence at the end of the year 2003. The data is based on the database of Statistics Finland. The findings indicate that the employment rate of the graduates from the Jyväskylä Polytechnic was 80%, with the unemployment rate being 8%. Among the university graduates, the figures were 81% and 7%, respectively. The results support the regional role of the Jyväskylä Polytechnic as a provider of a skilled labour force when compared to the University of Jyväskylä: 61% of the polytechnic's graduates appear to be staying in Central Finland, whereas only 36% of those graduating from the university are currently living in the region.

In a working paper from the Pellervo Economic Research Institute (2004), the mobility of newly graduated higher education students in 1998-2002 was analysed at a sub-regional level. The main aim of the study was to discover the amount of newly graduated students staying in the sub-region of their city of study after the point of graduation. On average, in the Jyväskylä region, the "regional retention-rate" of higher education students is about 45% after graduation, with this percentage gradually decreasing to 35-40% in the following years.

5.3 Graduate employability

The building of the polytechnic system and the increasing number of university students has considerably promoted the expansion of higher education, which has already been very rapid in Finland during the last ten years. With the structural change of the labour force coming into the labour market, the demands for a labour force have been transformed as well. The increasing use of new technologies and the internationalization of firms have raised the level of required job qualifications. At the same time, however, the lack of blue-collar workers in traditional fields (carpenters, welders, and so forth) also occurs. Most educational reforms have clear connections to the changing needs of the labour market, yet the expansion is also due to "educational self-propulsion", which means that the educational level of the population is raised irrespective of the changes in the occupational structures and demands for skills.

The main problem for the Finnish labour market, it would seem, is the high level of unemployment, which is particularly affected by the aged people and those with a low-level of education. The unemployment rate of highly-educated people is approximately 5%. The structural unemployment rate in Finland is evaluated to be as high as 7-8% which is, at least partly, explained by the mismatching of vacant jobs and job seekers. In this case, the education of job seekers does not correspond to the requirements of the vacant job, or the job seeker's work experience is deemed to be insufficient. Given the age distribution of the Finnish population, a large exodus from the workforce will come to pass in the coming years. Thus, in spite of a high number of unemployed, there is a threat of a shortage in workers forecasted for the near future: this will force the HEIs and the Ministry of Education to carefully consider the allocation of investments in education, so that the number of graduates from different fields of study will correspond to the national and regional needs in the best possible way. The matching of education and occupations is mediated through two market systems, the educational market and the labour market.

The matching of vacant jobs and competent workers is also an important challenge at the regional level. The stakeholders of the HEIs in the Jyväskylä region stress the institutions' role as the providers of a skilled labour force, suitable for meeting regional needs. In this respect, they see that the matching of vacant jobs and qualified workers could be more effective through the use of anticipation/forecast data about labour market development as well as information on meeting regional needs by the implementation of annual intake quotas of students in HEIs.

Mechanisms promoting regional employability of graduates

The work-based learning that students from HEIs do in firms is a significant channel to achieve regionally positive effects by providing an opportunity for real interaction between students and their surrounding community. The transfer of knowledge in different directions allows the firms, students, and their institutions to profit from work based learning. This practice facilitates the integration of students into the regional labour market after their graduation by allowing them to get the work experience that is highly appreciated by employers. Besides the knowledge spillover effects arising from the contact with HEIs and their graduates, this approach also stimulates firms' awareness of the other educational and R&D opportunities offered within the region.

The practical training (e.g., working in a firm or participating in project activities) forms an obligatory part of the study programmes of the Jyväskylä Polytechnic. The extent of the polytechnic's work-based learning is usually 30 ECTS credits (the total extent of degrees is 210 credits), and in the field of Health and Social Studies it is normally 50 credits. At the University of Jyväskylä, the training period is optional and mainly depends on the independent activity of students. The organization of work-based learning varies markedly in the different schools at the Polytechnic and in the faculties of the University. In some of them, the pathway from work-based learning, through graduation thesis writing, to employability to regional labour market, functions rather fluently and forms a natural part of the education process, whereas some units face considerable difficulties in creating contacts with firms.

The firms in the Jyväskylä region see the development of work-based learning system as something very important. Naturally, the process requires that a firm is inclined to provide a work placement for the student, but sufficient steering from the HEI's staff is also necessary. The prerequisites for the whole system are: (1) the teaching staff is familiar with the rules of working life and able to monitor the student; (2) the company's staff is able to cooperate with the HEIs and to guide an inexperienced student; and (3) that the general modes of working-life action are integrated with the students' education programmes (Figure 5.3). Thus, strong development efforts and willingness to cooperate are needed both from the HEIs and firms in order for a well-functioning work-based learning system to be built. The apprenticeship system of Finnish vocational institutions, including the working-life periods of teachers could be utilized as a model that would be partly applicable to the HEIs as well. This system is also highlighted by the regional stakeholders of HEIs in the Jyväskylä region.

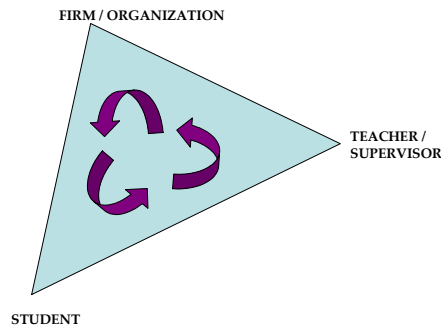


Figure 5.3 Work-based learning system based on interaction between the actors involved

The graduation theses of students from the region's HEIs is done in cooperation with firms, with other regional organizations being of equal importance to work-based learning; they should not be seen as separate components but as connected parts which support each others. In some faculties and schools, the importance of graduation theses in promoting regional contribution is very high and well organized with regional actors, whereas in the other units, the theses done for regional purposes have lesser importance and they lack systematic coordination. Naturally, it should be taken into account that, in certain cases, the themes or scientific contribution of theses might be more interesting at nationally and/or internationally than regionally. Moreover, due to the small size of the Jyväskylä region, it is not possible to fully absorb the output of HEIs in terms of graduation theses.

Internationalization is a key factor in regional development and its importance is increasingly emphasized in the globalizing world. The international orientation of the HEIs in the Jyväskylä region is strong. In 2004, the number of exchange students aiming at attaining a degree at the Jyväskylä Polytechnic was 129 and 262 at the University of Jyväskylä (Tables 1 and 2 in Appendix 8). International students can be seen as a potential labour force, promoters of the internationalization of firms and other regional actors, and as ambassadors for the locality, sending positive messages back to investors and facilitating future trading relations. The potential of these students has been recognized in the Jyväskylä region, as of yet it has not been effectively profited on. It is important to consider the ways in which the regional stakeholders, particularly the companies, could benefit more from the international activities of HEIs (e.g. exchange student programmes), and how the interaction between HEIs and the regional stakeholders could become more effective in this respect. The quality of internationalization is also one of the core issues. It is essential that the roles of the different regional actors are defined from the point of view of internationalization, so that the common steps and ways of internationalization can be worked out, and so that the regional resources can be channelled to specific activities. An effective mechanism to approach the international students could be organized in cooperation between the HEIs and regional actors. It is particularly essential to bring the students and firms together and support their mutual learning processes.

Entrepreneurship in learning programs

A well-known contribution of higher education institutions to their regional labour markets comes through encouraging graduate entrepreneurship. The commercialization of technology, based on HEIs' activities, has become a prominent issue in the policy making arena. The spinning-out of inventions into separate companies represents a potentially important but not fully exploited option. Entrepreneurship initiated by the HEIs' students can be based on new technological or social innovations, or the supply of knowledge intensive business services in which expertise has an important role. The latter business type is an increasing field in the Jyväskylä region and it can be extended to also cover the production of wellness services and the development of public administration.

However, the students of HEIs are typically not very keen to set up a firm and act as an entrepreneur. The findings in the Jyväskylä region support this national view (Appendix 12). Less than one percent of the graduates from the University of Jyväskylä start their own business immediately after their graduation. This is slightly below the national average level among university graduates. The statistics taken from the Polytechnic graduates indicate that the entrepreneurial activity increases when the observation period is

longer. 2.5% of the Jyväskylä Polytechnic's students graduating in 2000 were entrepreneurs three years later, whereas the share of students starting a business immediately after their graduation was one percent less. The entrepreneurship of graduates from the Jyväskylä Polytechnic is almost at the national average level of all polytechnics, as nearly 2% of graduates from 1999-2003 were entrepreneurs at the end of the year 2003. According to the representatives of the HEIs, the importance of spin-off -firms generated from students' or researchers' initiatives is not notable in the Jyväskylä region and exact statistics on spin-off firms are not available.

A recent Ministry of Education study (2005c) shows that there are no specific entrepreneurship strategies in Finnish universities, but it is considered to be an important strategic issue. Business know-how is an essential part of entrepreneurship regardless of the substance on which the entrepreneurship builds on. The aim is to increase academics' understanding of entrepreneurship and business life. In five universities in Finland it is possible to study entrepreneurship as a major subject, the University of Jyväskylä being one of them. This is one way to promote entrepreneurship in universities. According to the study, the universities recognized several future challenges concerning entrepreneurship. These challenges take place mainly in finance, the interaction between universities and their interest groups, as well as in the ongoing curriculum reform. On the whole, entrepreneurship and its promotion mostly appear in Finnish universities either in the form of teaching entrepreneurship or as social and regional influencing. The Finnish government has devised an entrepreneurship program and one part of it is to improve the capacity of universities and polytechnic to promote entrepreneurship.

The School of Business and Economics at the University of Jyväskylä and the School of Business at the Jyväskylä Polytechnic provide teaching in business studies that includes coverage for entrepreneurship. Additionally, the students from other fields can profit from this knowledge base in both institutions and, for example, at the University the customized learning programmes that cover the basis of business thinking are organized for students of other faculties. In the Polytechnic, the activation of students and the exploitation of their know-how in the R&D projects, also contribute to entrepreneurial thinking and increase the students' willingness to become entrepreneurs. The Jyväskylä Polytechnic defined internal entrepreneurship policy guidelines in the spring of 2005. As a part of that, a group of teachers is developing an operation model that aims to form an entrepreneurship path for each school (see Appendix 13).

Box 5.1 Team Academy promotes entrepreneurship

The Team Academy, founded in 1993, is a unit at the Jyväskylä Polytechnic specialized in marketing, management and entrepreneurship. The unit operates in Jyväskylä (217 students) and Jämsänkoski (163 students). During the last ten years, the Team Academy has provided various forms of entrepreneurial education, serving the needs of the business world. Every student takes over three years of intensive training in leadership and marketing as a member of a team. Team Academy is a learning laboratory, where new learning methods and models for business life are continuously being developed (e.g. building effective teams, learning organizations and modern marketing). The establishing of one's own business is not the only aim of the education, as an increasingly stronger focus is on mental entrepreneurship. The aim is to increase the entrepreneurial spirit of those working in their own companies as well as of those employed by others.

Entrepreneurial thinking has been promoted at the University of Jyväskylä and Jyväskylä Polytechnic but, due to the increasing importance of knowledge-based high-technology business, a low rate of entrepreneurship, the age structure of existing entrepreneurs, and the resulting threat of the disappearance of firms in the Jyväskylä region, there is a clear need to continue and strengthen those efforts. An important aim of HEIs should be to create a favourable atmosphere for entrepreneurship and emphasize it as a relevant alternative to the wage work. These activities should be directed to all students regardless of their study fields.

In addition to the above mentioned factors, the regional intermediate organizations support the commercialization of innovations and entrepreneurship. Jyväskylä Science Park promotes knowledge intensive entrepreneurship through the Centre of Expertise Programme and incubator process for technology enterprises. Their active role and visibility in connection with the HEIs could be further promoted.

The challenge of embedding doctoral graduates in the labour market

The number of doctoral candidates in Finnish universities has risen sharply in recent years (Table 5.1). The graduate schools, which offer full-time positions for researchers, are established to supplement the existing arrangements for researcher training. The purpose of the reform is to raise the quality and efficiency of doctoral education, making it possible for students to obtain doctorates much more quickly than before. The total number of Doctoral degrees at the University of Jyväskylä has nearly doubled from 1995, numbering 113 in 2004.

	Doctoral degrees			Doctoral degrees per professor	
	All universities	Univ. of Jyväskylä	%	All universities	Univ. of Jyväskylä
2002	1 224	97	7.9	0.56	0.59
2003	1 257	106	8.4	0.57	0.66
2004	1 399	113	8.1	0.62	0.69

Table 5.1 Doctoral degrees completed in Finnish Universities and the University of Jyväskylä

The rapidly increasing number of doctorates, and the concern over their employment prospect, has caused debate in Finland in recent years. At the University of Jyväskylä, a survey of doctorates graduating in 1996-2000 was carried out in autumn 2001 (166 respondents and the response rate was 51.4%). 52% of them worked in Central Finland, 19% in the capital area and the rest of them were distributed throughout the other provinces. The share of unemployed doctorates was 1.8%. The University of Jyväskylä employed 36% of its own doctorates, with other universities employing 14%. Furthermore, large companies, those with more than 250 employees, hired 8%, and smaller companies 7%.

The academic career opportunities of doctorates are likely to be more limited in the future. Meanwhile, opportunities in the private sector appear to be quite scarce as well. Private sector firms do not seem to favour the recruitment of doctorates; master's degree graduates seem to be the preferred group. This could be partly explained by the fact that it is still quite unclear how well doctoral studies are tied to the skills required in working life. Although, it seems evident that as the number of students continuing to the doctoral level grows, the private sector firms are compelled to employ them. However, this also means that the work assignments of doctorates will change.

In the region of Jyväskylä, where the relative size of firms is small, it will be a challenging task to find an effective way to embed highly skilled doctoral graduates in the regional economy. The results of the questionnaire indicate that, at present, the minority of doctoral level theses are completed within the region's public organizations or private sector firms. Thus, finding the mechanisms to create more connections with small firms, which have not traditionally employed doctorates or cooperated with universities, and consequently have a limited conception of the benefits that he/she might bring with them, is one of the key means by which the region can profit from a highly skilled labour force. In addition to the private sector also the region's public sector should be considered as a potential employer of doctorates and mutual efforts should be done to better exploit the human capital resources produced by the University of Jyväskylä.

Careers service in HEIs

The University of Jyväskylä has established a careers service unit to match students with placement activities and to inform them about the requirements of prospective employers. The Careers Service runs a recruitment e-mail list: this enables them to directly inform the subscribers of the list about the different job offers sent by the employers. The assignments offered through this recruitment channel vary from short-term placements and temporary posts to challenging, permanent jobs that correspond with the student's education. The large companies in the region are regular users of this service and the recruitment service is well known among the students. On the Careers Services mailing list, there are approximately 3 800 students and new graduates looking for work in a variety of fields. However, there is no information on how many students have got a job through this electronic channel.

The Career and Recruitment Services at the Jyväskylä Polytechnic has been recently closed down and the study office is now partly in charge of its activities. The activities include improving students' readiness for working life, career guidance training for teachers, monitoring the employment of graduates, and alumni

activities. As a part of the new quality assurance system adopted by the Jyväskylä Polytechnic, all teachers complete the basic course in career planning and, also, some of them are provided with advanced education. Finnish polytechnics also have a common employment and information service, which can be found at www.jobstep.net. In this site, employers can submit advertisements for jobs and practical training positions free of charge, as well as browse a CV bank.

The Recruitment Service units at both the Jyväskylä Polytechnic and the University of Jyväskylä, together with the vocational institutes of Central Finland, Regional Council of Central Finland, and the Finnish Association for Human Resource Management (HENRY), organize an annual recruitment fair that gathers large number of students and exhibitors (firms and other organizations) together. This has proved to be a good way to provide a meeting place for students and firms.

5.4 Promoting lifelong learning, continuing professional development and training

As a result of the structural change in industry and the labour market, lifelong learning has become an important principle that underpins Finnish education policy. The education level of older generations is lower than that of the younger generations, indicating that there is a clear need for supplementary and further education. During the next few years, when the post-war baby boom generation retires from the labour market, there will probably be an even greater need for adult education.

Both universities and polytechnics offer a wide range of education possibilities, from degree-oriented programmes (polytechnic sector) to professional continuing education courses (both sectors). Furthermore, Open University education has already enjoyed a long tradition in Finland. (19 open universities in total). The University of Jyväskylä aims at responding to the challenges of academic entrepreneurship and maintaining the high-level knowledge base of industry and other economic life. In turn, the Jyväskylä Polytechnic focuses on the working-life oriented educational needs of firms, particularly those of small and medium sized firms.

The range of adult education offered at the University of Jyväskylä is broad and of high quality. The main units organizing adult education are the Open University and the Continuing Education Centre. The number of their students in 1995-2004 is shown in Figure 5.4. The University of Jyväskylä was named, by the Ministry of Education, as the 2004-2006 University of High-Quality Adult Education and according to the present information it will be among the four quality units also in the next period (2007-2009).

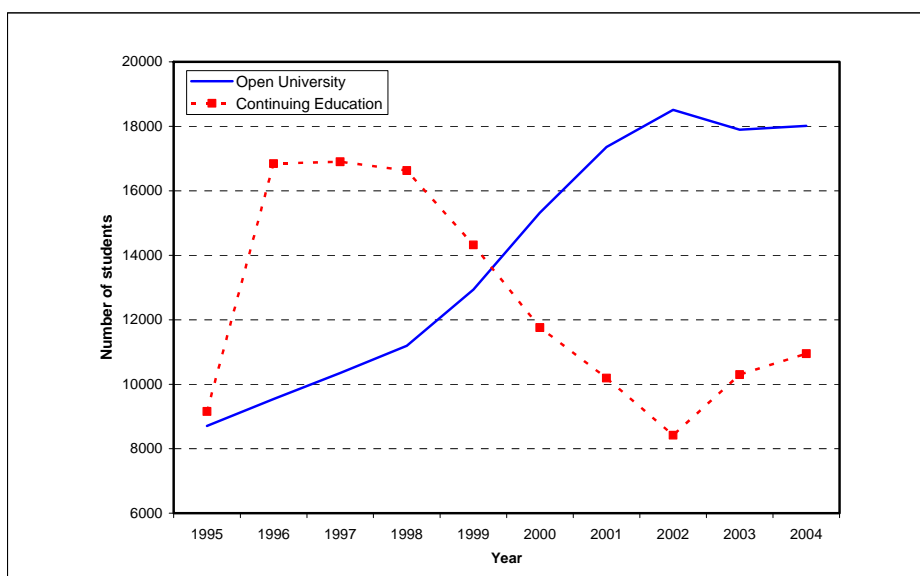


Figure 5.4 Number of students in the Open University and Continuing Education Centre¹⁴ at the University of Jyväskylä in 1995-2004

¹⁴ In the period of 1998-2002, the number of students at the Continuing Education Centre decreased sharply due to the reorganization and development of its administration and implementation.

In 2004 over 18 000 Finnish people, young and adults alike, chose to study in the *Open University of Jyväskylä*. The majority of students came from the Jyväskylä region and other parts of Central Finland (partly due to the active marketing in the region). The University of Jyväskylä and Helsinki led the field in the provision of Open University teaching in Finland, as measured by total annual study places. The open university teaching provided by the University of Jyväskylä covers nearly one fourth of the total volume in Finland. The Open University of Jyväskylä promotes educational equality by providing university level studies for all interested individuals, without age limits or requirements for basic education. The teaching corresponds with the basic university level in terms of quality. Information technology is widely utilized and profited from in the organizations of the studies, and cooperation with the virtual university is intensive. The Open University channel provides the option of becoming a university degree student on the basis of Open University studies.

The Open University concentrates only on teaching activities and they are not allowed to carry out external regional projects, even if customized projects for municipalities and different organizations are sometimes demanded. From the regional perspective, the role of the Open University is to provide education for people who want to update their skills or learn something new. The studies are easily accessible for people in working life as well as for the unemployed and for those searching for their "own" field of study. The Open University is also an important provider of competence education as, e.g., in 2004 nearly 2 000 Open University's students worked as teachers and wanted to have competence in another subject through open university path. Hence, the Open University of Jyväskylä helps to maintain the knowledge base of the regional labour force. It has an active role in career planning of personnel in surrounding municipalities and other organizations and through allocation of marketing activities this could be further strengthened.

The *Continuing Education Centre* operates as a business organization within the University of Jyväskylä, providing customized education and management programmes to clients. The unit sees its role as that of an intermediate organization between the university and external actors that transfer the academic knowledge into practise. The direct regional focus has not been very strong in recent years, but its importance is increasing. The existing diverse networks can be seen to facilitate regional engagement.

However, continuing education is not very effectively coordinated at the University of Jyväskylä. In addition to the teaching organized in the Continuing Education Centre, the faculties provide their own continuing education. As such, there is a clear need to develop the system so that the University's disparate continuing education services would be gathered together into a one large operative unit.

Box 5.2 University of the Third Age provides education for elderly people

The *University of the Third Age* (UTA) programmes are running in nine institutes of higher education (Jyväskylä, Helsinki, Tampere, Kuopio, Joensuu, Turku, Rovaniemi and Vaasa) in Finland. Third age university services are coordinated and developed by a national advisory board, which was established in 1989. One of the typical reasons for participating in the programmes is, for instance, that these elderly people did not have a chance to study earlier in their lives, due to lack of financial resources, war, or some other external constraint.

The University of the Third Age of Jyväskylä, the first in Finland, started in 1985. It arranges programmes in eight towns. The main tasks of UTA-activities are: (1) to promote elderly peoples physical, psychical and social health; (2) to promote educational and cultural equality between generations; (3) to improve dialogue between generations; and (4) to co-operate with academic gerontology research and the staff of the Centre for Social Welfare and Health Services (of older people) in Jyväskylä. The main programmes are: lecture series, seminars, publishing, students' programmes, study tours, projects, research, and international networking. The UTA programmes have been extremely popular in Jyväskylä from the very beginning. The total number of participants is about 2 500 older people, of which 75 - 80% are women. The average age of the participants is 65 years, with their basic education varying from primary level to tertiary.

In addition, the Jyväskylä Polytechnic provides continuing education, although to a lesser extent when compared to the University of Jyväskylä. The professional specialization studies it offers are continuing

education programmes consisting of 20–40 credits, which can be completed in 1-2 years while working (911 students in 2004). Participation in these specialization studies maintains the professional competitiveness of the participants, at the same time as deepening and widening their skills and scope of activity as well as those of the work community. The studies are open to everyone with a college or higher education degree, or extensive knowledge and skills obtained through practical experience. The specialization studies, or sections of them, can later be included in a polytechnic Master's degree, although this is always subject to the agreement of the polytechnic organising the degree. The volume of professional continuing education is largest in the fields of Health and Social Studies and Business. The Jyväskylä Polytechnic also provides degree programmes for adults in certain fields (683 students in 2004). These flexible programmes are primarily designed for those having earlier education or experience of work in the field of question.

For the future, it would be essential to primarily organize the continuing education in the region of Jyväskylä within both of the higher education institutions separately, and subsequently with cooperation between them. It is particularly important to coordinate the use of experts and instructors in this process, so that both institutions can profit from their expertise and develop cooperation in the provision of courses and the creation of networks. One way to proceed could also be through building continuing education under the same unit or network. This might allow the most effective channel to meet the educational needs of firms and other organizations.

The cooperation between the HEIs and regional employers is also of vital importance in the effective provision of lifelong learning. The role of regional intermediate organizations, as an actor that coordinates the information chain between firms and other organizations and the HEIs, might be useful. This need is already recognized by the Jyväskylä Regional Development Company, although the division of work in the information transfer process is not sufficiently clear.

5.5 Changing forms of educational provision

There are a number of different arrangements in higher education studies, such as multiform teaching, which may include contact teaching, distance learning, and independent studies. Contact teaching most often comes in the form of lectures, practicum, or seminars. In addition, teaching can be given through the Internet as virtual instruction.

Online learning is a new alternative mode of study and something that is becoming an integral part of Finnish higher education. Its implementation is fixed to a certain schedule, but there is, at least to a certain extent, freedom to decide when to study. Studying online allows also students to decide where to study, as long as they have access to the Internet. Thus, online learning increases flexibility in the provision of studies and allows the teachers/programmes to reach a larger number of potential students. These online opportunities are particularly useful in the provision of adult education.

The Jyväskylä Polytechnic is active in expanding the possibilities of virtual learning and the development of virtual studies has been selected as one of the indicators of internal change. The Polytechnic's staff is trained to design and implement online courses. All of the schools offer at least parts of their courses online. Furthermore, the Jyväskylä Polytechnic belongs to the national cooperation network of the Virtual Polytechnic. The units participate in the production rings of the Virtual Polytechnic, and the provision of online courses is continually increasing. The role of virtual studies is highlighted, particularly, in the Vocational Teacher Education College, School of Health and Social Studies, and the School of Business. The number of completed virtual studies has annually increased by approximately 25%, and in 2004, nearly 15 200 ECTS credits were completed virtually.

The University of Jyväskylä attaches an increasing significance to the provision of virtual learning and offers ICT education for teachers. The Faculty of Humanities and Faculty of Education have prepared strategies for the use of information and communication technology. The Open University of Jyväskylä is actively developing its virtual learning possibilities and it has widely integrated also the other tools of new teaching technology in its operation. The versatile tools of study available contribute to the educational equality. The VAINU-system (virtual application of study and career planning) developed by the Open University is rather unique kind of data bank designed to tutoring of students.

The University of Jyväskylä is a member of the Finnish Virtual University that is a partnership of all Finnish universities. It is based on collaboration, division of labour, shared knowledge, and the expertise of the universities. It promotes online learning and teaching and develops compatible information infrastructures. In the Finnish Virtual University framework, universities participate in the national collaboration and, in addition, each member university has a special unit to locally promote and support online teaching and learning.

Optima, launched in 2002, is a learning environment at the University of Jyväskylä that is intended to be used in studying and teaching in the net. It is an enclosed learning environment, where all users login with their personal user account and password. Teachers and students can take advantage of Optima in many different ways. It can be used, for instance, in supporting the campus based studying and teaching (for example distributing the learning material for the course, discussions on the net, distributing the students' practical works), and as a working area for distance learning (for example, teaching practice, during the thesis phase, at the time of exchange studies). In 2004, the number of active users in Optima was 6 600, of which nearly 500 were teachers.

Moreover, the Agora Learning Laboratory, as a part of the Agora Center at the University of Jyväskylä, focuses on research of virtual learning environments. The laboratory explores the use of this knowledge in designing powerful new learning environments, pedagogical innovations, evaluation methods for e-learning purposes, and knowledge management. The contexts of the research projects transcend curricula areas, levels of education and work organizations. The primary aim is to develop e-learning models, while seeking collaboration between basic research at the university and the practical applications of educational and business organizations. This integration of high-level scientific knowledge, pedagogical expertise, and product development know-how, facilitates the rapid transfer of knowledge.

5.6 Enhancing the regional learning system

In 2004, the Finnish Government approved a development plan for education and research for the years 2003-2008. This important policy document emphasizes the connection between education and industrial policy, the challenges of adult education, the profitability of education in conditions where the number of young people is diminishing, and the requirements for the quality of education and quality assessment. Jobs in the service sector, information industry and other high-tech fields, and in the culture industry are increasing. Considerable expectations are focused on improving the quality of services. As the general population ages, this applies particularly to welfare services. Finland has remarkable scope for improving the application of new information and communications technology and business expertise, which in turn presents all parts of the higher education sector with new challenges.

Anticipating future needs

Anticipatory activities form an essential part of contributions to increasing the regional impacts of higher education. Finland has a long tradition in forecast activities, especially in terms of regional and local quantitative forecasts concerning economic trends, population development, and the demand of the labour force. Regional Employment and Economic development Centres (TE-Centres) have adopted the most active role and have taken responsibility for regional anticipation activities. At the same time, the Regional Councils are responsible for the coordination of regional development. Anticipation is needed in TE-Centres in order to; (1) recognize, as early as possible, the relevant changes in business and working life, competences and technology; (2) to influence the future so that the targets, goals, and visions are actualised; (3) to act proactively so that the recognized threats are avoided and the possibilities are utilized; (4) to increase the effectiveness of the decisions and actions of TE-Centres, and; (5) to deepen the expertise and understanding in terms of regional business and working life, competences, technology, internationalization, and rural issues. The foresight of TE-Centres also produces strategies for regional business policy, labour market policy, training policy, technology policy, internationalization, and rural policy issues. Nowadays, one of the most important areas in TE-Centre-foresight is anticipating the changes in workers' qualifications and skills. A key challenge in this area is to promote cooperation between educational institutions and companies. As a part of a national survey, which gathers information on labour force and educational needs,

the TE-Centre of Central Finland annually publishes industry specific reports covering the prospects of Central Finland.

Box 5.3 OPTIIMI – a tool for mapping the regional needs

The learning network of Central Finland – OPTIIMI was started in 2004 to map out the future needs of the labour force and to support networking, the creation of innovations, and new business ideas in Central Finland. The project's operative team consists of representatives from the Jyväskylä Polytechnic, the University of Jyväskylä, Jyväskylä Vocational Institute, Technical Research Institute of Finland - VTT Processes, Jyväskylä Science Park, and the Regional Council of Central Finland. The different sub-regions of Central Finland will prepare sub-regional expertise programmes leading up to 2008. These programmes offer information on the objectives, the specific strengths and needs of each region, and special attention is paid to the development needs of education and research activities from the point of view of firms and industries. OPTIIMI is considered to be a very useful tool for regional development and its role in the field of lifelong learning is also significant through the contributions it makes to a more coordinated mode of action, which then supports the collaboration between Central Finland's municipalities.

Cooperation between central and peripheral areas

The University of Jyväskylä and Jyväskylä Polytechnic are located in the city of Jyväskylä, but they contribute to the development of the whole sub-region of Jyväskylä and the district of Central Finland as well. The Jyväskylä Polytechnic has two small operating units located outside of the Jyväskylä region, in the municipalities of Jämsänkoski and Saarijärvi (totalling about 400 students) and it organizes needs-based training programmes (bachelor level), or other kinds of courses, in the other municipalities of Central Finland. The University of Jyväskylä set up a cooperative initiative with the municipalities of Northern-Central Finland in 2003. It was an important educational opening, designed to strengthen the role of the University in the development of those municipalities. The Open University of Jyväskylä is actively operating (e.g., with the use of streaming video chat) in the whole of Central Finland as it has several partner institutions in the province. The learning network OPTIIMI also promotes the interaction between the central and peripheral areas of Central Finland, acting as an intermediary between them.

Dynamic education modules adapting to regional needs

The life-long learning and flexible education programmes are, for the most part, the principal means to respond to the evolution of the business and industry structure, and the changes in production and working methods. The *Master's programmes* of the University of Jyväskylä and the *Retraining and grading qualifications* provided by both the University and the Jyväskylä polytechnic are exemplary forms of the regional orientation and dynamic organization of education.

The University of Jyväskylä offers several *Master's Programmes* that have been created to enhance multidisciplinary approaches (see Appendix 14 for the list of Master's programmes currently running). These are all degree programmes leading to Master's degrees. The entry requirement is a lower (Bachelor's) degree, other prior university studies, a polytechnic degree or a vocational college diploma. Special Master's programmes increase the flexibility of university studies and their supply should be dictated by demands of the working life. The Ministry of Education stresses that the programmes should be connected to the universities' overall strategy and designed to be permanent programmes, with clear, long-term objectives.

The University of Jyväskylä can be seen as a pioneer in building Master's Programmes. The cooperation between the University of Jyväskylä and the various regional actors was strengthened in 1995-2000 with the launch of the region's first Master's Programmes funded by the EU Structural Funds. The Master's Programmes in the field of information technology have significantly contributed to the development of the field in the Jyväskylä region; for example, the Faculty of Information Technology was founded in 1998 and the Agora building opened in 2000, and ICT company Nokia started its operations in Jyväskylä in 1999. (Puukka, 2004.) In the Jyväskylä region, the basic aim of Master's programmes has been to achieve a more effective transfer of knowledge from education and research to the use of regional actors. According to the

Finnish Higher Education Evaluation Council (2002) study, the region's firms expect Master's programmes to extend the recruitment base of the labour force, and allow faster and more effective use of workers' know-how. The accomplished, multidisciplinary programmes correspond rather well to the university's knowledge profile. The programmes have promoted the cooperation between the university and the firms in the region, improving the employability and work-readiness of students. However, the usefulness of these programmes for the small and medium sized firms could still be increased.

The EU-structural funds have contributed considerably to the supply of Master's programmes at the University of Jyväskylä, particularly in the field of information technology. In 2004, the total volume of EU structural funding was EUR 8.1 million (approximately 5% of the total budget for the University). Thus, the end of the current EU programming period (after 2006) will be a challenge for the continuation of a large number of the Master's programmes.

Retraining and upgrading qualifications (muuntokoulutus) are designed in response to the needs of society and are based on previous academic studies and aims at degree. In universities, graduate entry education mainly leads to a Master's degree. In 2004, the number of students participating in the Master's Programmes and Retraining and upgrading qualifications provided by the University of Jyväskylä was 1 022, of which nearly 60% were in the Faculties of Information Technology, and Mathematics and Science. Polytechnics provide Bachelor's programmes for those with a vocational college diploma. It is worth noting that in terms of adult education degree programmes, these can be organized in different locations as the need arises, such as the Jyväskylä Polytechnic has already done in the fields of Engineering and Technology, Business, and Health and Social Studies. At the Jyväskylä Polytechnic, the number of students in adult education leading to Bachelor's degree was 911 in 2004. This is one way to support the life-long learning and achievement of qualifications for workers based on the needs of firms in the Jyväskylä region and the whole of Central Finland.

Strengthening the educational cooperation between HEIs

The cooperation based on complementary roles and clear division of work between the Jyväskylä Polytechnic and the University of Jyväskylä is the main mechanism enhancing the regional learning system, and this has been acknowledged by the institutions. The new European degree structure adopted in Finland in 2005, which is based on a two-cycle model, facilitates the clarification of the division of work between the university and polytechnic. From the regional perspective, cooperation in higher education involves, in particular, educational quality improvements, and the prioritizing and effective use of resources. In the Jyväskylä Polytechnic and the University of Jyväskylä, certain educational tasks and fields are strongly institution-specific and with these, cooperation is not needed at all. On the other hand, there are some educational fields that have thematic proximity and common interfaces across the institutional borders, and thus they allow cooperation and joint coordination. The most advanced fields in this respect are information technology, paper manufacturing technology, and wellness technology. Other fertile fields of regional cooperation are energy technology (particularly renewable energy), environmental technology, and gerontology. Furthermore, in the long term, nanotechnology can provide an opportunity for collaboration. Currently, the University is developing the knowledge base of nanotechnology and at this stage the role of the Polytechnic is minor. However, when the technology reaches the phase of business application the Polytechnic will be able to react quickly, for example, by educating competent engineers.

The Master's programmes and the new polytechnic master's degrees are developed to meet regional and/or national needs and they lead to the same level of degree. As such, they also provide an excellent opportunity to deepen the cooperation between HEIs and respond to the regional learning demands. The development of continuing and adult education is also a favourable field for the new openings that promote collaboration between HEIs in the Jyväskylä region.

The collaboration should not be taking place only between the HEIs, but also with the other educational institutions in the region as well. At the moment, the Jyväskylä Polytechnic is more actively cooperating with the other institutions, although the University staff also has contact with them. Cooperation is concentrated on teacher education (training), continuing education, and joint educational projects. The further development of education to meet the regional needs of the labour market and the exchange of good

practices in the provision of education could be intensified by more closely connecting the educational institutions of different levels.

5.7 Conclusions: Critical points relating to the contribution of teaching and learning to regional labour market and skills

1. **The need for better labour market matching.** The well-functioning anticipation mechanisms for occupational skill requirements and educational needs in the region, for the purposes of predicting changes in future skill requirements with respect to working life, are important. The main aim of the anticipation information is to help the educational institutions, firms and other employers, as well as regional and national authorities, to plan and successfully implement future activities and strategies for higher education. The need for regional anticipation derives from the specialization of educational institutions, on the one hand, and from overlapping activities and the requirement of cost-effectiveness, on the other. The character of these mechanisms varies from quantitative forecasts to questions of future qualifications. In Finnish regional policy, the Employment and Economic Development Centres (TE-Centres) have adopted the main responsibility for regional anticipation activities. Nowadays, one of the most important areas in TE-Centre foresight is anticipating changes in workers' qualifications and skills. A key challenge in this area is to promote cooperation between educational institutions and companies. In the Jyväskylä region, the HEIs also carry out annual surveys on the integration of their graduates into the labour market. They gather information about the employment rate of graduates, the region in which they are working/living, and whether the current job corresponds to the acquired skills of graduates. This allows the HEIs to evaluate how well their activities meet the regional and national needs of the labour market. The active scenario work of the Jyväskylä Polytechnic is also an important part in the anticipation of these regional needs.

In the Jyväskylä region, and in the whole of Central Finland, the mismatching of jobs and job seekers can be seen as a problem. In the higher education sector, this implies that graduates are compelled to move to the other regions. The structures of HEIs are rather rigid, something that inhibits their dynamic reactions to the labour markets. However, during the last decade, the HEIs in Finland have launched new kinds of learning modes to increase their capability of responding to the changing educational needs. For instance, in the Jyväskylä region, *retraining and upgrading qualifications* (muuntokoulutus) are designed to meet the short-term needs, which may involve educating a certain number of professionals for a specific industry. The Master's Programmes of the University and Master's Degrees of the Polytechnic are, by their very nature, more permanent and oriented towards the long-term, but they are also flexible forms of education.

2. **Promoting regional employability of students. Promoting the regional recruitment of students.** At the University of Jyväskylä and Jyväskylä Polytechnic, student recruitment is facilitated by providing career services. The services include organizing recruitment events, gathering online information about vacant jobs, and providing consultation. At the University, a new kind of mode of action, called "idea forum" (ideariihi), has been recently launched. It aims at providing ideas and suggestions for solving some specific problems that firms have, by bringing a number of students together and giving them a certain period of time to work actively with the problem. This is just a single action to narrow the gap between the students and employers, but those kind of new measures are needed in the region to enhance the regional employability of highly educated students as well as the opportunities of the region's firms to profit effectively from the skilled labour force. The integration of the increasing number of doctorates into the labour market is also a real challenge in the Jyväskylä region. A relatively large number of small firms and a fairly low level of companies' R&D activities decrease the employment prospects of doctorates. Finding the mechanisms to create more connections between doctoral candidates and small firms, which have a limited conception of the benefits that hiring a doctorate might bring along, is one of the key challenges of the future in the Jyväskylä region.

3. **Work based learning combines education and working life.** The development of the system that promotes the workplace training of HEI students is considered to be very important by the HEIs and firms in the Jyväskylä region. The practical training (e.g., working in a firm or participating in project activities) forms an integrated part of the study programmes of the Jyväskylä Polytechnic, whereas at the University of Jyväskylä, the training period is optional. The Integration of higher education learning in the workplaces is one way to promote the regional employment prospects of students and stimulate firms' awareness of the educational and research opportunities offered by HEIs. The adoption and efficient utilization of the more coordinated system of on-the-job learning requires new ways of thinking and new kinds of cooperation from both the educational institutions (staff and students) and the workplaces involved. Vocational institutions in Central Finland provide a good example of the well-functioning system of work based learning. Apprenticeship training in vocational institutions means that the education provider, the employer, and the employee enter into a fixed-term employment agreement about the training; this takes place alongside work. The working-life periods of the vocational institutions' teachers are a part of their work assignment. The graduation theses done by HEI students in cooperation with firms and other regional organizations are of equal importance to work-based learning, and they should not be seen as separate components but, rather, as connected parts that support each other. The importance of graduation theses in promoting regional development varies between and within the HEIs in the Jyväskylä region. The potential of international HE-students, as a part of the regional labour force, should also be promoted by enabling them to create contacts with the firms and to get work experience.
4. **Responding to increasing needs of life-long learning.** The rapid growth and content renewal of know-how and professional requirements, the ageing of the work force, differences in education and training between generations, and the growing number of the retirement-age population, necessitate that the education policy is weighted towards lifelong learning. The need for the revision of skills, or even total re-qualification, can appear for different reasons. It may be related to the individual, changes in the job/position, to the firm, or the market. Adult education in Finland is arranged by universities and polytechnics, public and private vocational institutions, adult education centres and summer universities, adult upper-secondary schools, study centres, sports institutes, and music institutes. The University of Jyväskylä aims at responding to the challenges of academic entrepreneurship and maintaining the high-level knowledge base of industry and other aspects of economic life. The Open University and Continuing Education Centre are the main units providing tertiary level adult education in the Jyväskylä region. However, their regional orientation is not very strong. The Master's Programmes organized by their faculties also provide a flexible way to continue earlier studies to the advanced degree level. In turn, the Jyväskylä Polytechnic focuses on the working-life oriented educational needs of firms, particularly those of small- and medium-sized firms. The different forms of polytechnic education aiming at life-long learning include professional specialization studies, retraining and upgrading qualifications, and Master's Degrees. The life-long learning possibilities in the higher education sector are diverse in the Jyväskylä region, but the main problem is the lack of systematic coordination and the resulting scattered provision of education. Table 5.2 represents different reasons related to the need for updating individual skills. The last row suggests the responses of HEIs.

Reason for skill upgrading	Related to the individual	Related to the conditions of the post	Related to changes in the post	Related to the firm	Related to the market
Description	Age, illness, injury	Insufficient use of skills	Demands related to the type of job change	Appearance of new competitors undermines a business	Employment in a given sector declines
Response in terms of training	Revision of skills already acquired or total re-qualification	Revision of skills already acquired	Training for new requirements of the job	Development of existing skills or total re-qualification	Training for similar jobs in a new sector or total re-qualification
Response of higher education institutions	Degree education, Retraining and upgrading qualifications, Continuing education	Continuing education	Continuing education, Master's programmes, Polytechnic Master's degrees	Customized continuing education, Expert services	Degree education, Master's programmes, Retraining and upgrading qualifications

Table 5.2 Different reasons for skill upgrading (cf. European Commission 1999)

5. **More intensive cooperation between the HEIs opens new possibilities.** Cooperation and a clear division of work between the universities and polytechnics have been highlighted by the Ministry of Education. These actions allow HEIs to focus on their strengths and, thereby, contribute to the more effective and competitive use of resources, to find new opportunities in the interfaces of institutions' activities, and to respond to the regional and national needs in a more holistic and complementary way. The cooperation between the University of Jyväskylä and the Jyväskylä Polytechnic is at an early stage. However, in regard to the short time period (since the creation of the polytechnic system) the cooperation between the institutions has, in fact, been rather well developed. The attitudes towards this cooperation are rather positive in both institutions, but the division of labour and collaborative mechanisms are still unclear. From the regional perspective, and according to the recommendations of the Ministry of Education, the fields of cooperation with the most potential are continuing education and the connections between the university's Master's Programmes and the polytechnic's Master's Degrees. The former is of special importance in the Jyväskylä region due to the sparse provision of continuing education. The university's Master's Programmes and the polytechnic's Master's Degrees have similar characteristics; for instance, flexibility and the same level of degree awarded. An orientation towards working-life is typical of Polytechnic Master's Degrees, but it is also emphasized in some of the Master's Programmes at the University. Thus, the collaboration might be fruitful for the institutions as well as for the region. According to the HEIs' staff, the practical cooperation, such as the organization of graduation theses and the visits of national and international experts, could also be useful.
6. **Deepening the cooperation between HEIs and intermediate organizations.** In the Jyväskylä region, there are several intermediate organizations promoting regional development and entrepreneurship. According to the Ministry of Education, regions should aim at building a science park concept, a plan that would bring different actors together, enabling them to form a gapless entity of regional development. In the Jyväskylä region the structures for this type of plan are well-founded and, with further development, the operation will be more efficiently rendered. In the educational sector, the interaction between HEIs and intermediate organization should be active and based on the effective transfer of information. The intermediate organizations could act as a link between the HEIs and firms by providing the HEIs with information about the needs of firms and increasing the knowledge of firms concerning the HEIs' educational supply. The need for this kind of information chain is recognized in the Jyväskylä region but, at the moment, it is not working effectively enough. The lack of coordination is the main problem. The contacts are mainly based on informal personal relationships: this implies that the cooperation between HEIs and intermediate organizations varies markedly between the different faculties and schools. In the Jyväskylä Polytechnic, the new development managers of each school could possibly be the most appropriate contact persons in the information chain, whereas the university system is much more complicated in

this respect. Nonetheless, the effective combination of the three steps of the information chain – firms, intermediate organizations, HEIs – might considerably improve the matching of supply and demand in the regional higher education sector.

<p>Strengths</p> <ul style="list-style-type: none"> + HEIs are actively confronting the challenge of integrating students into local labour markets. Extensive measures have been made in both HEIs to improve the connections to business enterprises and public sector partners. + HEIs have a diverse sector promoting life long learning and continuing professional development and training. This forms a strong basis for the regional contribution of life long learning. + HEIs have actively participated in regional anticipation and development processes, pursuing better matching in the labour markets. This gives a good basis for long-term development of the HEIs' regional contribution. + HEIs have actively developed and integrated methods enabling them to contribute the transition of students into work-life. + A mutual agreement about the improvement of the collaboration and division of labour exists between HEIs. This forms a good foundation for concrete development measures to be launched. + Student recruitment in the local labour market is generally very efficient. The regional labour markets are the net receivers of students of HEIs, simultaneously increasing the educational level of the population in the region. 	<p>Weaknesses</p> <ul style="list-style-type: none"> - The cooperation between the HEIs is at an early stage, and the division of work and collaborative methods need to be improved. - The national emphasis on certain fields of education causes a temporal mismatch in labour markets. This phenomenon raises a need for measurements to be taken to augment labour market mobility. - In spite of the efforts made, matching the local needs of continuing education is still insufficient, in spite of the efforts made. New methods for identifying the needs and organizing the education are required. - The flexibility of HEIs to respond to the continuously changing needs of the labour markets is not sufficient, causing mismatching. Increasing the dynamics of HEIs requires both organizational and process innovations. - Student training suffers from insufficient support systems. Improving student training requires the systematic development of the abilities of students, staff of training places and teaching personnel in order to face the challenges of the new learning situation. - The integration of international students into HEIs and the local environment is not systematically organized, diminishing the benefits received.
<p>Possibilities</p> <ul style="list-style-type: none"> + More intensive collaboration between HEIs, especially in the field of continuing education, could increase the efficiency and quality of the education offered. + More intensive cooperation between HEIs and stakeholders could increase the contribution of HEIs to labour markets by expanding the common operation interfaces especially in the business sector. + The new Master's Degree studies at the polytechnic offer new possibilities to integrate the continuing learning and R&D-activities of the enterprise sector. + The increasing number of international students raises possibilities for human capital accumulation. The work-life training of international students forms a potential source from which the readiness of small firms to become international increases. In addition, international students form a potential solution to the predicted labour shortage. + The high and gradually increasing educational level of the population in the region increases the role of HEIs in continuing education. + The active role in "making the future" (proactive reaction to future) increases possibilities for advanced labour market matching. 	<p>Threats</p> <ul style="list-style-type: none"> - The small size of the regional labour market makes the integration of students into the labour market more difficult - Many development projects for improving the matching in the labour market, student recruitment, and lifelong learning are funded by ERDF and the diminishing of these resources in the future may threaten the development processes that have started. - The expansion of doctoral education raises a new challenge for the university. In the future, an increasing amount of graduated doctors will be employed to the private sector. Without a careful preparation, the employability to the enterprise sector may be confronted by significant difficulties. - Reacting to labour market changes incautiously may bring about significant risks. Facing up to the short-term needs requires relevant tools. - The ageing process will cause significant losses of tacit knowledge without the development of new methods to transfer that knowledge. - The personnel of HEIs are required to go through a major learning process in adopting the new way of operating. Without this learning process, the contribution to the labour market suffers remarkably.

Table 5.3 SWOT -analysis of the contribution of HEIs' teaching and learning to labour market and skills (Jyväskylä region)

VI CONTRIBUTION OF SOCIAL, CULTURAL AND ENVIRONMENTAL DEVELOPMENT

6.1 Basis for societal contribution - sustainable development

The theme of sustainable development can be built on the recursive nature of economic, socio-cultural, and ecological dimensions (Figure 6.1). The different dimensions of sustainable development can be defined through the measures and objectives at a macro-level, for example, the changing climate (ecological sustainability) and economic growth (economic sustainability¹⁵), promoting the well-being of elderly people and other groups by paying special attention to employment, preventing social displacement (social sustainability), and nourishing cultural diversity (cultural sustainability). In promoting sustainable development, attention must be paid to the fact that the socio-economic operating environment also creates the basis for actions that concern the natural environment. Therefore, the different dimensions of sustainable development must be seen as entities that support each other, and which, in the long run, are preconditions for the successful realization of the others. Socially and economically sustainable development has effects on the realization of ecologically sustainable development, which in turn advances the realization of the other dimensions.

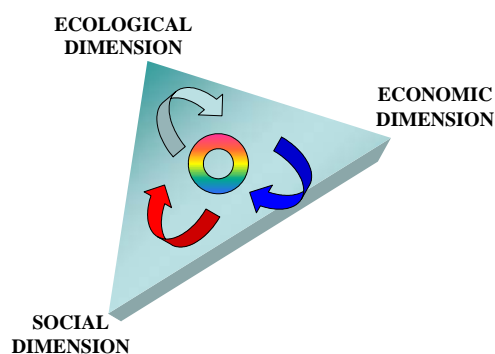


Figure 6.1 Sustainable development as a recursive process of mutually supportive dimensions

The principles of sustainable development have been widely adopted in Finland as a basis for central government policies, local government administration, and commercial activity. Social, economic and ecological responsibilities are recognized as principles to be striven for in decision-making. In autumn 2005, the national strategy working group started their work to prepare a proposal for the basis of a new national strategy for sustainable development (the current strategy dates from 1998).

In the Jyväskylä region, sustainable development is taken into account in the Jyväskylä Agenda 21, which is an operational programme for sustainable development that has been prepared with the cooperation of regional actors. The University of Jyväskylä and Jyväskylä Polytechnic have not prepared separate strategies for sustainable development, but sustainable development is, instead, horizontally integrated in their operations. The HEIs contribute to local sustainability in different ways; for instance, through their own internal processes, as sources of expertise and research, through the sustainability thinking brought about by the curriculum, and as active participants in local partnerships. The HEIs will follow the national policy guidelines set in negotiations, currently underway, in regard to sustainable development.

Channels for the societal effects of HEIs

Sustaining the economic, social and cultural development opportunities entails constant input into the production and large-scale utilization of knowledge. The Science and Technology Policy Council of Finland has noted that the key challenge in the circumstances of growing global competition is to keep Finland sufficiently attractive to business and jobs and as a living environment in general. At the national level, it is necessary to secure welfare services in the face of a rapidly ageing population and the ensuing pressures for

¹⁵ This aspect is covered in preceding chapters (IV and V).

taxation, to lower the unemployment rate, which remains high in the aftermath of the early-nineties recession, to improve employment, and to balance regional development.

The polytechnics and universities have an important role as the producers of societal effects. However, their operation modes and focuses differ. The Finnish polytechnics operate close to the sphere of the working and everyday life of individuals. Thus, the societal effects of their activities are more direct than those of universities, which are more focused on scientific research and education. One example of this difference can be found in the production of services or regional project work. Without a strong link to research or education, these do not belong to the core operations of universities. To roughly summarize, the polytechnics have a more direct influence on society whereas the universities have a more indirect effect through their research and education activities.

The societal activities of HEIs are strongly integrated to the aims of sustainable development. Firstly, they support sustainable economic development; for example, by building networks and providing services to firms. Secondly, due to the extension of the operation field of HEIs, they also participate in the activities promoting social cohesion and preventing social exclusion. The HEIs carry out R&D projects and provide direct services that aim to promote the social inclusion of individuals (e.g., unemployed and elderly people, and other special groups). Thirdly, the HEIs offer cultural and physical exercise services and participate in the coordination of different events. The fourth element of sustainable development is an ecologic aspect, which is supported by the knowledge based ecological solutions and services produced by HEIs for the private and public sector.

In the Jyväskylä Polytechnic and University of Jyväskylä, the most promising fields, from the perspective of social effects and the provision of service, can be found in the areas of social and healthcare, environmental and cultural fields, and their horizontal integration with other fields, such as ICT-adaptations. The mechanisms for the transfer of social and service innovations to general use include diverse project activities and larger development programmes.

The influence of the HEIs' project activities is highlighted, in particular, in the areas of social, cultural and environmental development. The financial contribution of the European Regional Development Fund (ERDF), European Social Fund (ESF), European Agricultural Guidance and Guarantee Fund (EAGGF), is significant in these projects. In Central Finland, during the period 1.1.2000 – 30.6.2005, 20% of all funding (national funding and the contribution of ERDF, ESF and EAGGF) were granted to the projects implemented by the University of Jyväskylä or Jyväskylä Polytechnic. Respectively, 25% of this funding was granted to projects making direct contributions to the social (14%), cultural (3%) or ecological (8%) dimensions of sustainable development. These projects are listed in Appendix 15 according to their main focus and amount of funding received. Some of them are research projects and others are direct service projects.

6.2 Contribution of HEIs to the social wellbeing of the region

An ageing population, migration flows from rural municipalities to towns and the subsequently increasing social problems form an area where HEIs also have an important role to play. For the HEIs, the innovations that support the development of a more effective public sector and the provision of services are some of the main challenges in the near future.

Production of public health and wellbeing services

Central Finland's Centre of Expertise in Social Field forms a network of actors that aims at developing effectively organized services and the supporting of the renewal of the service structure. It also contributes to the applied research in the field of social studies by transferring information about the needs of working life to researchers. The University of Jyväskylä and Jyväskylä Polytechnic form an integral part of this network. Both the hospital district of Central Finland and the social and health services of the city of Jyväskylä, and other municipalities, are also important partners for the HEIs in the field of social and health care.

Jyväskylä Polytechnic responds to public sector needs by providing education and R&D activities in the health and social care sector, which uses the applications generated by information and wellness

technologies. Entrepreneurship based on new service products and the development of working methods is a new developing branch in the field of health and social studies.

Jyväskylä Polytechnic's School of Health and Social Studies educates professionals in the sector of social and health care. The students complete their studies in close cooperation with regional employers as a significant part of the education takes place in supervised practical training, in various work-life settings; for example, in hospitals and health centres. The R&D activities of the Jyväskylä Polytechnic's School of Health and Social Studies are aimed at the development of wellness services (Box 6.1). They support the objectives set in the region for the promotion of the population's wellbeing. The project activities of the Jyväskylä Polytechnic have also made a significant contribution to the region, with the WIRE projects being good examples (Box 6.2).

Box 6.1 Providing services to meet the needs of the region

The Rehabilitation Service Clinic, *Fysipiste*, is a centre offering wellness services within the School of Health and Social Studies at the Jyväskylä Polytechnic. It was founded in 1994 with the aim of developing more practically oriented teaching and learning. Multi-professional rehabilitation services are provided and developed by students in cooperation with, for instance, the social and health services and sport centre of the City of Jyväskylä, as well as with various companies and communities. *Fysipiste* serves as a training centre for the students of physiotherapy, occupational therapy, rehabilitation counselling, nursing and social care. In addition to these, *Fysipiste* provides an exceptional opportunity to international Erasmus students and students of physiotherapy at the University of Jyväskylä for practical training. The students provide services under the supervision of tutors and/or teachers. About 110 students are annually participating in the activities of the *Fysipiste*. Cooperation with working life and clients offers students valuable real-life learning experiences. *Fysipiste*'s operation is based on applied research, which further emphasizes its role as a learning centre.

For companies, *Fysipiste* provides such things as activities promoting fitness for work and special theme days. Additionally, testing and sport services are offered for associations and sport clubs. Besides these activities, people of all ages living in the Jyväskylä region are taken into account in the provision of services through the provision of individual physiotherapy and occupational therapy, health promotion, and rehabilitation counselling. From a regional point of view, in addition to the services provided for individual clients, the theme days and project work are of special importance. In 2004, 22 theme days were organized around Central Finland. *Fysipiste* has also had a significant role in the WIRE projects as a subcontractor, organizing several rehabilitation periods for the unemployed. The annual number of individual clients is approximately 200 (1 300 visits) and the number of groups per week is nearly 50.

Hence, the *Fysipiste* learning centre is a new kind of innovative operation environment for students, which emphasizes independent working practice and entrepreneurial thinking. It also takes into account the future needs in the field of health and social care (e.g., hospitals and health centres).

Box 6.2 The WIRE –projects: Supporting social inclusion

During the last ten years, the WIRE projects have focused on the development of new kinds of services for the long-term unemployed in Central Finland. The model – developed in cooperation with the Jyväskylä Polytechnic (coordinator), Jyväskylä Development Organization Jykes, and the Jyväskylä Employment Office – integrates, step by step, various disadvantaged groups into working life through diverse measures of physical and social rehabilitation that aim at sustaining long-term practices. The model takes into account the different resources of the municipalities and actors participating in the project. Thus, the WIRE projects are examples of an effective mechanism to support social inclusion. The WIRE has contributed to the employment of approximately 800 long-term unemployed people in Central Finland during 2000-2004. It is an important societal opening and has been recognized as a good practice by the the National Research and Development Centre for Welfare and Health (STAKES). The project activities involve a large social network, comprising of representatives from the third sector, municipalities and firms. The WIRE is an essential part of the Jyväskylä Polytechnic's centre of expertise, which concentrates on health and welfare service. WIRE projects are funded by European Social Fund.

At the University of Jyväskylä, the activities of the Faculty of Sport and Health Sciences, the education of teachers (Faculty of Education), social work and psychology (Faculty of Social Science) are important fields from the point of view of social development in the Jyväskylä region, and they involve an increasing number of possibilities in the future. The *Research and Training Clinic in Psychotherapy* within the university's Department of Psychology provides services to the clients (including individuals, couples and families), contributes to scientific research and organizes continuing education to professionals in social and health care. Several departments at the university have cooperative projects with the Peurunka Rehabilitation Centre located in Laukaa (25 km north of the city of Jyväskylä) (Box 6.3).

Box 6.3 Rehabilitation centre based on long term partnership with the University

The idea of Peurunka Medical Rehabilitation Centre was created by war veterans almost thirty years ago. The University of Jyväskylä, its staff, students and alumni from various faculties, helped to develop the original philosophy and programme. It has, thus, been a natural outcome that the university has for all this time been represented in the governing bodies of the centre. Physical education professionals, including those working at the University of Jyväskylä, have had a major impact on the centre's operations and activities. As a multifunctional centre, Peurunka has always needed multi-skilled professionals and specialists. These have been relatively easy to recruit, due to the close location of the University and colleges. The University has also been a major catalyst in providing opportunities for the self-improvement of the staff through independently studying and developing new skills.

The majority of Peurunka's clients have been disabled and other war veterans, as well as women who had worked in conditions comparable to front-line activity. This client group is now rapidly diminishing, and the challenge of renewing the operations is being met more and more actively. In the future, the clientele will come from the working population. Services are now being created and developed to maintain the capacity to work and to promote the well-being and health of the workforce of client companies, in correspondence with their expectations and needs.

Collaboration with the university has become closer, creating research projects as well as opportunities for education and training. The knowledge, know-how and research available at the university have been directed to benefit practice. As a partner, Peurunka has opened up possibilities for the university to extend its research into the fields of rehabilitation and wellness services. As a by-product, a model for mutual co-operation has been created, which will benefit both parties as well as contribute to the quality of rehabilitation services in Finland. Research information and its application are needed to develop the effectiveness of the services. The contract between the University of Jyväskylä and Peurunka, established in 2004, aims to further enrich the research cooperation in the field of wellbeing and strengthen the standing of expertise in the region.

The wellness sector is set to become a new pillar for the development of the Jyväskylä region. The development of the wellness technology and associated services require a strong knowledge base. Research and education in sports and health sciences – both mental and physical health – are firmly established in the Jyväskylä region. Research and development are conducted by the University of Jyväskylä and the Jyväskylä Polytechnic in health and sport sciences, occupational and physiotherapy, and gerontology. The palette is complemented further by the activities of Likes, a trust that promotes public health through sport, and KIHU, the Finnish Research Institute for Olympic Sports. An important unit at the University of Jyväskylä is the *PsykoCenter*, a multidisciplinary networked research community concerned with human development, which operates in the Agora Centre. The regional effects of the development of the wellbeing sector might be realized through the establishment of new firms providing wellbeing services and different R&D projects carried out in the region. The expansion of the wellness branch allows such things as an increasing provision of services aimed at elderly people, the development of vocational wellness and properly functioning work communities.

In the Jyväskylä region, in addition to the numerous recreational facilities accessible daily, there are numerous lakes and forests where one enjoys the great outdoors. Sport is a visible part of the image of Jyväskylä; this is especially so as the Faculty of Sport and Health Sciences located in the University of Jyväskylä is the only one of its kind in Finland. The Department of Sport Sciences educates professionals and experts in order to refresh and renew the professions in the field of sport and leisure activities. The contribution of students in promoting sporting activities among the wider population can be seen by their active participation in the organization of sporting events, work efforts as instructors in the regional sports societies, and public and private organizations for physical exercise (e.g., fitness centres). The Faculty of Sport and Health Sciences also cooperates with regional public sector authorities (e.g., Department of Sports and Physical Activity of the city of Jyväskylä and the Sport Council of Central Finland).

The contribution of HEIs to social development in the Jyväskylä region could be further strengthened by extending regional networks. A new promising field is gerontology, which aims at meeting the challenges of an ageing population. Issues related to ageing, functional capacity and disability form the core of the research activities in this field. The main aim of this field is to understand age-related changes in the ability to adapt to the relevant environmental requirements. The development and cooperation of HEIs is promoted by establishing GeroCenter, which brings together the different actors and their know-how in research, education, development, and the provision of services.

The National Research and Development Centre for Welfare and Health (STAKES) established a regional unit in Jyväskylä in autumn 2005. At an early stage, one of its main objectives was the development and evaluation of, and research into those social services operating in close cooperation with the HEIs, municipalities, Central Finland's Centre of Expertise in the Social Field and other organizations. The Jyväskylä Polytechnic and University of Jyväskylä have great expectations for STAKES' operations in the region.

Physical renewal of local milieu

The Seminaarinmäki campus of the university occupies a key role in the cultural history of the city of Jyväskylä. It forms an integral part of the city's architecture and it has influenced the planning of the city. The oldest buildings date from the 1880's. The buildings that comprise Finland's first Finnish-language teacher training college dating from 1880-1905 were designed by architects K. Kiseleff and Yrjö Blomstedt. The next phase of construction coincided with the granting of university status, at which time the various buildings designed by the world-famous architect Alvar Aalto were completed (1952-57, 1964, 1971). The newest buildings on the main campus are designed by architect Arto Sipinen and date from the 1970s. A number of private houses designed by the architect Wivi Lönn in the early 1900s have also been preserved in the Seminaarinmäki area and restored in recent years to their former glory. The result is a unique architectural whole in the heart of the city. Aalto's campus became a protected area, including the buildings, in the Council of State protection declaration in 1992.

The town area of Jyväskylä lies squarely between two lakes, Jyväsjärvi and Tuomiojärvi. The 1980s were a decade of powerful development in Jyväskylä. This was most evident in the form of new public buildings in various parts of the town. This was a period when buildings such as the town library, the town theatre, the

indoor ice-skating rink, the Rauhalahti peat-fired power plant, the market hall, and numerous shopping centres were completed both in the town centre and along its periphery. Another visible change in the town landscape was the building of the Kuokkala area, which had been preserved as an almost untouched rural landscape on the other side of Lake Jyväsjärvi. Kuokkala is now home to over 15 000 people. The problem of through traffic was resolved in 1989 with the completion of new Rantaväylä roads along the shoreline of the lake. Kuokkala Bridge, half a kilometre in length and crossing Lake Jyväsjärvi, was completed at the same time as the Rantaväylä roads.

As the end of the century approached, the scenery around Lake Jyväsjärvi changed considerably in other ways as well. The low-lying area of Mattilanniemi – former wasteland and dump – was partly composed of landfill and provides today a location for the university buildings (constructed in 1980-84) and ICT company Nokia (in 2000). The light-coloured University and Jyväskylä Science Park buildings, located at Ylistörrinne (the construction process started in 1990 with the last building, the Nanoscience Centre, being completed in 2004), on the opposite side of the lake Jyväsjärvi, and the pedestrian and cyclist bridge connecting these areas have, indeed, become the new landmarks of the town.

Construction work along the shoreline has continued into the new millennium on the Lutakko site vacated by the former Schauman's plywood factory. It is now occupied by the "turbine" building of the Jyväskylä Polytechnic, a trade fair and congress centre (Jyväskylä Paviljonki), and the highest building in the town, the Jyväskylä Science Park Facilities' Innova building. In addition to the aforementioned, there are also residential buildings. The turbine house is a new type of learning centre, acting as home to the Information Technology Institute and Team Academy of the Polytechnic. Lutakko is connected to the new travel centre (completed in 2002), offering both rail and road travel services by a footbridge over the rail tracks. The Lutakko district reflects the structural change from traditional industry to the knowledge intensive economy and the HEIs' role in that change.

HEIs participating in the development of rural areas

According to the grouping of municipalities by Statistics Finland five municipalities in the Jyväskylä region are classified as rural areas (Hankasalmi, Korpilahti, Petäjävesi, Toivakka and Uurainen)¹⁶. The Jyväskylä Polytechnic and University of Jyväskylä contribute to the development of the rural areas of the region of Jyväskylä and Central Finland as a whole.

The Institute of Natural Resources is an educational unit at the Jyväskylä Polytechnic within the field of natural resources, located in Saarijärvi in northern Central Finland. The activities are based on the sustainable use of natural resources, with the objectives of development work being a vital countryside and clean environment. The applied R&D activities of the institute aim at promoting entrepreneurship and good living conditions in rural areas. The most important development branches are bio-energy, small and medium-sized entrepreneurship in the food industry, management of the rural environment, and the development of villages. They participate as administrators and as experts in several projects financed by the EU. Regional R&D occupies a significant role in the Institute of Natural Resources, as project activity accounts for half of its turnover. The institute provides education and consultation services that benefit the working life of the whole region (e.g. in the following fields: preliminary analyses of rural entrepreneurship, village planning and development of micro-areas).

The benefits of rural tourism in Central Finland are not yet fully profited upon. The future vision for the region is that the high quality rural tourism in Central Finland, associated with the Finnish Lakeland, will be nationally and internationally well known, sought-after and easily accessible. As a part of the rural development process, the School of Tourism and Services Management at the Jyväskylä Polytechnic is coordinating a project on rural tourism in Central Finland during the period of 2005-2006. The main goals are the coordination of project activities for rural tourism and the realization and evaluation of regional strategies. The project strives to develop business and the cooperation involved in rural tourism, and to

¹⁶ Definition made by Statistics Finland: Rural municipalities are those municipalities in which less than 60% of the population lives in urban settlements, and in which the population of the largest urban settlement is less than 15 000, as well as those municipalities in which at least 60%, but less than 90% of the population, lives in urban settlements, and in which the population of the largest urban settlement is less than 4 000.

promote the competitiveness and attraction of the rural areas in Central Finland by supporting the new entrepreneurship and capability of existing rural tourism firms to increase their turnover and number of employees. The analysis of the development and needs of enterprises will be carried out at the beginning and the end of the project by surveying the know-how of about 85 companies.

The University of Jyväskylä is engaged in rural development through the development programme on rural know-how and entrepreneurship in Central Finland. This has been supported by the creation of the rural professorship and participation in the national programme of rural studies. Rural Studies is a network initiative between nine Finnish universities that aims at establishing a multi-disciplinary Rural Studies programme for graduate level students. It provides students with specialized knowledge and understanding on rural change, development policies and practise. The programme is being piloted with the support of the European Social Fund (ESF) and the Ministry of Education in accordance with the framework of the European Union Objective 1 programme for Eastern Finland (2000-2006). Rural Studies at the University of Jyväskylä comprises of a special programme: *Rural areas as economic and social platforms* (Box 6.4).

Box 6.4 Rural studies takes into account the needs of rural areas

Rural areas as economic and social platforms is a special programme under the major subject of entrepreneurship in the School of Business and Economics at the University of Jyväskylä, forming a part of the national network of rural studies. It is built around the professorship in rural entrepreneurship that was inaugurated in 2004. The Master's level studies were launched in 2005. The goals of the programme include exploiting the multidisciplinary know-how of the university in the rural field, strengthening R&D and education focused on rural environment and transferring research results into practice. The programme is divided into three thematic areas: (1) rural entrepreneurship and networking, (2) the interaction between centres and rural areas, and (3) the social and economic characteristics of rural areas in Central Finland. The need for the development of rural areas is met with education, development activity and projects that are designed according to regional needs. The teaching mechanisms include discussion forums and expert lecturers. Moreover, the possibilities for the students to integrate into the rural development are supported by the selection of appropriate themes for their master's thesis and by creating their contacts with firms through R&D projects. An essential part of the operation is also the participation in rural strategy work. The professorship in rural entrepreneurship is based on project funding from both the Rural Department of the Employment and Economic Development Centre and the Rural Policy Committee of the Ministry of Agriculture and Forestry. External Funding from regional actors has been essential in establishing the professorship and continuing cooperation with them is important in the course of the project.

6.3 Cultural contribution of HEIs

Richard Florida suggests that, in this creative age, technology alone is not enough to ensure success: instead, society needs the kind of creative entrepreneurs who can turn great ideas into sustainable business models. At the heart of Florida's argument is the notion that culturally rich, unique, diverse regions draw the most creative people (often educated people) who, in the author's broad definition, have jobs that draw on their intellect and ingenuity, be it teaching, computer programming, music, or law (to mention a few). The presence of those people is what attracts successful companies to locate in the same region, or better yet, to spring up on their own, bringing economic prosperity and a high quality of life. (Florida, 2002.)

Strong foundation for the creative region

Even if the Jyväskylä region is small, a rather rich variety of culture is provided, particularly in the city area, including museums, art exhibitions, concerts, events, and theatre performances. Promoting culture as a tool for regional and economic development has become more and more important in the Jyväskylä region and in the whole of Central Finland. In small regions, such as that of Jyväskylä, the HEIs typically act as the generators of culture by supporting creative thinking. However, those kinds of effects are often hard to measure.

The School of Cultural Studies at the Jyväskylä Polytechnic and the Faculty of Humanities at the University of Jyväskylä offer a strong cultural knowledge reserve, based on a high-standard of education and R&D. There is a growing demand for experts in the fields of the arts and culture in both traditional professions (museums etc.) and, for instance, in media business, diverse culture projects, in IT companies and others, which require expertise in content as well as a critical view of the relationship between culture and technology. Both the staff and students of HEIs also provide an important potential resource for the diverse cultural events organized in the region, including, for example, the annual one night arts festival "Yläkaupungin Yö" (Box 6.5).

Box 6.5 Gathering the creative people together in one night

Yläkaupungin Yö is an annual one night arts festival. Libraries, museums, galleries, bars and theatres in the Yläkaupunki area of the City of Jyväskylä keep their doors open for festival goers and the festival site is abound with music, dance, theatre, exhibitions, performances, workshops, games etc. All the events and exhibitions are free of charge.

The creator of the festival was an active member of the University of Jyväskylä Student Union's Subcommittee for Cultural Affairs (JYY). The first festival was organized in 1992. The original aim to gather different cultural organization, artists and people interested in culture together is still the main motivating factor of the event today. The festival's annual programme consists of more than 200 different performances and activities, with approximately 700-800 artists performing. The main stage of the festival is the Seminaarinmäki Campus of the University of Jyväskylä.

Financial support for the festival is provided by the City of Jyväskylä, the Arts Council of Central Finland and other sponsors and participating firms. The University of Jyväskylä is also an important supporter, offering stages for the festival free of charge. The volunteers form a necessary group of organizers (500 annually) and a proportion of them are members of the University of Jyväskylä Student Union. The JYY also participates in the event's communication and marketing. The different departments and units of the university organize some programme activities such as, lectures, workshops and exhibitions. Thus, the University of Jyväskylä contributes considerably to the organization of the regional festival.

The School of Cultural Studies educates professionals for the fields of music, clothing and communication, and carries out different cultural development projects in the Jyväskylä region and Central Finland. One of the school's basic missions is to build a creative well-being society. They see that the importance of culture in the regional development is increasing, something that encourages them to systematically develop the creative sector in Central Finland together with the Regional Council (Box 6.6). The aim of developing the creative sector is to support the existing actors and their creative know-how and, at the same time, to create possibilities for new actors and modes of operating by promoting entrepreneurship and generating of new jobs.

Box 6.6 Creative industries – new development potential

The development project for creative industries in Central Finland was initiated in the spring of 2004. The project consists of three sub-projects (e.g., LINKO) and it is coordinated by two organizations, the Regional Council of Central Finland and the Jyväskylä Polytechnic. The goal of the project is to reinforce the opportunities for specialists in the creative field to make a living from their own skills and to systematically develop their operations to become more business-like. When talking about creative industries, the concepts of business and entrepreneurship are rather loose. Creative industries – and entrepreneurship within them – mean action and professions based on individual creativity, skills and talent. This field is also known as the cultural industry and creative production – and the target of trade therein is the cultural contents. Creative industries interface and collaborate with the graphic, communication and ICT fields, tourism and the wellness field, among others.

One of the key development projects of the Jyväskylä Polytechnic's School of Cultural Studies is LINKO, which has set out to improve the entrepreneurial expertise of creative industries. Its training is targeted specifically at self-employed people and people thinking about starting, invigorating or expanding their own business. The contents and needs of this type of training are determined in the interviews carried out by the creative forum. The idea is to provide help in designing and managing a coherent plan of action in order to be able to start business operations and/or engage in profitable entrepreneurship. The project is supported by the European Social Fund.

Music activities form an essential part of the regional culture. The Jyväskylä region is a very popular place to study music. The three educational establishments – the University of Jyväskylä (Department of Music), Jyväskylä Polytechnic (degree programmes in music and music management) and the Jyväskylä-owned Finnish Conservatory – have a total intake of more than a hundred students each year. Additionally, a large number of students are currently engaged in adult education and around a thousand children are taking basic studies in music and dance respectively. The variety of concerts and other music events organized by the HEIs in the Jyväskylä region, and the choirs and orchestras consisting of HEI students also highlight the strong knowledge base in the field of music. For instance, a concert series in autumn 2005, organized by the Jyväskylä Polytechnic (partly in cooperation with the Centre for Cultural Services of the City of Jyväskylä) comprises of 11 music presentations under different themes. These music events form an integral part of the cultural capital of the region.

Cultural exportation and entrepreneurship are considered to be promising future opportunities in the region. However, from the regional perspective, the biggest problem is that the Jyväskylä region is too small to effectively profit from the supply of HEIs in the cultural field. An important question is also whether the firms in the region are sufficiently capable of benefiting from the cultural know-how of HEIs.

Library services and university museum serving surrounding society

The Finnish library system is an interactive organized network based on an extensive use of information and communications technology (ICT) and information networks. Library services in Finland are effective and accessible, and the lending and library use rates are high. Municipal libraries, research libraries, specialist libraries, and libraries at educational institutions form part of the national and international information service network. In the Jyväskylä region, the Regional Library of Central Finland, Jyväskylä University Library and the Library of the Jyväskylä Polytechnic serve the surrounding society. Regional collaboration between these libraries has been promoted by clarifying their division of work. This has enabled the libraries to organize joint courses for material use and information searching.

Jyväskylä University Library, consisting of the main library and four other campus libraries, serves over 5 000 customers daily and nearly two million annually. The collections exceed over 1.5 million volumes and include 15 000 currently subscribed journals. Customers have access to Finnish and foreign databases and over 7 000 electronic journals. The Jyväskylä University Library provides access to extensive collections and information services, as well as modern loan services. In addition, it offers up-to-date library and information skills training and reference and consultation services. The number of loans in 2004 was nearly 215 000 and

the number of registered customers was nearly 44 000 of which 17% were students or staff of other educational institutions and 7% represented something other than educational units.

The library of the Jyväskylä Polytechnic comprises of six library units, whose collections supplement each other. The total stock of materials covers nearly 117 000 collections and 7 500 journals. In 2004, the number of library visits exceeded 320 000 and number of registered customers was nearly 17 500. Besides the Polytechnic's own students and staff, the students of other educational institutions form the main group of customers (24%). The share of customers representing the economic life of the region is approximately one percent.

The Seminaarinmäki Hill of the University of Jyväskylä has housed museum activities for over a hundred years. The accumulation of exhibits resulted in the founding of the museum in 1900. It was officially named "The Collegiate Ethnological Museum at the Jyväskylä Teacher Training College". Today, it consists of two sections: Cultural History and Natural Sciences. The Cultural History section collects, preserves, studies, and exhibits materials related to the University of Jyväskylä's past and present. It also administers the art collections of the University, and acts as an expert in questions concerning the architectural environment on campus. The Natural Sciences section serves as a preservation unit for natural scientific research, and displays environmental subjects and research material. It takes care of the living plants in the botanical garden on the campus. It also receives wild animals found dead and prepares scientific samples from them. The section has a collection of over 230 000 samples. In 2004, the number of people visiting the Cultural History section was 4 000 and the Natural Sciences section attracted nearly 14 000 visitors. The museum is a particularly important place to visit for groups of schoolchildren: in 2004, the number of such visits was nearly 4 100.

6.4 Environmental development

Supporting sustainable environment

The growing interest in the use of the region's natural resources, the impacts of industrialization and global change, increasingly and directly affect human lives and the state of the environment. The University of Jyväskylä and Jyväskylä Polytechnic also contribute to the environmental development of the region. Various environmental issues are taken into account in the planning and development of HEI strategies and environmental technology is a key area of expertise in the region. The environmental aspect of HEIs in the region of Jyväskylä is both horizontal as it is integrated in the general modes of operation and decision-making (its effects are hard to measure) and specialized focusing on the specific field.

The Institute of Natural Resources at the Jyväskylä Polytechnic provides Bachelor's degree education in Agriculture and Forestry in Saarijärvi, and participates actively in the environmental development of Central Finland. Their activities are based on the sustainable use of natural resources. It carries out surveys and product development projects together with the local firms, expert organizations and other stakeholders. One of the key projects is Norwat which aims to support the sustainable development of communities, promote the wise management of natural resources, and help to overcome the disadvantages of remoteness and sparse population (Box 6.7).

Box 6.7 Promoting sustainable development by international collaboration

The Norwat project was approved in mid-2004 and it will continue until 2007. Four countries and twelve partners are participating in it. Finland is the lead partner and the overall project manager is the Jyväskylä Polytechnic's Institute of Natural Resources. Other participants from Central Finland are the Municipal Authority of Saarijärvi, the Forestry Centre of Central Finland, the Central Finland Regional Environment Centre and the University of Jyväskylä (Institute for Environmental Research).

The project aims at finding and disseminating new ways of making the best use of watercourses for the benefit of local sustainable community development. Many communities live alongside watercourses, and the project will improve the inter-relationship between environmental and socio-economic wellbeing in these areas. This will be achieved under the heading of three themes: (1) sustainable land use management to protect water quality; (2) naturalization of watercourses to restore and enhance riverside natural habitats; and (3) education, interpretation and training to raise awareness of the value and uses of watercourses. By working together the project partners will produce best practice manuals related to these themes for the benefit of the whole Northern Periphery Programme (NPP) area.

The University of Jyväskylä does important research in the fields of bio-gas technologies and the recovery of contaminated soil and water bodies (Box 6.8). The department of Biological and Environmental Science at the University of Jyväskylä provides education and research in the fields of ecology and environmental management, aquatic resources and environmental sciences. It operates in close cooperation with the Institute of Environmental Research at the University, which plays an important role in the environmental cluster of the region as a producer of scientific research, and a provider of services and training in addition to the accredited laboratory services in the field of environmental studies.

Box 6.8 The region's lakes provide a research environment

Located right in the heart of the City of Jyväskylä, Lake Jyväsjärvi has been the subject of continuous monitoring for some years. As recently as in the 1970s, Lake Jyväsjärvi was virtually dead. Large quantities of sewage and waste water from industry had got into the lake and ruined it. Nowadays, the lake is clean enough to swim in and the fish are fit for human consumption.

The Jyväsjärvi project aiming to survey the conditions of the lake was started in 2000 by the Department of Biological and Environmental Science at the University of Jyväskylä. As a part of the creation of a research environment, the project involved the construction of a research raft known as Aino, which was positioned on the lake. The raft monitors the state of the lake and transmits the obtained data to the internet for the use of residents.

At the beginning of 2004, a Jyväsjärvi-Päijänne Research Environment project was launched at the Department of Biological and Environmental Science. It aimed at putting aquatic environment data and technology to commercial use, with particular reference to Lake Päijänne as an environment for expertise and research. The project is a follow-up to an earlier research project involving Lake Jyväsjärvi, which is a contiguous part of Lake Päijänne, Finland's second largest lake, separated from the main lake by a narrow channel. Financed by the European Regional Development Fund, municipalities and several companies, the new project will gather environment-related data on Lake Päijänne and the municipalities surrounding it. The data will be placed in the internet where it will be available to students, researchers and non-academic people alike. The goals of the project are: (1) to produce information for follow-up research on Lake Päijänne and other water systems; (2) to exploit the large amounts of available environmental information; (3) to support the processing of that information and any entrepreneurship built upon it; and (4) to educate experts and researchers.

Environmental issues are also taken into account in the field of business education and research at the University of Jyväskylä. Environmental sustainability has become an important element in the management of both private and public organizations. To respond to the increasing needs, the School of Business and Economics launched a programme in corporate environmental management in 1995 (Box 6.9).

Box 6.9 Environmental management integrated in curriculum

The School of Business and Economics at the University of Jyväskylä has been proactive in integrating corporate environmental management in its curriculum, research, and other activities. Master's and doctoral theses that include environmental considerations can be found from the beginning of the 1990s. A huge step forward was taken in 1995, when a new master's program dedicated to environmental issues was launched. This marked the beginning of the structured training in environmental sustainability at the School of Business and Economics. The programme in corporate environmental management provides an integrated and interdisciplinary approach to environmental issues having close co-operation with the Department of Biology and Environmental Sciences at the University and with the Renewable Energy Research Programme. Since 1995, there have been 46 completed master's degrees and 8 doctoral degrees. The number of students in the Master's programme in 2004 was 53, and among them there were also foreign students, as the teaching is given mainly in English.

Jyväskylä was the first university in the whole of Scandinavia to offer a full master's and doctoral programme in corporate environmental management. Recently, according to the Beyond Grey Pinstripes survey 2005, conducted by WRI, the School of Business and Economics was positioned among the top 30 business schools that lead the way in integrating issues of social and environmental stewardship into business school curricula and research.

The important regional research partners include the Jyväskylä Science Park (JOIN-project), the Central Finland Energy Agency (RePlan etc.), the Central Finland Environmental Agency, the Alliance of Central Finland and Jykes (Environmental Steps). The partners from trade and industry include Jyväskylä Energy, Nordea bank and a large number of SMEs from Central Finland, to mention just a few.

The HEIs actively participate in the development of environmental technology in Central Finland, which has been driven by the needs of the forestry, paper and metal industries. The focus areas are waste treatment and environmental biotechnology, process industry ecology, recovered and mixed fuels. Environmental management and measuring, and monitoring and analysis technologies are further fields of expertise. In addition to HEIs, the main actors in the environmental cluster comprise of the Jyväskylä Science Park, the Technical Research Institute of Finland (VTT), and companies. Mustankorkea is the regional waste treatment company in Jyväskylä, which has, in cooperation with the Department of Biology and Environmental Science at the University of Jyväskylä, been acting as an experimentation site for research into landfill operations and composting. VTT Processes, located in Jyväskylä, does research and development in the fields of environmental studies related to both the energy and forestry cluster. Environmental protection authorities in the region include the Central Finland Environment Centre and the Jyväskylä City Environmental Agency.

6.5 Conclusions: Critical points relating to the contribution to social, cultural and environmental development

1. **Collaboration between HEIs.** In contributing to social, cultural and environmental development, the collaboration and the division of work between HEIs is based on their complementary roles. The operations of the university usually have a strong research emphasis, whereas the actions of the polytechnics emphasize a practical approach. These two different starting points form a good foundation for cooperation in socio-economic involvement. The exploitation of these possibilities varies significantly between the different lines of action; the operations carried out are usually based on mutual projects that are financed by regional development funds. This kind of project-based development often lacks continuity and easily leads too incoherence and inefficiencies in the implementation of the development activities. The collaboration between HEIs in local socio-economic development forms a significant challenge, which has partly been responded to by the mutual regional development strategy of the HEIs. However, a more comprehensive, consistent and concrete strategy for the development of the local socio-economic environment would take the contribution of the HEIs to a new level.

2. **Collaboration and the division of work between HEIs and the regional stakeholders.** The collaboration between HEIs and their regional stakeholders in contributing to the social, cultural and environmental development of the Jyväskylä region is based on several strategies that direct the regional development measures. The HEIs are seen as integral parts of a socio-economic entity. The teaching and research basis of HEIs forms a good, but only partially exploited resource in the social, cultural and environmental processes of regional development. The field of social and health care provides a good example of regional networking. The HEIs are part of *Central Finland's Centre of Expertise in the Social Field* and collaborate actively with the Hospital district of Central Finland as well as the social and health services of the city of Jyväskylä and other municipalities. However, the regional contribution of HEIs suffers from incomplete information about their operations and possible areas of application. An overall conception of the system in which the roles of different regional actors are clearly and coherently integrated and active collaboration with stakeholders would increase significantly the contribution of HEIs.
3. **Project-activities as a tool for making a socio-economic contribution.** The diverse project activities of HEIs form the main mechanism for contributing to the social, cultural and environmental development in the Jyväskylä region. Some projects have succeeded in generating continuous development processes that have multidimensional impacts on the (wider) society. Generally speaking, however, the main drawback of these project activities is their incoherence and loose connection to the overall regional development processes. Project funding has been strongly based on the European Regional Development Fund (ERDF) and European Social Fund (ESF). Without careful anticipation and planning, the diminishing resources of the EU structural funds will threaten both the activities that get carried out and the regional development processes launched in the fields of social inclusion, cultural development and the development of environmental sustainability. From the regional development and funding perspective, a more intensive collaboration between the HEIs and their regional stakeholders would enable them to launch projects as integrated wholes, with close connections with each other.
4. **The roles of HEIs in social innovation.** A good level of cooperation between the public and private sectors, with a view to increasing social innovations and enhancing their utilization, is one of the key factors for overall economic and societal development in the regions. The geographical concentration of population, level of economic activity, ageing population, and the resulting pressures on the service structure increase the value of social innovations. Effectively promoted social innovations frequently give rise to new business opportunities and jobs (e.g., social and cultural entrepreneurship). As such, the role of HEIs in these processes is considerable. In the Jyväskylä region social and health care, and particularly wellbeing and gerontology, are promising fields for innovations in the provision of social service. Additionally, the cultural and teacher education provide favourable breeding places in terms of social innovations. As a whole, the multidisciplinary activities of the University of Jyväskylä and the Jyväskylä Polytechnic should be more effectively exploited in the region. The social and service innovations could be promoted in cooperation with different regional actors by means of joint cluster programmes, relevant strategic planning and anticipation activities.
5. **Broaden the conception of sustainable development.** Basically speaking, the principle of sustainable development is thought to only be concerned with the natural environment, but the concept has become wider and also covers economic and social perspectives. Both social and ecological issues are emphasized in promoting sustainable development. Sustainability is now recognized to be a key area of development for the higher education sector and applying it in practice will become increasingly important. Particularly in the Jyväskylä region, the policy and practice of sustainable development point to the need to consider how to most effectively embed it in the strategies and curricula of higher education learning and teaching.

<p>Strengths</p> <ul style="list-style-type: none"> + The significance of HEIs in the regional socio-economic development process has been mutually accepted by stakeholders and HEIs are tightly connected to regional development strategies. + The HEIs have actively integrated themselves in the development of the local socio-economic milieu in all three sectors of sustainable development – socio-cultural, economic and environmental. + Role of HEIs in contributing to social inclusion, cultural development and the development of environmental sustainability is based on a complementary approach. The operations of HEIs fill the gaps in the local markets, mostly avoiding overlapping with other actors. + The strong divisions of social and health care in both HEIs form a strong basis for contributing to the local social development by research, education and expert services as well as by producing services complementary to those supplied by other actors. + HEIs have actively developed new ways of promoting the cultural development of the region. HEIs also have an active role in promoting cultural events and forming national and international cooperation based cultural exchange. 	<p>Weaknesses</p> <ul style="list-style-type: none"> - The operations of HEIs related to social inclusion, cultural development and the development of environmental sustainability are mainly based on separate projects, which, to some extent, lack a connection to the overall development processes. - The contribution of HEIs to regional cultural, social and environmental development processes suffers from incomplete information about the operations of HEIs and the possible areas in which they can be applied by their stakeholders. - The numerous overlapping strategies for regional development make the management of the overall contribution difficult. This may lead to incoherence between individual measurements. - The research focusing on environmental questions is strongly nationally orientated, neglecting a significant selection of the possibilities for regional applications. - The concept of environmental sustainability is too narrowly connected to the biological environment by HEIs and stakeholders alike, missing the active exploitation of the socio-cultural and economical dimensions.
<p>Possibilities</p> <ul style="list-style-type: none"> + The teaching and research basis of HEIs forms a good, yet only partly exploited resource for contributing to the social, cultural and environmental fields of regional development. The overall joint strategy and active collaboration with stakeholders would increase significantly the contribution of HEIs. + The application of social innovations developed by HEIs raises the potential to contribute to the local socio-economic milieu, in order to confront the ongoing structural changes (e.g. renewal process in public sector services and municipality structure). + The combined entity of the University and the Polytechnic forms possibilities for complementary expertise in environmental development processes, simultaneously involving both a strong research base and a practical orientation. + The horizontal operations in the field of environmental development (e.g. the integration aspects of environmental sustainability and energy) form a potential strength for the regional contribution of HEIs. + Social and cultural entrepreneurship raises the possibilities of HEIs contributing to these sectors in a multi-dimensional sense. + Joint infrastructural solutions allow deeper cooperation and more effective use of resources. 	<p>Threats</p> <ul style="list-style-type: none"> - The diminishing resources of the EU structural funds will threaten activities carried out and regional development processes launched in the fields of social inclusion, cultural development and the development of environmental sustainability. - National level decision-making may change the possibilities of HEIs to contribute to social, cultural and environmental development. - Without an adequate increase in resources, the pressure on development activities may endanger the subsequent provision of resources allocated to basic research and education activities. - The overall contribution of HEIs to social, cultural and environmental development remains minor due to the disjointed structure of involvement. Too many separate interventions do not lead the objectives aspired. - The vulnerability of funding for activities contributing to social, cultural and environmental development may cause serious conflicts in the case of significantly diminishing project funding, especially without careful anticipation and planning.

Table 6.1 SWOT analysis on the contribution of HEIs to social, cultural and environmental development (in the Jyväskylä region)

VII CAPACITY BUILDING FOR REGIONAL COOPERATION

The mechanisms promoting regional the involvement of HEIs can be divided into four levels of operation; namely (1) the national level, (2) the regional level, (3) the institutional level, and (4) the regional HE-system level. The basic characteristics of the different levels are summarized in this chapter.

7.1 National level

Promoting the regional contribution of HEIs

Policy actors and strategies. The operations of HEIs are integrated with the national parliamentary system, and national authorities have a central role in building the framework for the regional involvement of HEIs. A number of national authorities, strategies and programmes support and coordinate the regional contribution of HEIs through a variety of channels. At the national level, a trilateral series of relationships among industry, government and universities (the Triple Helix model) are emerging, stimulating knowledge-based economic development (Etzkowitz, 2002). As an integral part of regional policy, 10 key ministries are obliged to define their regional development plans (see Figure 7.1). The Ministry of Education was the first to complete its own plan at the beginning of 2004. This strategy defines and strengthens the role of Higher Education Institutions (Universities and Polytechnics) in regional programmes. The Ministry of Agriculture and Forestry emphasizes urban-rural linkages and rural hubs, qualified as “competence centres”, in line with the Regional Centre Programme deployed by the Ministry of the Interior. The Ministry of the Environment focuses on the attractiveness of communities. The Ministry of Labour’s strategy focuses on the TE Centres, servicing individuals and businesses in labour market issues. The Ministry of Trade and Industry is attentive to regional competitiveness, particularly competences and enterprise financing. The Ministry of Transport and Communications will focus on the ICT infrastructure framework, with implementation largely being the responsibility of local government (regions, joint municipal boards and public-private partnerships), and on Information Society policy, aside from its traditional foci (road maintenance/construction is, increasingly becoming a regional prerogative). (OECD, 2005.)

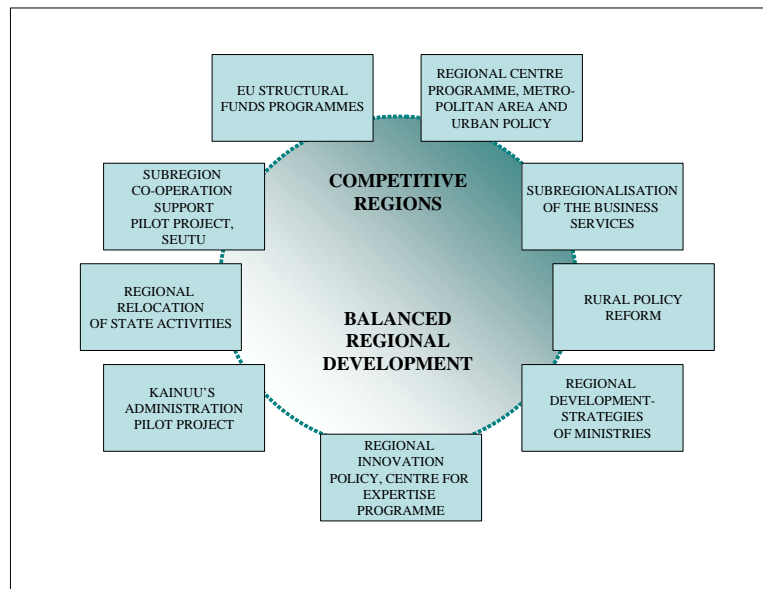


Figure 7.1 Regional development programmes (OECD, 2005).

At the sub-national level, regional development policies are managed by the Regional Councils under the Regional Development Act. Each regional council draws up a "Regional Plan" (long-term strategic vision)

referring to the regional development targets decided at the national level. Decisions about the "Regional Strategic Programmes", debated on with the main public and private regional actors, and also discussed with the national level to ensure overall coherence, are made by the different regional councils. The "Annual Implementation Plans" detail financing from committed sources (EU, national, municipalities, and private sector), taking into account the regional development programmes defined at the national level. Each actor, at different levels of government can thus express their views, with the regional council actively co-ordinating the preparation and elaboration of the strategic documents that it is to adopt, thus defining its regional development goals, measures and means of implementation.

Regional policy based incentives. Parliament enacts laws on education and decides on the general principles of education policy. The Government and the *Ministry of Education* implement these principles at the level of central government. The Ministry of Education has an active role in guiding and supporting the HEIs regional contribution. The *Ministry of the Interior*, in cooperation with other ministries and the regional councils, is responsible for the formulation of national targets for regional development. In addition, the Ministry of the Interior is responsible for coordinating, monitoring and evaluating the preparation and implementation of regional strategic programmes and other programmes in accordance with the Regional Development Act. The *Ministry of Trade and Industry* ensures that the operating conditions of enterprises are favourable. A competitive operating environment is developed with both national and regional measures. The Ministry is also responsible for the policy on technology and innovation. The *Science and Technology Policy Council* of Finland, chaired by the Prime Minister, advises the government and its ministries about questions relating to the strategic development and coordination of Finnish science and technology policy as well as about the national innovation system as a whole. Tekes, the *National Technology Agency* is the main public financing and expert organization for research and technological development in Finland. Tekes finances industrial R&D projects as well as projects in HEIs and research institutes. Tekes' funds come from the state budget via the Ministry of Trade and Industry.

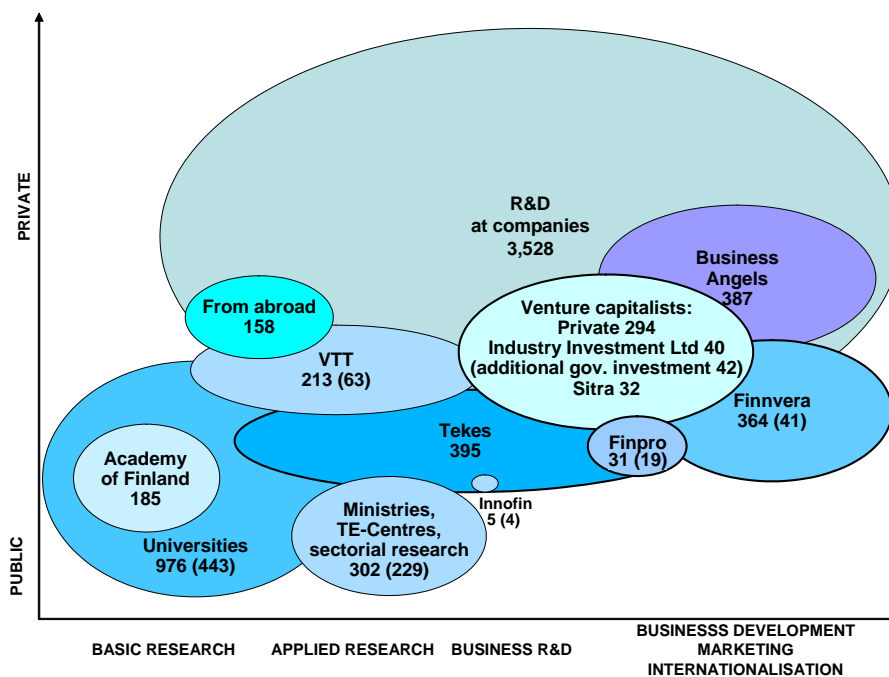


Figure 7.2 Total extent of funding from different organizations in million euros in 2003¹⁷ (Source: Tekes)

The *Centre of Expertise Programme* represents one of the main tools of the Finnish regional innovation policy. The objective is to increase cooperation between HEIs and enterprises, develop top-level expertise, attract investments and talents to the region and improve the regions' ability to generate R&D funding. Furthermore, the principal objective of the *Regional Centre Programme* specifically stresses the

¹⁷In parenthesis the share that is funded from the State budget. The funds of Tekes, the Academy of Finland and Innofin are funded entirely from the State budget.

development of sub-regional cooperation by bringing together, in a joint network, municipalities, HEIs, research units and enterprises. The assumption is that urban regions are considered to be functional entities for development, for which the core city and the surrounding municipalities must cooperate closely. Both the Centre of Expertise Programme and the Regional Centre Programme are based on regional/local inspirations, forming the “bottom approach”, in contrast to the “top down” national system. The EU programmes and structural funds promote the regional dialogue and, along with the new programming period, the collaboration will become increasingly important.

Hence, the coordination of the contribution of HEIs to regional development is a complex system. However, the importance of HEIs in regional development is stressed by all parties involved in the national system and the knowledge they produce is seen as an outstanding source of competitiveness.

Budget based incentives. Furthermore, the actual operations of HEIs are strongly dependent on the budget constraints set by the national budget instalments and sources of regional finance. In the annual performance negotiations, the Ministry of Education and each HEI agree on the targets for their operations, the resources needed, monitoring and assessment of target achievement and further development, and confirm three-year agreements on these. The Ministry also gives a written feedback document to each university on how well the targets set in previous negotiation have been achieved. The feedback concentrates on strategic issues and, if possible, suggests development proposals. The financing of the operational expenditure of the universities, allocated through the Ministry of Education, comprises the core funding, project and performance-based funding, and the national funding also. Besides education and research, the core funding formula takes the societal service mission into account. Performance-based funds are used to reward the quality and societal and regional impact made. The different components of the Ministry of Education’s funding for the University of Jyväskylä are represented in Appendix 16. In addition to the core funding, the polytechnics’ funding consists of project and performance-based funding as well as substantial external financing. The polytechnics chosen as high-quality units of education or regional contribution receive performance-based appropriation. As a whole, the regional contribution is only one part of the performance-based funding of HEIs and the amount of funding addressing the regional contribution is rather small when compared to the basic funding streams. Hence, the budget based incentives for the regional activities of HEIs are not very efficient.

Reviewing and evaluating the impact of HEIs on regional development

Evaluation and monitoring focusing on HEIs. The evaluation of regional engagement is a multi-faceted system carried out by different actors. HEIs evaluate their education, research activities and their impact; for example, in connection with their quality assurance processes. In addition to these self-evaluations, there are other external evaluations such as peer evaluations. The Finnish Higher Education Evaluation Council (FINHEEC) – a permanent expert body attached to the Ministry of Education – assists HEIs in their evaluations and submits a proposal to the Ministry concerning the units to be rewarded for high-quality education, based on applications from HEIs. A university unit may be designated as a centre of excellence in undergraduate, doctoral and adult education. A polytechnic unit may be rewarded as a centre of excellence in education and in terms of its regional impact. The guiding principles of FINHEEC include transparency and impact. The former means that the evaluation aims, methods and results are public information and they are recorded in project plans and other documents. The aim of the latter is to provide HEIs and educational policy-makers with the tools to understand and improve their policies in such a way that evaluations are seen as useful. Currently, the contribution of polytechnics to regional development is more emphasized in the evaluation of FINHEEC than the regional contribution of universities. University research is evaluated by the Academy of Finland, which designates centres of excellence in research.

HEIs as a part of evaluation and monitoring. The operations of HEIs are often evaluated as a part of the larger evaluation focussing on certain themes; for example, regional evaluations of the Centre of Expertise Programme or EU-programmes. The large number of evaluations and statistical information collected regularly by Statistics Finland, and other institutes, ensures that the national authorities are aware of the regional knowledge resources. However, the identification and dissemination of the good practices associated with the regional contribution of HEIs are not systematically organized in the Finnish system. One effort that the Ministry of Education has made to identify the good practices of HEIs, in terms of their regional contribution, is through their recently updated joint regional strategies.

Key topics relating to changes in the HE-system. The Finnish higher education system is currently under pressure to change. The diminishing youth age groups put pressure on the decrease in annual student intake whereas the need for adult education is increasing. The productivity programme of the Ministry of Education for the period of 2006-2011 involves such things as plans for the gradual cut in the number of university employees, increasing the size of the institutions (by incorporating and shutting down small units), and increasing the share of performance based funding. Increasing the autonomy of universities is also in progress, a process that aims to improve the possibilities for commercialization of research and education and facilitate the holding of shares in companies and establishment of university-based companies. For instance, by establishing separate technology transfer units, universities could focus more efficiently on their core functions – education and research – as well as societal interaction, in order to collaborate with the surrounding community and to transfer the knowledge for the use of society and industries. Moreover, the proposal for the transfer of polytechnics' ownership to the government has been debated recently as a part of the renewal of the municipal and service structure.

7.2 Regional level

Promoting the regional contribution of HEIs

During the last ten years, the Jyväskylä region has become a centre of growth and high level knowledge. The Jyväskylä region is marketed internationally as a Human Technology City – a city that develops innovations at the crossroads of people and technology, which is strongly founded on the knowledge base of the HEIs in the region. Both the University of Jyväskylä and Jyväskylä Polytechnic have a national and international profile and they are respected as strong actors and intellectual forerunners in the region. Furthermore, they attract talented young people to the region. The HEIs participate in regional strategy working groups and their activities form an essential part of regional strategies and programmes. The main strategies and development programmes involve the Provincial Development Strategy, Centre of Expertise Programme, Regional Centre Programme, and the Network City Strategy, among others. For instance, the wellness technology, which is a new pillar supporting regional development, has been strengthened as a result of constructive cooperation between the HEIs and the regional stakeholders. Due to the important position of the HEIs in the Jyväskylä region they have a strong voice in matters which affect them.

The intermediate organizations promote the regional contribution of HEIs in the Jyväskylä region by carrying out joint projects, profiting from the expertise of HEIs and acting as a facilitator of information transfer. The promotional effects could be further strengthened by developing mutual mechanisms for effective cooperation. An important form of regional cooperation between the University of Jyväskylä and *Jyväskylä Science Park (JSP)* has also been the building of premises¹⁸. For instance, the JSP has had an active role in the planning and funding of the new significant buildings like the Agora (owned by the Fastighetbolag Jyväskylä Agora Ab), Viveca (owned by the JSP Facilities Ltd.) and the Nanoscience Center (owned by the Senate Properties), which has considerably accelerated the extension of the university based on their needs. JSP has also rented a certain part of those premises to firms that support the creation of networks.

In addition to the intermediate organizations, there are other regional actors supporting the regional contribution of the University of Jyväskylä and Jyväskylä Polytechnic. The duties of the Department for Education and Culture in the *State Provincial Office of Western Finland* are to improve the quality of culture and education at all levels in the province of Western Finland, as well as the productiveness of the region as a part of national educational and cultural activity. The Department's task areas include: professional training, the evaluation of educational and cultural services, further training for educational personnel, library administration, sports and youth activities, arts management, and general applications. The State Provincial Office of Western Finland has convened a *Knowledge forum of Central Finland* which consists of experts (concerning e.g. EU-programmes) and members of all parties providing EU funding, as well as the educational institutions in Central Finland. The forum determines goals and development lines in order to

¹⁸ The main part (75%) of the University of Jyväskylä premises is rented from a state-owned Senate Properties. Most university premises in Finland were given to Senate Properties in 1999, and today nearly all new university premises are built by them.

increase knowledge in the region, and focuses on defining the framework for relevant project activities. The role of the State Provincial Office is highlighted more at the lower level of education than in higher education.

The *Regional Council of Central Finland* is a joint municipal authority that works to promote the prosperity of the region. It takes charge of regional development including long-term planning, rapid reactions on current affairs and the creation of a development strategy for Central Finland. The regional plan sets guidelines for regional development over the long term (20-30 years). The drafting of this plan, in 2002, involved the participation of state and local government officials, the business sector, establishments providing education and training, a variety of organizations, and individual citizens. The cooperative committee of the province of Central Finland (MYR) is responsible for the implementation of EU programmes in Central Finland. MYR combines the regional plan, implementation of special programmes and funding, and reviews the implementation document of the regional plan. It handles supra-provincial projects and other projects with a special regional importance and / or with a budget exceeding one million euros. The committee consists of members representing the Regional Council, municipalities, national authorities responsible for the funding of programmes, and labour and industry organizations. Although the HEIs are not participating in the committee, they frequently act as experts for it.

Entrepreneurship and its promotion have been prominent topics of social discussion recently. To respond to the challenges of creating an entrepreneurial atmosphere, several Central Finnish actors started a Y4-entrepreneurship process "Appreciation of Entrepreneurship Up through Cooperation" in 2002. Its objective is to develop Central Finland to be the most vital province for business in the world by appreciating, motivating and encouraging people to be innovative, work with an entrepreneurial spirit and to be entrepreneurs. The Y4-process has created resources, methods and a way to work. In addition, the Jyväskylä Polytechnic and University of Jyväskylä have signed the agreement.

Reviewing and evaluating the impact of HEIs on regional development

The contribution of HEIs to regional development is not systematically evaluated by the regional authorities. The TE-Centre of Central Finland produces information on the local employment of HEI students and this is a frequently used to measure the regional effects of the HEIs. Besides these statistics, the information gathered by regional opinion and attitude surveys provides information on the regional relevance of HEIs. It might be important to consider whether new, more systematic, means of reviewing the HEIs' impacts on regional development such as an annual evaluation panel or progress report would be needed in the region.

7.3 Institutional level: The University of Jyväskylä and Jyväskylä Polytechnic

UNIVERSITY OF JYVÄSKYLÄ

Institutional capacity building for regional involvement

The overall strategy of the University of Jyväskylä includes the relationship with the regional community as one of the key challenges it seeks to address. The strategy highlights the role of regional development projects, the contribution to the regional innovation system, the dynamic ability to react to changes in private or public sector needs, and collaboration between other educational institutions and regional actors.

The vice-rector of the university is responsible for promoting regional cooperation and monitoring the development of innovation activities. To promote the regional collaboration, a new permanent post of senior coordinator focusing on the coordination of regional operations, was created in the administration branch in 2005 (the post will be filled later on¹⁹). Moreover, the temporary posts of project personnel are numerous at the University of Jyväskylä. The faculties and departments can rather autonomously define the level and principles of their regional orientation. The main channels of communication between the regional stakeholders and the University include networks based on joint project activities, joint strategy work and

¹⁹ At the moment, due to the national productivity programme the new posts cannot be fulfilled until the national policy lines for the future will be settled.

participation in the decision making process as a member of the board of different bodies. In 2005, the first external members were elected to the University board: they were the Mayor of the City of Jyväskylä and the Technology Senior Vice President of Metso Paper.

Academic leadership is under increasing pressure. The changes in the university system and the growing engagement with societal and regional development require a new kind of strategic leadership. Some of the key challenges are, for example, finding the balance between centralized and decentralized leadership, introducing business-type leadership characteristics to the university and ensuring the wellbeing of staff in the competitive labour market. To respond to these challenges the University of Jyväskylä launched the JOPLAA -project in 2002, which aims at making the administrative personnel (of different levels) of the University acquainted with the new challenges and then providing them with the appropriate tools for the development of quality achievement and personal wellbeing. The main objective is to raise the quality of leadership in the long-run.

From the perspective of ICT infrastructure management, the strategic focal points of the University of Jyväskylä are: to provide high quality services in education, research and societal engagement that promote the development of individuals' knowledge base. A primary goal of the ICT infrastructure management is to create an overall system with common rules that allows an effective and secure transfer and management of information both within the institution itself and to stakeholders.

Human and financial resources management

Regional responsibilities have been traditionally integrated to the core activities – education and research – of the University of Jyväskylä, but only now is their importance gaining special attention. This explains, at least partly, the lack of systematic training and rewarding of staff for regional engagement. Although a diverse supply of courses, such as managerial development or project management courses, is organized for the staff. A challenge of the new performance-based salary system, which will, according to the present information, come into force at the end of the 2005, is how it will take into consideration the regional activities of the university staff in encouraging them to pursue regional collaboration.

The Management Development Board (JOPLAA) serves as an important part of the personnel policy and the development of professional management. Acting upon the recommendation of the Science Council, the University Senate took the significant decision in 2004 to initiate a comprehensive research evaluation programme, the first of its kind in the University's history. The creation of permanent quality assurance systems for education and administration are also under preparation.

The process of quality assurance for education was conducted at the University of Jyväskylä in 2000-2003 and a research evaluation exercise is currently in progress (in 2005-2006). The purpose of the research evaluation is to enhance the University's development as an international level research university. Units demonstrating a high level of success in the evaluation may be rewarded, and resources for future development may also be allocated to those units.

The incentives from national government designed to encourage universities to strengthen their regional links are not flattering. Performance-based funds are used to reward universities for their societal and regional impact but those funds are fairly trivial compared to basic funding streams. Thus, the regional activities are mainly based on external funding, of which the amount is increasing. Due to this situation, the university departments are sometimes compelled to participate in projects that are not relevant to their core activities. The end of the current EU programming period also brings along new challenges for the University of Jyväskylä, as the share of EU structural funds has been significant (7% of total funding in 2004) in carrying out the regional projects. In the future, the funding resources will be increasingly competed which requires more intensive collaboration with the other educational institutions and stakeholders in order to be able to form large and internationally competitive project entities.

Creating a new organization culture

The creation of a more regionally oriented organization culture is in progress at the University of Jyväskylä. However, the phase of regional engagement for the different faculties and departments varies considerably.

The main challenge is to get the University staff to understand that the regional mission is not a separate component but, rather, an integral part of their education and research, and that the higher national and international performance profiles serve the regional goals and vice versa.

JYVÄSKYLÄ POLYTECHNIC

Institutional capacity building for regional involvement

A strategic mission of the Jyväskylä Polytechnic is the promotion of well-being, primarily in Central Finland, through the advancement of working-life skills, the creation of networks, and through internationalization. The strategic choices of the Polytechnic are based on the development needs and goals of the province and they are always part of the regional innovation strategy. According to the Polytechnic's vision, it will be known as a higher education community specialized in the development of working life and the generation of new skills, well-being and competitive advantage within its sphere of influence. Its regional development tasks include both strengthening the growth centre and supporting the development of the peripheral areas of the province.

The institutional structures (including management) at the Jyväskylä Polytechnic are favourable for regional engagement. The owners of the Jyväskylä Polytechnic Ltd. are: the City of Jyväskylä (55%), the Municipal Federation of Education in the Jyväskylä District (35%), the Municipal Federation of Vocational Education in Äänekoski (5%) and the Municipal Federation of Vocational Education in the Jämsä District (5%). In addition to the members from the various municipal federations and politicians, the Polytechnic's board consists of members from the business sector. Thus, the organizational and ownership structure allows the influence of external bodies in decision making.

The communication with regional stakeholders is also frequent, via the joint strategy work and active participation in the regional bodies. The advisory councils in each school comprising members of the business sector and other regional actors are important channels of information exchange in developing the teaching and R&D to meet the regional needs. The new development manager posts that were created to add to the capability to respond to the regional needs, also promote the more coordinated activities and regional engagement of each school. Besides the development managers, numerous project managers and workers are hired to carry out regional projects.

Human and financial resources management

Regional activities are an integral part of the Jyväskylä Polytechnic's operations. Thus, the staff are not rewarded separately for regional engagement. The Ministry of Education annually awards performance-based grants to certain tasks that highlight impacts on society. The Jyväskylä Polytechnic has been successful in this regard: in two successive years, 2003 and 2004, it was awarded grants for its effective R&D sector and, in 2004, also because of its successful performance in degree education. The increasing dependence on external funding and the decreasing resources of the EU's structural funds elevates the importance of project activities. In the future, the role of project activities will be increasingly stressed in the work tasks of the staff at the Jyväskylä Polytechnic.

In the education of staff, quality assurance and collaboration with the employment sector are particularly highlighted. One challenge in this area is the transfer of information and knowledge from the institution to the employment sector and vice versa. The R&D support unit assists the staff in their projects activities (e.g. in planning, funding issues and coordination of projects) and organizes education.

Particularly since autumn 2004, quality assurance work has been a focal point for the Polytechnic's key functions: in education, R&D and regional effectiveness. Quality assurance at the Jyväskylä Polytechnic takes place at two levels. Firstly, the creation of an effective quality control system is based on the development of a high quality educational culture. On another level, the actual quality assurance system consists of a number of measurement, documentation and analytical tools, with which information is gathered to support the decisions regarding the improvement and development of activities. The development of Jyväskylä Polytechnic's own Balanced Scorecard (BSC) integrates quality assurance tightly

in the strategy-making process. The national auditing of the quality assurance practices will be implemented in the Jyväskylä Polytechnic at the beginning of 2006 by the Finnish Higher Education Evaluation Council (FINHEEC).

Creating a new organization culture

Regional engagement has been a part of the Jyväskylä Polytechnic's main mission from the beginning. Thus, regionally minded thinking is not a new part of the organization's culture. Probably, the main challenge from this perspective is to strengthen the teaching and R&D staffs' understanding of the importance and contribution of their activities to regional development and working-life. The Finnish polytechnic system is rather new, and the role of R&D activities, in particular, has increased in recent years. To support the development of R&D activities the Jyväskylä Polytechnic devised a new R&D strategy in 2004.

Incorporating the new activities, modes of action and increasing regional pressures requires diverse knowledge of the administration and other staff of the polytechnic. The effective allocation of human and financial resources between high level teaching and R&D, in accordance with the institution's mission and vision, is supported by the development of the quality assurance work. Regional impact factors and assessment methods are included in the quality assurance system.

7.4 Regional HE-system level

The information in this sub-section is based on the summary of the joint regional strategy of both the University of Jyväskylä and the Jyväskylä Polytechnic that was completed in autumn 2005. The preparation of the strategy was headed by the executive group, consisting of the administrative personnel of both institutions, which was established in the course of the previous regional strategy process in 2002. The process of preparing the strategy can be divided into two stages. Firstly, the executive group set up an expert group that prepared a framework analysis of the regional impacts of HEIs and the development needs concerning the innovation environment. In the second stage, the preparation of the strategy was the determining factor of the working group that devised a strategy proposal for the executive group. Finally, the strategy document and the standpoints involved were revised by the steering group.

According to the view of the Ministry of Education, the HEIs' regional stakeholders did not have such an active role in the recent strategy process as was expected. Thus, in the future of the Jyväskylä region, it would be important to engage the regional stakeholders in the strategy process from the very beginning of the next stage.

The changes in legislation guiding HEIs, as well as changes in their operational environment, open many new possibilities. The new European two-tier degree structure enables the division of educational tasks between universities and polytechnics. The conditions of R&D activity and cooperation with enterprises are also changing, which further opens up the opportunities to develop new operational models. The successful recent history of the region supplies the requisite confidence and initiative to exploit these new possibilities.

Goals

The primary goal of the regional cooperation between the HEIs is to invigorate the region so that knowledge-based competitiveness and entrepreneurship will increase, producing well-being. To achieve this goal, the HEIs will develop new operational models and clarify their division of tasks in order to achieve a strategic partnership. Increasing openness between the HEIs is also a central goal.

Measures that support regional development

The enterprises and communities in the region do not have enough relevant information about the HEIs, their know-how or their task division. There are no established operational models for cooperation between the HEIs and enterprises. The investments in research by the enterprises in the region are rather small and concentrate mainly on a specific selection of fields. This directs the research conducted in the HEIs towards certain fields and small-scale projects, and limits the potential of firms to utilize the research provided by

HEIs. Because of the structure of the fields of education and expertise, the role of the third sector is also important in research cooperation.

- The HEIs develop the promotion of their knowledge potential and expertise with the intermediary organizations. The goal is to make the expertise that can be utilized through the cooperation networks of the HEIs available to the region. The HEIs increase their visibility in the area through the learning network cooperation (OPTIIMI).
- The HEIs develop their internal processes, concerning both the business activities of their staff and students, and make an agreement with incubator organizations about the necessary arrangements for establishing a business.
- The HEIs support and develop preconditions for business activity created as a result of R&D work, and invest in education that develops entrepreneurship and business competence in the region.
- The HEIs promote the activity of service sector firms and social innovations by looking for new financial instruments.
- The entrepreneurship education provided by the cooperation between the HEIs and the Jyväskylä Science Park is still being developed and expanded into new fields of business. New forums for interaction between entrepreneurs and students are also being sought.
- The HEIs also ensure the availability of their services (for example adult education) in the rural areas and increase the flexibility and regional reaction speed of their operations.
- The HEIs organize education for managing international projects.

Developing the division of labour

In terms of regional cooperation, the institutions should prepare themselves for tightening market conditions in the field of education during the strategy period 2006–2009, when the age groups begin to get smaller, and also for a decrease in the availability of resources for regional development after the current EU Structural Funds period ends. Therefore, it is important to develop the division of tasks within degree education as well as within other operations, trying to avoid possible overlapping activities and seeking new financial sources for the development activities.

- The University and Polytechnic go through their degree education profiles field by field, starting from the educational needs of the rural areas, and discussing the division of tasks and collaboration.
- The HEIs discuss the focuses of the University's Master's Programmes and the Polytechnic's Master's Degrees, and the volume of education, keeping in mind the objective and performance management model of the Ministry of Education and the future needs of the province.
- Working agreements are made with regional and national intermediary organizations on cooperation and the division of tasks in different phases of the innovation processes.
- The HEIs deepen their cooperation in the field of international teacher and student exchange in order to increase the much needed international competence in the region. Cooperation in arranging services and spare-time activities for foreign students is still under development.
- Expert cooperation and the mutual coordination of continuing education, open higher education and language centres are increased. The HEIs also work in closer cooperation in the fields of library and information services and information management.
- The HEIs aim at closer collaboration in regional projects and at developing the competence of their staff in the fields of project work (e.g. project management and finance skills).
- The Polytechnic guides their teachers and other staff to continue their academic doctoral studies at the University of Jyväskylä. The University promotes the integration of the Polytechnic's senior lecturers, and other staff with scientific doctoral degrees, into research communities and research in the different fields.

7.5 Critical points in promoting the regional contribution of HEIs

- 1. Merging regional and national aspirations.** The Finnish national system promoting the regional contribution of HEIs is based on a “triple helix” interaction model, involving government, industry and HEIs (c.f. OECD 2005). The national level system promoting the regional involvement of HEIs is composed of many different strategies, programmes and financial instruments. The approach of the national system is mainly top-down, seeking to simultaneously increase the national performance and regionally balanced growth. The regional system promoting the integration of HEIs into the local socio-economic environment also involves a number of actors, strategies and financial sources. The approach of the regional level system is, however, based mainly on efforts to develop the competitiveness of the local economy. From the viewpoint of an individual HEI or regional HEI-system, this two-way promoting/guiding system is sensitive to conflicts. The regional and national aspirations and expectations set for HEIs are not necessarily consistent with each other. Therein, the key question is how successfully are the HEIs able to integrate the top-down and bottom-up initiatives in order to promote their regional contribution. The successful integration of national and regional aspirations requires continuous interaction between national and regional level bodies. Locally prepared plans and strategies promoting the involvement of HEIs in regional development should always take account the national level aspirations. Without sufficient national support (including budget decisions), the aspirations for the region are at risk of crumbling away. Vice versa, the national level performance-based inspirations cannot be reached if the local operations are not in line with them. The conflicts between national and regional level aspirations could be partly solved by the implementation of a systematic audit-system, whereby the regional aspirations would be adapted to meet the national framework through the mutual acceptance of the regional and national authorities.
- 2. Anticipatory viewpoint.** Identifying local needs is stressed in the regional involvement of HEIs. Identifying the needs of local enterprises and public sector should be based on anticipatory approach. From the viewpoint of education and R&D-activities, it is not enough to identify and react to present needs only (reactive approach). A reactive response is sensitive to timing problems; the know-how required today is not available until tomorrow. In addition to the “first aid” given, HEIs should be able to anticipate the future needs of the region and shape their operational profile to confront them (pre-emptive approach). The HEIs should be able to produce the know-how required in the region beforehand. In fact, a number of HEI operations reach even further, focusing on “making the future” of the region (proactive approach). The anticipatory viewpoint presented above should be taken into account at all levels of capacity building for regional contribution of HEIs. This also requires that the firms operating in the region are able to map out their long-term needs and commit themselves to the process. Threatening shortage for skilled labour force stresses the importance the commitment of firms. Excessive emphasis on the direct needs of local socio-economic environment should not endanger the future-orientated operations, such as forming a basis for new technology diffusion (e.g. nanotechnology) or generating the know-how required for confronting the social challenges of the future (e.g. wellness technology).
- 3. Gradually advancing capacity building.** The regional contribution of HEIs is gradually progressing. Firstly, to be able to cope with regional challenges, the internal structure of individual HEIs should be constructed to promote regional engagement. Internal strategies, leadership, management, and incentive systems should contribute to the regional involvement. Secondly, the regional HE-system should be improved to confront and systematically solve the challenges and problems involved in mutual collaboration. The efficient regional engagement system of individual HEIs and the regional HE-system form the basis for external operations that promote regional contributions. Thirdly, comprehensive collaboration between HEIs and regional stakeholders is required for the efficient contribution of HEIs to regional development. Trust, mutually accepted roles and a clear division of labour between HEIs and the regional stakeholders form the basis for actual measures to be carried out. Without a purpose-built infrastructure, the regional contribution of HEIs remains random and rambling, leading to insignificant effects and results. To sum up, a strong basis for collaboration should be ensured before moving on to significant regional development projects requiring seamless cooperation. The efficiency of communication between the firms, other

regional organizations and HEIs can also be increased by the parallel participation in the boards, such as has been done in the Jyväskylä region.

4. **Towards an overall evaluation.** The evaluation, auditing and dissemination of good practises relating to the regional engagement of HEIs are currently based on several separate acts. The audits and evaluations usually focus on certain themes (e.g. the interaction between polytechnics and enterprises) or instruments (e.g. certain master's degree), missing the overall vision. Furthermore, the operations of HEIs are often evaluated as a part of larger evaluation, focused, for example, on EU-programs. The Jyväskylä Polytechnic carries out an extensive self-evaluation process of their operations, also including a regional perspective. However, these separate evaluations are not able to provide the overall picture about the HEIs' regional contribution. Therefore, it would be useful if the HEIs would collectively construct an overall monitoring and evaluation system, covering all of the regional development issues. An essential part for such an efficient system would be that coherent and informative indicators for the measurement of regional contribution of HEIs would be found. The system should be able to gather information on three levels: (1) an organizational level, (2) a HEI-system level and, (3) the regional level inputs and outputs. This system should also be able to identify good practices that could be reproduced for further dissemination.
5. **Improving financial incentives for regional involvement.** The current systems at a national, regional and organizational level do not encourage the regional contribution of HEIs efficiently enough. At the national level, the current financial incentives of core funding connected to the promotion of regional involvement are too small when compared to the basic budget instalments. This disproportion may cause a situation where contributing to the region is not among the central priorities of the HEIs. Furthermore, the minimal resources designated for regional contribution do not allow the relevant contributory operations to be implemented, and nor do they ensure the sustainability of the regional development processes started by external funding. The minor core funding leads institutions to seek and accept non-core funding for regional activities from a diverse range of sources (national and regional), some on a marginal-cost basis. Besides the core government funds, the regional contribution is funded by other ministries and public bodies, by private industry, by charities and other such foundations, and by international organizations. Many of these bodies only fund direct project costs, expecting the infrastructure for regional development to be provided by the institutes themselves. The rapid growth of marginal, cost based external funding may result in a decaying infrastructure. The weak points of the core funding of HEIs may produce a situation where the incentives for regional contribution remain minor at an institutional level and, as such, the regional engagement does not attain a central position in the strategies of HEIs and their units. Accordingly, the incentives for regional engagement at an individual, case by case, level also remain insignificant.
6. **The combination of an increasing number of tasks and diminishing resources.** The national and regional strategies emphasize the growing importance of HEIs in national and regional policy making. The stakeholders of HEIs expect the HE-system to contribute to a number of national and regional policy goals including life-long learning, social inclusion, widening participation, citizenship skills, economic development, cultural development and regeneration, knowledge-based developments, research and development (especially in science and technology), and regional development. At the same time, the national authorities put the HE-sector under significant pressure to increase their efficiency and cut costs, including those related to personnel. Estimates for cost and personnel cuts are significant and they might threaten the possibilities of HEIs' regional contribution in the future. Simultaneously, it is anticipated that the project funding from EU structural funds will diminish considerably. This means that a very significant part of the resources allocated to the regional contribution development of HEIs are expected to decrease. The challenge for HEIs is to manage the more complex portfolio of aims and funding, to differentiate themselves in an increasingly competitive funding market, and simultaneously protect and develop academic quality. The pressing mission of HEIs is to respond to the external pressures without neglecting their fundamental mission. This is one of the greatest challenges the HEIs have confronted. Moreover, the increasing competition for funding stresses the importance of collaboration between the HEIs (allowing, e.g., larger projects).

7. **Cooperation in strategies concerning the premises.** In the strategies concerning the premises of the HEIs (particularly those of universities) it would be important to find joint solutions with regional actors concerning the building of new premises. As the majority of university premises in Finland are owned by state-owned Senate Properties, the rent revenues and opportunities for additional investments might leak away from the Jyväskylä region. Thus, regional cooperation in building new premises, with subsequent regional ownership, would benefit the University and the whole region (e.g. Viveca owned by JSP Facilities).

VIII CONCLUSIONS: MOVING BEYOND THE SELF-EVALUATION

The role of the University of Jyväskylä and Jyväskylä Polytechnic in regional development has a long history and cooperation with other bodies participating in development work in the Jyväskylä region is part of the operation of HEIs. However, there is a great challenge in terms of how regional effectiveness could be further developed. The competition between the HEIs and the regions at the national level is hard, and becoming stagnant is not an option. Continuous development work has to be done to maintain the advantage over other competitors. The Ministry of Education's commission, designed to update the joint regional development strategy of the region's HEIs, set yet another challenge for increasing regional effectiveness. *The created strategy presents the tools by which the HEIs promote the welfare and competitiveness of Central Finland in the coming years, and which at the same time improve the position of the University of Jyväskylä and Jyväskylä Polytechnic in the national network of HEIs.* The joint regional strategy of the University of Jyväskylä and Jyväskylä Polytechnic was appreciated by the Ministry of Education Finland for three reasons: (1) this OECD –project was positively used in the preparation of the strategy, (2) the development needs of the innovation environment are well analysed, and (3) the strategy aims to concretely contribute to the cooperation between the University and Polytechnic²⁰.

8.1 General starting points

Contents of the regional development task are still under discussion. There is a lot of variation in the understandings of what regional effectiveness means and what the role of HEIs actually is, and, furthermore, what the regional development task should actually contain. To get common understanding of regional development task is particularly challenging for the universities due to their strong national and international orientation. Regional effectiveness, or in a broader sense, a task of societal service, is easily perceived as being separate from the other basic tasks of HEIs. The third basic task of HEIs, which has already gained ground as a concept, has helped to guide opinions in this direction. The assumption presented above is just what it takes to make actors concerned about a possible shortage of resources and limitations to their freedom of action. Another concern is that their national role, in carrying out the basic tasks of education and research, weakens as well.

Discussion proposal 1: *Regional effectiveness should be seen as a field of tasks, solidly integrated with the core HEI functions; education and research.* In order to have real impact on the region, the possibilities must be recognized and utilized effectively when carrying out these basic tasks. Without a clear connection to education and research, regional development becomes nothing but hot air, with no real objective or chances of continuity. The intermediary organizational and expert services provided by the HEIs should also be tightly connected to the chosen focuses of education and research.

The relationships between the national and the regional focuses of the HEIs should be defined more clearly in the future. The functions that have a strong national emphasis in the HEIs should not be used artificially to promote regional effectiveness. On the other hand, activities can have an effect on the region only if they are nationally significant. Concretising the regional development task in the faculties/departments and separate units of the University and the schools of the Polytechnic requires the contents to be clearly and concretely defined and goals to be set for regional effectiveness/regional development tasks, and the joint regional strategy. When drawing up the definitions, the complementary roles of the University and the Polytechnic should be taken into account through the division of labour.

The challenge of prioritizing activities. At the moment, the HEIs in Jyväskylä offer a wide range of education, which, on the one hand, is a definite strength. The key factor in international competitiveness – excellence – is only achievable by prioritizing activities and by specialization in the areas of highest expertise. Without sufficiently prioritizing activities, the possibilities for regional effectiveness are also left unutilized because the regional effectiveness of HEIs is measured by how high the level of competence in the

²⁰ Based on Arvo Jäppinen's seminar presentation (Ministry of Education) in Turku in 24.-25.11.2005.

region is according to national and international standards. The interviews and questionnaire (used in this study) revealed that the prioritization of activities will be a significant challenge; the units have clear views about the needs for additional resources connected to new openings and areas of strength. However, on the other hand, apart from a few exceptions, there were no drafts (plans made) about (how to affect) the declining functions. What is required in the prioritization of activities, are policies concerning the re-allocation of the aforementioned resources: the endless expansion of the various functions is impossible.

Discussion proposal 2: Stronger re-allocation of resources to targets that form the area of excellence in schools, faculties and individual subjects is needed. In the future, the units should be capable of showing how resources are re-allocated in developing the most important areas of emphasis (Figure 8.1). *Prioritising activities that would support national competitiveness requires the areas of competence to be defined in such a way that ensures they are complementary with the other national (and even with foreign) HEIs.* On the other hand, from the regional point of view, prioritising activities means closer and more holistic cooperation between educational institutions in order to promote the chosen areas of focus. *The starting point for regional specialization should be complementary roles achieved through cooperation between the University and the Polytechnic, and an effort to use the resources as efficiently as possible as well as defining the regional focuses.* Through the University and the Polytechnic's specialization, critical mass can be achieved even on a national or international scale. *Prioritising activities should be guided by both regional and national strengths, present areas of competence and current focuses.* However, in practice to achieve both nationally and regionally complementary operation of HEIs might be rather complicated.

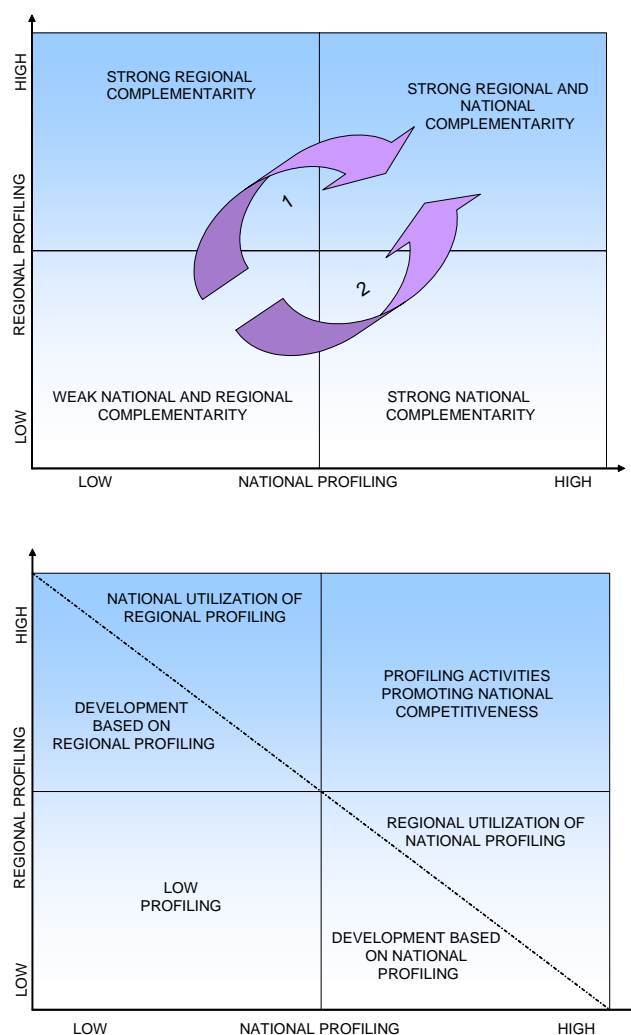


Figure 8.1 Allocation of resources: Development paths towards regional and national profiling

A need for holistic cooperation. At the moment, the cooperation between the University and the Polytechnic is mainly built on various development projects. The good thing about project work is that it concretizes aims that have only been planned on paper. Turning objectives into concrete projects should also be encouraged in the future. However, the shared work on regional development strategy changes the situation parting this respect. It is highly unlikely that the holistic and deep cooperation demanded by the Ministry of Education can be achieved through individual projects alone.

Discussion proposal 3: The division of labour between the University and the Polytechnic, and the task of developing a regional innovation system require that the approach is holistic. *Holistic cooperation should be built on the distinct profiles of the institutions, defining the division of labour, promoting complementary roles, and increasing the utilising of resources. This should be done with consensus with the other actors in the region.* It is essential to take account that as the university has a strong national and international role all its operation cannot be guided according to regional needs whereas the role of the polytechnic is different in this respect.

Fragmentation of project activities aiming at regional development. After the European Union's structural fund programmes and other external sources of funding became a more significant part of the HEI funding, the implementation of, for example, the regional development tasks has become very project-like. The risk of carrying out these tasks as projects is fragmentation, which might result in insufficient control of the whole process at the same time as endangering the continuity of the process. Fragmentation can present itself in two ways. On the one hand, it can be difficult to integrate a whole, consisting of a number of separate projects, with the basic strategies of organizations. If the projects do not connect easily with the strategic lines, the continuity of the processes they have started becomes very uncertain. On the other hand, fragmentation can also become a problem from the point of view of funding individual projects. The aforementioned problem especially comes into effect in large development projects based on basic research; those that require long-term funding. Getting the research group, actors participating in testing and firms committed to the project might prove difficult if the financing only consists of short-term funding.

Discussion proposal 4: Project activities implemented on the basis of external funding should be seen more strongly as instruments for implementing the basic strategies. Projects should always be connected to strategic lines. Special attention of both HEIs should be paid to the continuity of the processes already in the project-planning phase, particularly from the point of view of economic sustainability, among other things. This should be ensured through sufficient coordination. Jyväskylä Polytechnic has responded to this challenge by establishing a system of development managers for each school, enforcing the role of the R&D support unit in project operation and by integrating the project management in the quality assurance system. Also, at the University of Jyväskylä the coordination system and tools have been further developed based on matrix structure. Aiming at launching large project entities can be considered a basic policy that helps increase the efficiency of project operation. *The HEIs should state clearly, how external funding helps to achieve the basic policies set for regional effectiveness, and how the continuity of the processes being initiated is ensured. Special attention has to be paid to policies for the new Structural Fund period, which requires moving towards larger and larger joint projects, involving several actors.*

Coordination of strategies. The regional strategies of HEIs should be seen as integral parts of regional development. At the moment, there is a great amount of strategies aiming at regional development in Central Finland, but there is not a hierarchy between them and the way they are connected to each other remains unclear. The difficulty of seeing where the strategies intersect is partly caused by the fact that they operate in different fields, and, therefore, also from different starting points. The somewhat unclear relationships of different strategies with each other makes defining the roles of actors and the division the tasks between them more difficult. Defining the roles between the two HEIs and between them and the intermediary organizations is not finished yet; although, a lot of work has been done in this area and there has been significant progress in recent years. The lack of role clarity also contributes to the overlapping of activities and causes mistrust between different actors, weakening the possibilities of increasing regional effectiveness at the same time. The division of tasks between the HEIs was considered to be especially unclear in the areas of education and R&D activities. However, the situation varies greatly between different faculties/schools and there have been experiences of both success and failure in such cooperation efforts. Defining the

boundaries for further developmental innovations has turned out to be the key problem between the HEIs and the intermediary organizations.

Discussion proposal 5: Clarifying the relationships between the different strategies and their interfaces requires action to be taken fast. It also supports the need to clarify the role of different actors and the division of labour between them on a sustainable basis. The first step in clarifying the division of tasks and identifying the interfaces could be a systematic matrix based analysis, by which the most important shared areas of activity could be outlined. After this, the relationships of interaction and subordination between the different strategies should be determined. *It would be important to state where the joint regional strategy of HEIs intersects with other strategies and what kind of relationships of subordination it has with other strategies. The division of roles between the HEIs, as well as in relation to the intermediary organizations in the area, should also stand out clearly.*

8.2 Increasing the regional effectiveness of education

The challenge of making educational cooperation more effective. The degree structure reforms bring a significant challenge for the development of the educational cooperation between the University and the Polytechnic. The reform will also bring many new possibilities to for resources to be utilized more efficiently. The educational cooperation between the University of Jyväskylä and Jyväskylä Polytechnic is still in its initial phase, which is the predominant situation in the whole of Finland, and systematic, basic work is required to build a stable foundation for it. The challenges presented by the allocation of study places in the future also emphasize the need for educational cooperation.

Discussion proposal 6: From the point of view of regional effectiveness, educational cooperation is mainly about developing the quality of education, focusing on core competence and increasing the efficiency of resource usage. *The development of collaboration requires customized approach for different educational fields as their modes of operation differs from each others. Thus, the same approach not fits for all.* There could be a chance for cooperation in pilot projects between, for example, the Master's programmes in the applied fields of the Faculty of Information Technology at the University of Jyväskylä and the School of Information Technology at the Jyväskylä Polytechnic, or between the applied fields of the University of Jyväskylä's School of Business and Economics and the Jyväskylä Polytechnic's School of Business. *The aim of these pilot projects would be to produce operations models and good practices that would be further developed and more widely utilized when establishing holistic educational cooperation.* Furthermore, it would be important to discuss how the new Master's Degrees at the Polytechnic could be efficiently utilized through educational cooperation and how, on the other hand, the possible problems of the new degree could be avoided. As a whole, it is important to support the different characteristics of education provided by the HEIs and take also account of their national and international orientation. For example, the allocation of student intake based on regional needs only would be too narrow criteria for the university sector.

A need for the further development of practical training. Practical training is one of the essential methods for the regional development of HEIs. The training in working-life environments involves a real interaction with society. Both the firm providing the training job and the educational institution gain competence through the training. Practical training has a significant effect on the human capital of the students still located in the region after graduating as it makes their transition into working-life easier. The implementation of practical training is not, however, a simple task and carrying it out successfully requires a lot of effort. The amount of experience and know-how in the different faculties/schools implementing practical training varies a lot, but, as a whole, the enterprises of the region see a need for further development.

Discussion proposal 7: More work has to be done to ensure the quality of practical training. The cooperative partners' experiences of how successful (or not) the practical training has been vary enormously. This fact supports the need for the large-scale development of practical training, comparable to on-the-job learning used in upper-secondary vocational education. The development

measures should apply to all parties – teaching staff, workplace instructors and students. *When concretized, the aforementioned recommendation means that teaching staff will utilize working-life contacts and activities more than before and career and life management will be more strongly integrated into the students' study programmes. For workplace instructors this means an increasing level of education.*

Expanding entrepreneurship education. The age structure and the loss of enterprises is a significant threat in Central Finland. As entrepreneurship based on information and technological know-how becomes more important, there are high expectations for HEIs, as educators of future entrepreneurs. In contrast, however, studies indicate that the probability of an individual becoming an entrepreneur decreases as the individual becomes more educated. In the light of this information, the policy of raising the general level of education in Finland puts more pressure on the role of HEIs in creating a positive image for entrepreneurship. The HEIs in the Jyväskylä region have also tried to promote a positive attitude towards entrepreneurship, but there still is a clear need for improvement.

Discussion proposal 8: The importance of entrepreneurship education as an essential part of studies in HEIs should be emphasized more in the future. Creating an atmosphere that encourages entrepreneurship and adopting entrepreneurship as a possible choice of career, at least later in one's career, should be the central aims. The challenge of entrepreneurship education could partly be met by teacher education, which is one of the Jyväskylä region's areas of strength. Increasing teachers' knowledge and skills concerning the themes of entrepreneurship would, for its part, help to create positive attitudes towards entrepreneurship from the first days of school onwards. *Integrating entrepreneurship education in different studies in both the University (for instance in the basic studies) and the Polytechnic should be emphasized.* This type of process has recently been launched in the Jyväskylä Polytechnic. Developing entrepreneurship paths for each school at the Jyväskylä Polytechnic is an essential step to further promote entrepreneurial thinking.

International students. International students could promote the possibilities of regional effectiveness in the future. International students can be seen, for example, as potential customers for education services, as promoters of intercultural skills in the region, and as a potential reserve of human resources. At the moment, interaction with foreign students is partly inconsistent and inefficient. In the best situation, international students could become a natural bridge for cooperation between the Polytechnic and the University. Interaction with foreign students could be arranged in a much more efficient and successful way through cooperation.

Discussion proposal 9: Deeper cooperation should be achieved between the HEIs to more efficiently utilize resources when interacting with international students. International students should be seen as a resource from the point of view of regional development also, and the creation of an international labour market large enough (international atmosphere) is one of the key issues in promoting the willingness of students to settle in the region and in achieving extended impacts on the region as a whole. Thus, this is a challenge for the whole region. *As a concrete first step, a joint measure for the Polytechnic and the University that would be based on a thorough study, responding to the challenge set by international students, should be established.*

Increasing the efficiency of lifelong learning. Lifelong learning is considered as one of the prerequisites for the development of the information society. An individual must have an opportunity for lifelong learning. Both Jyväskylä Polytechnic and the University of Jyväskylä respond to this challenge through a number of ways. Degree education in itself is the route to lifelong learning. In addition, the challenge is met through open higher education and through continuing education. Altogether, the options provided by continuing education and open higher education are versatile and functional. Thus the central target of development is a more efficient utilization of the possibilities opened up through cooperation.

Discussion proposal 10: In order to increase regional effectiveness, closer cooperation between the HEIs should be developed, especially in continuing education and open higher education, and regional targeting should be strengthened. Complementary roles and clarifying the division of labour should form the basis of educational cooperation. *As a concrete measure concerning these functions,*

joining resources and operations by forming one unit or a joint operation network, allowing flexibility and differences between the HEIs, could be considered.

8.3 Strengthening roles in the regional innovation system

A more efficient utilization on complementary roles in the innovation process. HEIs form an important part of the foundation of the innovation system by producing a high level of knowledge in the region. This knowledge base is essential for producing and refining new ideas. In high technology innovation processes, in which basic research and demanding applied research are central sources of innovation, the research of the University of Jyväskylä (total innovations) is one of the main sources of innovations. In innovation processes aiming at continuous, gradual and systematic development of products, services and other business activities (incremental innovations), the Jyväskylä Polytechnic is one of the main players. In innovation projects implemented in the region, the HEIs have more and more tri-party cooperation with firms, in which the HEIs bring in their own expertise. In these processes, the University mainly functions as a source of new research knowledge and expertise. The role of the Polytechnic is mainly that of testing the new knowledge and then applying it in practice. There are good experiences of the complementary roles of the HEIs, for example, in the field of renewable energy. The further development of cooperation and complementary roles opens up the possibilities for benefiting more from synergy in regional effectiveness.

Discussion proposal 11: The complementary roles of the University and Polytechnic in creating and developing innovations should be utilized more widely. In transferring research knowledge into business use (e.g., directly from the projects to the use of firms capable of utilizing it, by mobility of the staff, or by generating new businesses through the incubator process) the HEIs, together with the know-how of the intermediary organizations, offer a good foundation for growth. The joint spearhead projects of the HEIs in the fields of renewable energy and wellness technology produce good operational models that also have wider applications. *Future goals should include raising the profile of these operational models and their wider utilization to support the innovation system.*

Supporting horizontal innovations. As technology and know-how are increasingly emphasized, the significance of traditional competitive advantages decreases and new kinds of innovations and their horizontal utilization become more and more essential. The present trend in development, which is very line-of-business-oriented, is facing a new transition. The boundaries of the traditional lines of business are breaking and the ability to adopt regional, national and global innovations and to adapt them to different functions becomes more essential. The point of view becomes more and more horizontal in its scope. Examples of this kind of activity are Wellness Technology, which combines the knowledge generated in different fields with the applications produced in the ICT field in the more traditional fields of industry. This also sets new challenges for the operation of HEIs. The roles of a pioneer and interpreter of the weak signals of societal change bind the HEIs to become the foremost supporters of creation, development and the application of horizontal innovations.

Discussion proposal 12: It is the task of HEIs to be the forerunners on the road of horizontal innovations. HEIs should more actively seek opportunities to recognize and utilize the potential for the horizontal development of innovations. Concrete openings in this field by HEIs have been, for example, the multidisciplinary operations concept of Agora and the Wellness Technology programme as well as openings in the fields of Nanotechnology and Gerontology. In these fields, opportunities for cooperation with instances outside the Jyväskylä region, for example with the Oulu region, could be mapped. *A way of thinking that supports horizontal innovations should be the starting point in education as well as in basic research and expert services.*

Social innovations. The role of social innovations as the basis of innovations systems together with technological innovations has been widely recognized. In an update of innovation policies concerning the Lisbon strategy, the significance of business model innovations, as well as social and organizational innovations, as sources of growth and employment, is highlighted. For this part non-technological innovations also have been given more emphasis. The update of the innovation policy emphasizes the fact that weaknesses in creating social, organizational and business model innovations have probably had as much an effect on failing to achieve the goals set in the Lisbon strategy as the low level of investments in

R&D work. Thus, the commission emphasizes that, in order to respond to the challenges set by the innovation policy, the knowledge base is a significant factor in producing, adapting and utilizing innovations. In the light of this information, the roles of creating social and organizational innovations and of developing the operational environment should be increasingly emphasized in supporting the creation and development of innovations (EC, 2003). Social innovations might also contribute to the quality of service processes provided by service firms, which further promotes such things as the development of the industrial sector. The HEIs should be able to do their part in promoting the introduction of social innovations to corporate and public sectors. Social innovations present both great challenges and the possibilities for improving the regional effectiveness of the HEIs.

Discussion proposal 13: The role of the HEIs as producers and developers of social innovations should be systematically strengthened. Research and education connected to social innovations is already an integral part of the operations of HEIs. *In the future, operations should be further developed so that an area of study supporting producing or utilizing social innovations would be integrated into the technological innovation processes of the HEIs.*

Innovations increasing the efficiency of the public sector. The ongoing municipality and service structure reforms force the public sector actors to further increase the efficiency of their operations. Increasing the efficiency of operations in an already tight situation requires choices to be made, but it also requires new services to be developed and organizational and product innovations. The HEIs have to face the challenge of increasing the efficiency of operations both within their own organizations and in society (diminishing resources). From the point of view of regional effectiveness, innovations connected to increasing the efficiency of the public sector perhaps form the greatest challenge in the future. Geographical concentration and the ageing of the population, the concentration of businesses, threats connected to environmental problems, and the growing problems associated with (health and) well-being define the tasks, which also the HEIs are expected to participate in.

Discussion proposal 14: New innovations in the public sector are vital to developing the Jyväskylä region in the future. The HEIs are actively working on the development challenge and openings such as the Gerocenter to help in their part to promote the development and application of innovations in the public sector. *This kind of innovative activity will become more and more important in the future's operation of HEIs. Suitable targets are social and health services and environmental and cultural boards due to the fact that both the University of Jyväskylä and Jyväskylä Polytechnic already demonstrate strong expertise in these fields and have already progressed in the desired direction (for example in the Jyväskylä Polytechnic's School of Health and Social Studies). It is also important to recognize the horizontal nature of these innovations. However, also the public sector (e.g., different ministries and sectoral research institutions) should allocate more their fragmented resources for the HEIs through, e.g., national programmes, to enable their efficient operation in this field.*

8.4 The role of expert services in regional development

Meeting customers' requirements. The HEIs have a very important role as the providers of expert services for the corporate and public sectors in the Jyväskylä region. The expert services provided by the HEIs are very versatile, ranging from individual R&D projects designed for organizations to general education and consulting services targeted at firms. Expert services are offered to firms and organizations directly and in cooperation with regional intermediary organizations. When transferring expertise to companies or organizations, whether it happens directly or through intermediary organizations, there are two key factors to consider. Firstly, the expertise must meet the customer's requirements (demand-orientation). Secondly, expertise must be achievable with little effort (accessibility). At the moment both the corporate sector and intermediary organizations think that there is a fair amount of activity in both areas, but, at the same time, that there is still a lot of room for improvement. The R&D work carried out by polytechnics in general is rather new and this is also true in the Jyväskylä region and it takes time to fully integrate it with the operation of firms and other actors.

Discussion proposal 15: To ensure demand-orientation and accessibility, systematic interaction with enterprises is needed, as well as systematic screening of the findings to be used in strategy work (creating a kind of customer relationship management system). The polytechnic has responded to this challenge by establishing advisory councils for different fields of education. Their task is to act as a medium of continuous interaction between the actors. *To form an overall picture of the HEIs' resources and regional needs it might be useful to launch one common regional forum through which the educational needs and feedback on strategy work could be channelled.* In addition to the things mentioned above, ensuring demand orientation probably requires direct inquiries from the enterprises. In this respect, it would quite likely be in the best interest of all parties, that surveys and so forth would be conducted in cooperation with as many of the involved parties as possible. Intermediary organizations would be naturally suitable to compile the reports. Existing systems, such as those connected to anticipation, should also be utilized efficiently. Furthermore, accessibility could be improved by informing intermediary organizations and, through them, the regional enterprises about the expert services provided by the HEIs. As a whole, the basic prerequisite for meeting the needs of firms is a readiness to carry out long-term goal-directed R&D work, which, in turn, requires a change in the operation culture and attitudes of several units of the HEIs.

The utilization of expertise. The regional effectiveness of HEIs is not only a sum of the means a polytechnic or a university has to promote the development of a region. Although a HEI could offer the highest level of expertise for the use of firms and public sectors in the region, it does not guarantee that the expertise would be utilized efficiently. The customers must also be prepared to utilize expertise (the utilization of expertise). In the future, a central challenge in increasing the regional effectiveness of HEIs is how the preparation of the region's small and medium sized enterprises can be increased to such a level that they could utilize the produced excellence.

Discussion proposal 16: New operational models to utilize expertise more efficiently and to increase the preparation of the target enterprises have to be developed. *Utilization of expert services could be increased through tri-party cooperation between the Polytechnic, University and intermediary organizations (for example with the cooperation of customer relation management systems, which might, however, be problematic due to the regulations on confidentiality).* Through cooperation, the expert services could be focused to better match the enterprises' ability to utilize them and, on the other hand, the enterprises' preparation to recognize their own needs.

A holistic approach to enterprises. The problem of research and development work based on projects is, on the one hand, its inability to meet the holistic requirements of the target enterprises and, on the other hand, too small a volume of participating enterprises to create more widespread effects. To increase the effectiveness of development work two basic factors should be adopted – individuality and a holistic approach. Firstly, development work should be able to better recognize the distinct needs within a heterogeneous group of enterprises, in terms of both the objectives and their implementation. Secondly, the starting points for developing enterprises should be holistic. The development work of an individual company should be seen as a holistic process. An individual intervention should be seen as an integral part of a holistic development of the enterprise that aims at responding to the enterprise's changing needs at the different stages of its life-cycle, from the point of view of competence development. Furthermore, the simultaneous development of substance knowledge and business competence produces cooperative effects that further increase the effect of interventions on the competitive strength of enterprises.

Discussion proposal 17: To enable a holistic approach to enterprises and to increase effectiveness, R&D work should be based on large-scale cooperation as often as possible. The Business Departments of the Employment and Economic Development Centres are about to take into use a comprehensive customer management system (ASKO). Its wider utilization possibilities in HEIs, and other intermediary organizations, should also be studied (although the user license probably prevents wider usage of the software. If this is in fact the case, there could also be a need for customer management systems in HEIs). All in all, the division of labour and complementary roles through cooperation should be the principal idea behind the comprehensive development of enterprises and attempts to increasing their effectiveness. *The more actors would participate in cooperation, the more enterprises would be affected. This way it would also be possible to meet the enterprises' requirements more holistically.*

Reducing market failure as the starting point of expert services. Expert services provided by HEIs are often, at least partially, funded by the public sector. Furthermore, HEIs themselves can be considered public sector actors. Based on the aforementioned assumption, it is justifiable to expect that the operations implemented by HEIs fulfil the role set for interventions in the public sector and the reduction of market failure. From the point of view of R&D measures, the role of reducing market failure means that, without intervention, certain services would neither have been made available (the criteria for improving the product selection) by enterprises, nor would the target groups have been able to utilize them because of lack of resources (the criteria of equality). In other words, the prices of services provided should not go below the market price, even though they are supported by the public sector.

Discussion proposal 18: Expert services supported by the public sector should aim at reducing market failure. In practice, this means that the service provided should differ sufficiently from the services provided by enterprises. On the other hand, the service can include development work that raises the unit price of the service and differentiates it from other available services. *Consequently, the role of reducing market failure is best achieved by developing new operational models and services. Reducing market failure significantly increases the regional effectiveness of the measures taken and reduces market distortion, as well as the dead weight phenomenon (effects that would have been created without the support).*

8.5 Concluding words

HEIs have had a strong effect on the development of the surrounding region through the ages and have generally affected societal development. R&D activity has been a natural route for improving and implementing the effectiveness of them. Lately, the operation of HEIs has been raised as a key factor in the development of the information society and great expectations are placed upon HEIs in many areas, especially as a corner stone for economic development and well-being. A natural result of this is the attempt to increase the regional effectiveness of HEIs: societal interaction, regional impact and regional effectiveness as separate entities have gained a special importance. It is important in this context, however, to return to the roots of all the action, and give education and research the credit they deserve as the foundation of societal effectiveness. *Societal effectiveness is based on the knowledge produced and utilized through education and research.*

As a whole, *on the one hand, the HEIs have an effect on the development of the innovation environment and, on the other hand, on the development of the living environment.* The primary means for this to be achieved is the development of knowledge capital (education and research). In addition, the HEIs participate in promoting the development of the competitiveness of enterprises (expert services), the development of the infrastructure and the living environment (architecture and attractiveness) and the content of wellness services (increasing the efficiency and quality) in the region. The interfaces of the aforementioned means are important for increasing regional effectiveness and bringing additional value to the region as a whole.

All in all, the regional development task of the HEIs is still taking shape. This is natural, since the *time period during which the two HEIs have operated in the region is short due to the young polytechnic sector.* In fact, the improvement of the regional cooperation and contribution of the HEIs has been significant in the Jyväskylä region with regard to such a short time span.

Regional development, and with it the regional development task of the HEIs in the Jyväskylä region, has come to a point, where new openings are warmly welcomed. The development in the Jyväskylä region has been noteworthy on both national and international levels since the recession in the middle of the last decade. All of the key actors, including the HEIs, have invested resources into developing the infrastructure and preconditions necessary for development. The past years have, however, brought about a situation, in which the regional actors unanimously agree, that the current policies will not necessarily lead to a desired growth in the economy and well-being in the future. In this situation, new, unexploited measures would also be needed.

The foundation for development exists in the region, but now, appropriate ways to efficiently utilize these developmental tools are needed. *Based on the present views of experts, the most potential openings can be*

achieved by the horizontal utilization of expertise and by the more efficient cooperation of the regional actors. It is crucial to try to cooperate and combine know-how with actors in the different fields in the future. The ability to utilize and apply existing know-how has become more and more important in regional competition. In the game of innovations and competence, it is important to master the whole process, from building the basic factors to bold openings, and to exploiting “scoring chances” efficiently. The aforementioned rule should also guide the actions of the HEIs in the future. HEIs often function in the role of a quarterback on the field of innovation and competence, and this requires an ability to anticipate the game and to build team spirit. An example of this is the strong input of both of the HEIs in the development of wellness technology. The game has just begun on this field also, but the opening has been done and the challenge is to win the game together with the help and cooperation of the other regional actors.

APPENDICES

Appendix 1 Members of the Regional Steering Committee, Working Group and Regional Coordination Team

The Regional Steering Committee comprises of members representing the following organizations:

Chair: *Ossi V. Lindqvist* (Professor Emeritus, Chair of the Finnish Higher Education Evaluation Council),
Kuopio

Jukka Akselin, Managing Director, Jyväskylä Science Park (www.jsp.fi)

Jouni Juutilainen, Regional Development Chief, City of Jyväskylä (www.jyvaskyla.fi)

Anita Mikkonen, Executive Director CEO, Regional Council of Central Finland (www.keskisuomi.fi)

Ritva Nirkkonen, Managing Director, Jyväskylä Regional Development Company – Jykes (www.jykes.fi)

Mauri Panhelainen, Rector, Jyväskylä Polytechnic (www.jypoly.fi)

Kyösti Saarimäki, Chair of the Board, Federation of Finnish Enterprises (regional unit of Central Finland)
(www.keski-suomi.yrittajat.fi)

Ari Saarinen, Counsellor for Education, Ministry of Education (www.minedu.fi)

Aino Sallinen, Rector, University of Jyväskylä (www.jyu.fi)

Uljas Valkeinen, Managing Director, Central Finland Chamber of Commerce
(www.centralfinlandchamber.fi)

The Working Group comprises of members representing the following organizations:

Lea Goyal, EU-Coordinator, State Provincial Office of Western Finland (www.laanhallitus.fi/lansi)

Hannu Korhonen, Director of Planning and Development, Regional Council of Central Finland
(www.keskisuomi.fi)

Eero Suosara, Jyväskylä Polytechnic (www.jypoly.fi)

Toivo Takala, Senior Coordinator, University of Jyväskylä (www.jyu.fi)

The Regional Coordination Team:

Kirsi Mukkala, Researcher, University of Jyväskylä

Jari Ritsilä, Leading Researcher, University of Jyväskylä

Appendix 2 Information on data used in this report

Data gathering

The data was gathered during May-August 2005. The internet-questionnaire was addressed to the faculties of the university and schools of the polytechnic. It was sent to 76 persons (35 persons in the polytechnic and 41 in university) and the total response rate was 75% (86% and 66%, respectively). The questionnaire mapped out the opinions of the HEIs' actors on central themes concerning the self evaluation, namely, (1) starting-points and channels of the regional effects of their unit, (2) geographic dimension of their operations, (3) importance of regional cooperation in their primary strategies and operations, (4) nature and deepness of their interplay with the other HEI of region, business sector and other stakeholders, and (5) proposals for developing the regional linkages in the future.

Deeper information was gathered by personal interviews with the key persons of faculties/schools and separate institutions of HEIs (a total number of interviews was 24) and by discussions with the rectors. Interviews or workshops were organized also with stakeholders of HEIs.

Interviews/workshops:

Ministry of Education/Department of Education and Science Policy:

Erja Heikkinen, Counsellor of Education, University Division
Petteri Kauppinen, Senior Adviser, Science Division
Osmo Lampinen, Counsellor of Education, Polytechnic Division
Markku Mattila, Director, University Division
Tarmo Mykkänen, Senior Adviser, Polytechnic Division
Ari Saarinen, Senior Adviser, University Division

University of Jyväskylä:

Aino Sallinen, Rector

Heikki Hanka, Professor/Vice Dean, Faculty of Humanities
Jukka Heikkilä, Professor/Dean, Faculty of Information technology
Lauri Laakso, Professor/Dean, Faculty of Health and Sport Sciences
Matti Manninen, Professor/Dean, Faculty of Mathematics and Science
Mikko Mäntysaari, Professor/Dean, faculty of Social Sciences
Jaakko Pehkonen, Professor/Dean, School of Business and Economics
Helena Rasku-Puttonen, Professor/Dean, Faculty of Education

Satu Helin, Director, Open University
Jouko Korppi-Tommola, Professor, Nanoscience Center, Renewable energy
Sirikka-Liisa Korppi-Tommola, Research Manager, Research Services
Jarmo Meriläinen, Director, Institute for Environmental Research
Pekka Neittaanmäki, Professor/Director, Agora Center
Anna-Liisa Rassi, Director, Continuing Education Centre
Jari Veijalainen, Senior researcher/Director, Information Technology Research Institute
Jouni Välijärvi, Professor/Director, Institute for Educational Research

Jyväskylä Polytechnic:

Jussi Halttunen, Director of Strategic Development
Mauri Panhelainen, Rector

Hannu Ikonen, Director, School of Cultural Studies
Jyrki Kataja, Director, Institute of Natural Resources
Eila Latvala, Director, School of Health and Social Studies
Annikki Mikkonen, Director, School of Tourism and Services Management
Ulla Mutka, Director, Vocational Teacher Education College
Heikki Saastamoinen, Director, School of Information Technology

Mikko Salminen, Director, School of Engineering and Technology
Asta Wahlgren, Director, School of Business

Regional stakeholders:

Jyväskylä Science Park: Jukka Akselin (Managing Director)

City of Jyväskylä: Jouni Juutilainen (Regional Development Chief)

Employment and Economic Development Centre of Central Finland: Paavo Koukkumäki (Department Director) and Olli Penttinen (Senior Technology Adviser)

Regional Council of Central Finland: Anita Mikkonen (Executive Director CEO) and Hannu Korhonen (Director of Planning and Development)

Jyväskylä Regional Development Company (Jykes): Ritva Nirkkonen (Managing Director)

Organizations promoting entrepreneurship: Federation of Finnish Enterprises (regional unit of Central Finland: Antero Kiviniemi (Managing Director) and Kyösti Saarimäki (Chair of the Board); Central Finland Chamber of Commerce: Uljas Valkeinen (Managing Director) and Jorma Nokkala (Chair of the Board)

Summaries of the results of the internet survey and interviews carried out within HEIs and regional interest groups:

Jyväskylä Polytechnic

Vocational Teacher Education College

Role

The Vocational Teacher Education College offers the necessary teacher training and pedagogical qualification for those who wish to teach at polytechnics or vocational institutions. The college also organizes professional further education for special needs of teachers and study counsellors. The college's continuing education and services include, for example, professional specialization studies, staff training for teaching activities, and a wide range of education by request. The activities of the college are primarily nationally oriented, but the region is also considered an important area of operation.

Starting points and channels of regional effectiveness

The Vocational Teacher Education College sees its role as a significant source of education and an expert of developing know-how in the region. Regional effectiveness is based on strong substance knowledge: the college educates teachers with high pedagogical competence to the region and highly competent work-life trainers to work in companies. Development of educational units has also been tightly integrated into the operational models of the college. Students' working life experiences and networks, and competent teachers form an important resource of regional effectiveness in the Vocational Teacher Education College.

The college aims to regionalize its operations so that it would become more customer-oriented. It interacts with local actors through for example various steering groups. Utilizing students' skills on R&D work in a more systematic way is considered an important area of development. It is also fundamental to promote the visibility of results and reports in the region. In assessing the regional influence, the difficulty of recognising and measuring the indirect effects the college has on the region are experienced problematic.

Regional co-operation and the division of tasks

The Regional Council of Central Finland is an important partner of the college from both an operational and financial point of view. The college co-operates also with municipal education and training consortiums and the State Provincial Office of Western Finland. There is no significant co-operation with the enterprises in the region at the moment, and the co-operation is not expected to increase in the next years either.

The Vocational Teacher Education College co-operates with the educational institutions in the region of Jyväskylä (teacher training, continuing education, project work), but there is no tight co-operation with the University of Jyväskylä. The competition between these two educational institutions is seen as a problem. Instead of thinking of the other institution as a resource, it is seen as a threat, which hinders the development of co-operation. The most significant opportunities for co-operation between the polytechnic and university are connected to international project work through synergistic partnerships. As a whole, the co-operation

and finding synergy between the other educational institutions and actors in the region are considered important and necessary for the future (for example in the search of funding).

Areas of strength and prioritising of activities

As promising areas of development the Vocational Teacher Education College sees further development of teacher education and investments in recognising and giving recognition to university and polytechnic level competence. It is also important to secure the education of competent teachers for polytechnics.

School of Information Technology

Role

The School of Information Technology provides degree education in engineering, professional specialization studies and continuing education in the ICT field. It also carries out research and development activities for industry and business. The main operation area of the school is the Jyväskylä region.

Starting points and channels of regional effectiveness

The school has a significant effect on employment in the region as approximately 80% of the students find job in the region after graduating. Active work in regional networks and advisory boards binds the school tightly to the Jyväskylä region. The possibility for students to carry out their practical training and graduating thesis projects in local enterprises or in co-operation with them also increases knowledge and awareness about the activities and know-how of the school.

The international student exchange in the region should be increased and its significance for internationalization of enterprises should be emphasized. The aim is also to further develop the teachers' knowing how of working life by providing them opportunities to work part-time in projects (for part of the year). From a financial point of view, it is considered necessary that projects became more lucrative. Moving of jobs and large enterprises away from the region is considered the biggest threat in the future.

Regional co-operation and the division of tasks

The School of Information Technology has co-operation with the region's public actors (e.g., the Regional Council of Central Finland) and intermediary organizations (e.g., Jyväskylä Regional Development Company Jykes Ltd. and Jyväskylä Science Park) in team and strategy work and funding. The school's co-operation with the region's enterprises consists of planning of teaching and education, graduating thesis projects and shared use of equipment. In the future, the project work with regional enterprises is considered more and more important, because it would increase possibilities for continuing and direct funding from companies.

The School of Information Technology has good relations to the Faculty of Information Technology of the University of Jyväskylä. The division of tasks is based on open co-operation between the institutions and on avoiding overlapping activities. The university's role is to focus on high-level research, whereas the role of the polytechnic is to conduct applied research. Good personal level contacts also support the co-operation with the university. Jointly organized R&D projects and certain study modules could provide an opportunity to further deepen the co-operation.

Areas of strength and prioritising of activities

The School of Information Technology has five specialization options: electronics, software engineering, media technology, network technology, and automation technology. The last two fields are emphasized more than the others. The possibilities in the field of mobile phone technology and co-operation with the field of health and social care are seen as important areas of development in the future (integration of technology and nursing). Continuing education in the field of automation technology is also thought to be important for the region. Recourses are still being used to keep the electronics field up to date within the school, but if the field becomes any less important in the region, the resources will probably be allocated elsewhere.

Role

The School of Cultural Studies educates professionals for the fields of music, clothing, and communication, and also carries out cultural development projects in the Jyväskylä region and Central Finland. The aim of the field is to build a creative, affluent society.

Starting points and channels of regional effectiveness

The importance of the cultural field for regional development is more and more stressed. Together with the Regional Council of Central Finland the School of Cultural Studies aims to promote Central Finland as an operator of creative industry, and even turn culture into an export product. This is contributed by active project and development work in the region. Regional effectiveness could also be increased through cultural entrepreneurship. This, however, requires developing new forms of support activities, especially for product development and commercialization.

Active participation of the school's staff in networks increases regional effectiveness significantly. However, the mechanisms to exploit the existing networks efficiently enough are partly lacking. The biggest obstacle of increasing regional effectiveness of the school is the scarce resources in the field of education, which is also a threat to the future development.

Regional co-operation and the division of tasks

The most important partners in the region are other educational institutions and the Regional Council of Central Finland. The co-operation with educational institutions focuses mainly on education. The School of Cultural Studies and Regional Council of Central Finland invest resources in developing the creative field through shared projects. The school has also co-operation with small firms in the region (not very significant yet). The aim is to deepen the co-operation with regional businesses by approaching them from their starting points.

The School of Cultural Studies has active co-operation with the University of Jyväskylä in education and project activities. Especially, in the field of media the division of tasks is clear and works well. Co-operation in the field of music has developed very positively, as well; the major collaborative project on this field called Finnish Music Campus is reaching its aims and the co-operation for future is going to be agreed soon. The Eino Roiha Foundation will act as a collaborative regional centre of Applied Research and Development in Music between the Polytechnic and University. The School of Cultural Studies is committed to act according to the new Regional Strategy of HEIs of Central Finland. However, the co-operation in all areas can still be developed better and therefore it would be necessary to define the fields of operation of both institutions more clearly. Furthermore, adjusting different practices and educational structures together and getting people committed, as well as creating the right kind of intent, causes practical difficulties between the higher education institutions. Further opportunities for collaboration with the university could be provided for example by connecting the university's basic research with the polytechnic's applied development work, joint graduation thesis projects and guidance of students, inviting visiting experts, and by co-operative marketing. Increasing co-operation with the university could strengthen the region's appeal and support prioritizing of activities of both institutions.

The School of Cultural Studies is planning to focus its regional development actions with all collaborative partners to a centre of expertise of Creative Industries.

Areas of strength and prioritizing of activities

The field of excellence of the school is classical music and the promising field of the future is the combination of music and media. Developing the creative field is considered important both regionally and nationally. In the future it is crucial to integrate closely with the other fields and to be open to the new opportunities they provide.

School of Business

Role

The School of Business provides versatile opportunities for students to become experts in the field of business. There are three degree programmes: business administration, business information systems, and international business which is taught in English.

Business expertise is the key factor to the success of regional enterprises. Thus, the role of the School of Business in producing know-how and developing the opportunities for the businesses in the region is considered crucial. Activities of the school are strongly regionally oriented.

Starting points and channels of regional effectiveness

The regional effectiveness of the School of Business Studies is based on strong substance knowledge and tight regional networks. A large part of the graduated students finds job in the region. Connections to working life are part of the education from the very beginning and graduation thesis projects with regional enterprises are emphasized. However, students' integration to R&D work could still be strengthened.

The R&D work at the School of Business is still at an initial phase and the mechanisms to fully exploit the know-how are still lacking (product management). The scarce personnel resources also partly decrease the unit's capability to react quickly to the needs of the region.

Regional co-operation and the division of tasks

The School of Business has co-operation with the region's public actors and intermediary organizations (such as the Regional Council of Central Finland, State Provincial Office of Western Finland, enterprisers' associations, Jyväskylä Regional Development Company Jykes and Jyväskylä Science Park). The co-operation includes funding, project work, education and expert exchange.

The school has also co-operation with large businesses in the region, and with many small and medium sized enterprises. Participation in joint development projects with enterprises and co-operation in practical training and graduation thesis projects are important forms of co-operation. Co-operation with enterprises could be increased especially in research.

Although there has not been much co-operation with the University of Jyväskylä, it has generally gone quite well. There are possibilities for wider co-operation, but it is not actively promoted at the moment. It is necessary to clearly differentiate the fields of operation of Jyväskylä Polytechnic's Schools of Business and the Faculty of Business and Economics of the University of Jyväskylä to avoid competition and to be able to combine the areas of strength of both institutions in an effective way.

Areas of strength and prioritising of activities

In addition to trained and competent staff (especially in financial management and internationalization), the strengths of the School of Business include the creation of the concept of the Team Academy (pedagogical innovation) and interdisciplinary orientation (e.g. PBL applications). Promoting knowledge intensive services and supporting regional growth entrepreneurship are considered promising areas of the future.

From the point of view of prioritising of activities, the operations of the School of Business are too wide and fragmented. One of the most topical matters to think about is where to invest resources so that competitiveness could be maintained and increased. Because of future's changes in the distribution of resources, the annual intake quotas of students may have to be transferred between the fields of education within the School of Business.

Institute of Natural Resources

Role

The Institute of Natural Resources is Jyväskylä Polytechnic's unit within the field of natural resources, located in Saarijärvi. In addition to the educational task half of its budget is allocated to the R&D activities. The aim of the institute is to generate new innovative business activities in the rural areas. The fields of expertise of the institute are bioenergy, management of the rural environment, and business competence of

agriculture and rural industries. The Institute of Natural Resources works on the whole rural area of Central Finland. Approximately 20% of its activities take place in the Jyväskylä region.

Starting points and channels of regional effectiveness

The regional effectiveness of the institute is strongly based on high-level knowledge concerning the rural environment. The Institute of Natural Resources has participated in the preparation of regional programmes using community planning methods (village plans, regional development programmes and provincial programmes and strategies). In the planning of project work, it is considered essential that the projects are based on regional needs (e.g., with a help of a group of enterprises).

However, the Institute of Natural Resources is a small unit that is vulnerable against failures and risks involved in regional development. Furthermore, there are not necessarily enough resources for anticipation of changes and to react to them. Deepening and extending of the ongoing cooperation with VTT, the University of Jyväskylä, and the other regional, national and international partners would be a crucial step to overcome these weaknesses.

Regional co-operation and the division of tasks

The institute's co-operation with enterprises consists of applied research, graduation thesis projects and consultation services. The institute also co-operates with other actors in the field of bioenergy (for example VTT, Jyväskylä Science Park, power plants, engineering offices) and participates in the BENET (bioenergy) network. In the fields of rural entrepreneurship and agriculture, the Rural Department of the Employment and Economic Development Centre of Central Finland and the agricultural entrepreneurs of the region have been important partners. In this area co-operation connected to the professorship of rural entrepreneurship of the University of Jyväskylä might provide new openings. In the field of environmental planning there has been co-operation with the municipal authorities and citizens as well as with the Central Finland Regional Environment Centre and the Institute for Environmental Research of the University of Jyväskylä.

So far, the cooperation with the University of Jyväskylä is mostly based on personal relationships, joint projects, and sometimes also on teaching. Guidance of graduating thesis and creation of new networks would provide more opportunities for increasing co-operation with the university. According to the Institute for Natural Resources, it is essential to agree on a clear division of tasks allowing an effective combination of the areas of strength of both institutions.

Areas of strength and prioritising of activities

Bioenergy and its applications are promising fields of spearhead research in the region. Future challenges in the rural areas include sustaining basic agriculture, developing micro enterprises (IT technology, networking and logistics management) and implementing new IT and other technologies. Focusing of activities is important for the operation of a small unit.

School of Tourism and Services Management

Role

The purpose of the School of Tourism and Services Management is to develop business activities of their areas of expertise both through the provision of education and through versatile services for working life. The fields of strength include tourism and hospitality, facility management, and consumer services. In addition to a wide range of educational services, the research and development activities are continuously expanding.

Starting points and channels of regional effectiveness

A central goal of operation is the creation of international, national and regional networks. The degree programmes and the R&D activity of the school are tightly connected to regional development work. The school's active contribution to the regional development also connects the students to the development work of industry and commerce. One of the services provided by the school is the MARA Business Clinic. Clinic's educational and consulting services are provided by the internal and external experts of Polytechnics in cooperation with students. The business clinic has proven to be a flexible and fast operational model that, e.g., supports meeting the regional needs of continuing education.

The challenge of the school from regional point of view is to promote the visibility of its operations in the region. This requires extending the knowledge base to be applied in new fields. Bringing international expertise and innovations to the region is also essential. Future's threats to regional development activities include scarce resources and the difficulty of finding new financial sources.

Regional co-operation and the division of tasks

The most important regional partners providing funding are the Employment and Economic Development Centre (Rural Department), Regional Council of Central Finland and State Provincial Office of Western Finland. Other important partners include regional enterprises, the City of Jyväskylä, municipalities, advisory organizations and regional intermediary organizations. Co-operation with enterprises focuses on project activities, education and consulting. Students' practical training and graduation thesis projects in regional enterprises are strongly emphasized at the school. The school's co-operation with the intermediary organizations includes development of enterprises, co-ordination of services and international issues. The aim is to create an efficient international supporting network also for the polytechnic master's degree.

The co-operation with the University of Jyväskylä has been fluent. The Faculty of Sport and Health Sciences of the University cooperates with the tourism branch of the school and the division of tasks between the institutions has been clear. In the field of e-business the school has co-operated with the IT field of the university. As a part of the degree education has been carried out projects in which the university students have done the basic work and the students of the polytechnic have been responsible for the applied part of the project. New models for continuing education implemented together with the university could provide an opportunity for deepening the co-operation. Some co-operation connected to the university's professorship in rural entrepreneurship has also been planned.

Areas of strength and prioritising of activities

The spearhead field of the school, tourism, is a challenging field from the regional point of view, but also a great opportunity. Wellbeing tourism and catering services connected to it are promising fields of development in tourism. This requires competitive R&D work and exploitation of the consumer know-how.

The school participates actively in the operation of the Finnish Networked Centres of Expertise (the food industry, tourism networks), that have also significant regional effects. The Centre of Expertise of the food industry provides education and development services to the whole food-processing chain from agricultural enterprises to industrial enterprises. The national Centre of Expertise for Tourism consists of four areas of expertise which are localized through four regional focal points. The Jyväskylä Polytechnic is the body responsible for wellbeing tourism. The Networked Centres of Excellence provide a forum in which to build co-operation between enterprises.

School of Health and Social Studies

Role

The graduates of the School of Health and Social Studies are experts in wellbeing. The School provides a qualification for the professions of physiotherapist, rehabilitation counsellor, midwife, nurse, dental hygienist, public health nurse, occupational therapist, and social services. The School offers also the opportunity to professional specialization studies, continuing education and to complete a Polytechnic Master's Degree in Health Promotion. The operation of the school is primarily regionally oriented, and the regional effectiveness of the school is based on education and substance know-how. The operation of the school's centre of expertise in the field of sexual health is mainly nationally and internationally oriented but it has a regional aspect as well.

Starting points and channels of regional effectiveness

Networks created through regional projects and a close co-operation with the public sector and other regional employers are the strengths of the school. Probably, the most challenging task has been to integrate the regional orientation and entrepreneurial R&D activity into the staff's thinking, which has, however, gone well.

Regional co-operation and the division of tasks

Public sector actors such as the Central Finland Health Care District, social and health services of the City of Jyväskylä and other municipalities in the region, and the Central Finland's Centre of Expertise in Social Field (KOSKE) are important partners of the school. The co-operation includes joint development projects connected to service activities, students' graduation thesis projects and co-operation in practical training and education. The Regional Council of Central Finland and State Provincial Office of Western Finland are significant partners in funding and strategy work. Regional co-operation with enterprises does not have a significant role in the operation of the school at the moment, but the co-operation is expected to increase.

The co-operation with the University of Jyväskylä varies between the different fields. Especially in the social field, instead of having synergetic and constructive co-operation, the educational institutions are been involved in a partly competitive situation. The Gerocenter and location of the unit of the National Research and Development Centre for Welfare and Health (STAKES) to Jyväskylä will provide new opportunities for co-operation between the polytechnic and university, and an opportunity to join their limited resources. This means that the division of tasks should be clarified so that the university focuses on basic research, while the polytechnic concentrates on applications. Co-operation requires trust and openness between the institutions.

Areas of strength and prioritising of activities

Solid educational know-how is the foundation of the school. Polytechnic master's degree provides an opportunity for developing working life, knowledge base and innovations in the future. The promising areas of regional development comprise of, e.g., developing customer-oriented methods and health impact assessment integrating preventive way of thinking of decision-makers, utilising of information networks (e-welfare), networked learning environments and internationality. From the entrepreneurial perspective, the health and social care is a new, developing field and it offers many opportunities. New service products and developing working methods are in a key position.

Increasing funding by extending the project activities is almost necessary to secure the future of the school. This requires changing the curriculum so that it allows more opportunities for the active regional development work.

School of Engineering and Technology

Role

The School of Engineering and Technology provides bachelor's degree education in engineering and laboratory sciences, master's level and further education, research and development services, and educational, expert and laboratory services. Jyväskylä Polytechnic's is the most popular school of engineering in Finland if measured by annual number of applicants.

The activities of the school are nationally and regionally oriented, but it is also a strong actor at the international level. According to the vision of the school, the regional effectiveness is achieved through national and international competitiveness.

Starting points and channels of regional effectiveness

The core competence of the school is closely connected to regional development. The main part of the staff is able to create networks and work at the interface of regional development. The location of the Jyväskylä region, network of regional actors and the large enterprises in the region provide excellent preconditions for the operation of the school.

Regional research and development projects provide a foundation for strengthening the school's competence and activities, for expanding the networks and for deepening co-operation with enterprises. The expertise of the school is already widely recognized in the region.

Regional co-operation and the division of tasks

Of the regional intermediary organization, co-operation aiming at developing projects and services has been carried out with the Jyväskylä Regional Development Company Jykes Ltd. The role of the polytechnic has been to produce substance knowledge, while Jykes has concentrated on marketing, communications and financial transactions. Co-operation with the Jyväskylä Science Park is concentrated on projects of

developing wellness and environmental technology. With the Regional Council of Central Finland the school has co-operation concerning regional development strategies. Other important partners in the region are VTT (paper technology), and the large corporations Metso and Valtra.

In co-operation the primary task of the school is to adapt expertise into the enterprises' needs and to anticipate and recognize needs of the operational environment. Graduation thesis and R&D projects function as instruments of the activities. The enterprises' readiness to utilize the expertise of the school is rather good, especially in the educational field.

The co-operation with the University of Jyväskylä has reached a point in which both parties are unanimous about the roles and strengths of their own. The role of the university is to conduct basic research, and the role of the polytechnic is to create applications for the use enterprises. The co-operation has included, e.g., sharing laboratories and equipment and joint projects (for example innoroad and WDL). The aim is to further develop the co-operation, and bioenergy is seen as a promising field.

Areas of strength and prioritising of activities

The regionally and nationally important paper field and logistics are the school's fields of excellence. Bioenergy and wellness technology are considered promising fields of the future, and many regional actors are tightly connected to their development. Construction and laboratory field are also important and their existence has to be secured. All fields invest in R&D, service activities and internationalization. The Innoroad, a cluster of expertise in road traffic, is an important project from the regional point of view.

University of Jyväskylä

Faculty of Humanities

Role

The Faculty of Humanities is the largest faculty at the University of Jyväskylä with over 4 000 students. The faculty includes departments that conduct education and research in languages and communication, culture, arts and music, and history. Activities of the faculty are mostly nationally oriented.

Starting points and channels of regional effectiveness

The tradition of independency typical to universities has caused the faculty to have little interaction with the region. The structures and attitudes have changed, however, and regional and societal effectiveness is today seen as an integral part of faculty's education and research. Changing of the regional and national competitiveness base from technological to contentual and thus also to a more humanistic direction is considered an opportunity in the faculty.

Regional co-operation and the division of tasks

The co-operation between the faculty and regional intermediary organizations has included activities connected to expertise (working groups) and regional funding. Co-operation with firms is mainly based on personal contacts of the staff and it has included educational and expert services provided to enterprises. The problem from the point of view of the faculty is the unfavourable business structure and the small size of the region, which prevents the enterprises from efficiently utilising the know-how of the large faculty. However, the regional co-operation could be strengthened by increasing interaction and by creating closer networks with regional actors.

A few fields within the faculty have educational co-operation with the Jyväskylä Polytechnic and other educational institutions in the region. There is a spearhead project dealing with cultural communication and technology that connects the faculty and the polytechnic.

According to the faculty's view, tightening the co-operation between the university and polytechnic could result in a uniform and efficient regional cluster of education. Developing co-operation in applying new technology is potential field as well. In such co-operation the polytechnic would provide technological solutions and the university would produce the content. Generally, it is considered important that both institutions recognize their own areas of expertise and strength, and combine these functions in an efficient way.

Areas of strength and prioritising of activities

Two Centres of Excellence in Research nominated by the Academy of Finland operate within the faculty: the History of Mind Research Unit (2002 - 2007) and the Research Unit for Variation and Change in English (2006 - 2011), both co-hosted with the University of Helsinki. Combining culture and technology provides promising opportunities in the future.

The wide variety of subjects within the scope of the faculty includes also fields that are not profitable, but they are indispensable from the national point of view. However, the focuses of the content of different subjects could be changed if needed. In the future, the faculty aims at increasing the efficiency of continuing education and directing the topics of graduating thesis more towards themes that are also regionally important.

Faculty of Information Technology

Role

The objectives of the Faculty of Information Technology are: (1) to train high-grade professionals of information technology in co-operation with the other fields of study, (2) to provide professionals working in other fields with basic skills in using and managing computing, (3) to carry out research of internationally high quality in selected fields of expertise and (4) to participate in development and transfer of technologies in Finland. The operation of the faculty is based on tight national and international co-operation and on intent to build wide connections to business life. It pays a special attention on regional co-operation and educational challenges set by the structural change in Central Finland and by diversification of the business sector. The faculty has had a great effect on development of the IT field in the region. Currently, approximately half of the activities of the faculty are directed in the Jyväskylä region.

Starting points and channels of regional effectiveness

The faculty has a wide operational network in the region of Jyväskylä and regional orientation is an integral part of its operation. Regional effectiveness is achieved through education and research activities and the substance knowledge they produce. On the other hand, the faculty has been forced to participate in certain regional development activities that do not serve its own purposes, but tie a great amount of resources. According to the view of the faculty, the potential of multidisciplinary operation is not fully understood and exploited in the region.

Regional co-operation and the division of tasks

Of the intermediary organizations of the region, the Jyväskylä Science Park is the most important partner of the faculty. The co-operation includes R&D projects, strategy work and networking. The faculty has also much co-operation with enterprises in the region through planning and implementing different R&D projects. The readiness of enterprises in the region for utilizing the faculty's know-how is good, although the communication could be increased. A possible future threat is that enterprises that conduct relevant scientific spearhead research and have interesting research topics will move away from the region of Jyväskylä.

The division of tasks between the Faculty of Information Technology and Jyväskylä Polytechnic is getting clearer. The faculty participates only in regional development activities that include research, while the polytechnic focuses on applications. There is no significant co-operation with the polytechnic at the moment, but the amount of co-operation is expected to increase. The two-tier degree structure opens new possibilities for co-operation between the university and polytechnic. From the point of view of regional development, the most important thing is to define the relations between the different actors in order to clarify the field of operation.

Areas of strength and prioritizing of activities

Scientific computing and its technical applications are internationally strong fields of study at the Faculty of Information Technology. The role of research in the operation of the faculty is essential.

Faculty of Education

Role

The Faculty of Education represents the traditional roots of the university, namely the teacher training college founded in 1863 at Seminaarinmäki. The focus of research is on the life span development of a human being from early childhood education to educational gerontology. The faculty is concentrated strongly on education, especially teacher education (large volumes of students) and its operation is mainly directed by national needs.

The educational and pedagogic views of teacher education cover many fields. In teaching, the practice and theory are tightly integrated together. Most of the students stay in the region after their graduation, which means that also the region benefits from the competent labour force available.

As a result of putting a strong emphasis on education, there is relatively less research activity at the faculty but the research is focused on areas of importance, such as workplace learning and pedagogic development work. The aim is to gradually increase the emphasis on research.

The regional role of the faculty is not quite clear and regional orientation has not been very active or systematic due to lack of resources. Thus, the aim is to find a balance between education and research first, and then focus more on regional activities. It is clear, however, that the national and regional functions support each other, and could create new opportunities.

Starting points and channels of regional effectiveness

The most significant channel of regional effectiveness is the employability of competent teachers in the region, and to sustain their know-how. Regional effectiveness of the faculty could be increased by allocating more resources in development projects carried out together with the schools of the region. These projects benefit not only the schools, but also the students and the staff of the faculty. Continuing education could also be further developed and regional needs could be mapped through joint development projects with regional actors.

Regional co-operation and the division of tasks

Most of the faculty's partners represent the public sector as the most important ones are the City of Jyväskylä and other municipalities in the region, and instances organizing the services of the public sector (for example social and educational administrations). Co-operation includes continuing education and practical training of students, among other activities. The faculty does not have much co-operation with enterprises or intermediary organizations in the region, and the co-operation is not expected to increase in the next years.

There has not been much co-operation with the Jyväskylä Polytechnic either. However, the co-operation might be fruitful in some fields, for example through co-operation projects or joint study modules (focused on vocational aspect).

Areas of strength and prioritising of activities

Prioritising of activities is considered important and necessary, and it forms a foundation for strategic decisions in the faculty. The faculty defines prioritising of activities *as learning to be an expert in the field of education*. Sustaining life-long learning through for example adult education and training is a growing field in the future. Nationally important fields that have to be secured include early childhood education, teacher education and special education. As generations get smaller, resources can be re-allocated from teacher training to continuing education. It is hard to remove any fields of activities entirely, but new operational models can be created instead.

Faculty of Sport and Health Sciences

Role

The Faculty of Sport and Health Sciences at the University of Jyväskylä is the only university level institution in Finland educating experts in the field of sport. The central tasks of the faculty are to train high-level experts of sports and health sciences for different areas of society, and studying and developing the

sport and health culture by producing, compiling and sharing information needed in planning and implementing them.

Starting points and channels of regional effectiveness

Professional orientation of teaching and implementing the education partly in co-operation with regional actors binds the operation of the faculty to the region (built-in effectiveness), although it has a strong role as a national and international operator as well. The faculty also provides services to the region. Balancing between basic functions (education and research) and regional effectiveness, and sharing resources between them are experienced challenging.

The faculty emphasizes scientific research that does not aim at technological applications and product development. Applied research is mainly conducted in co-operation with research units locating in the region (the Foundation for Sport and Health Sciences and Research Institute for Olympic Sports), although generally their role is more national and international than regional. In the future, existing multidisciplinary research activities and more applied research would provide many opportunities in the region, for example in wellness technology.

Ageing of population enables developing the field of gerontology. A facility called Gerocenter is currently being founded. If it will become a success, it might provide many opportunities for research and development supporting regional co-operation. There are also great expectations for the cooperation with the unit of the National Research and Development Centre for Welfare and Health (STAKES) established recently in the region of Jyväskylä.

Regional co-operation and the division of tasks

The faculty has regular co-operation with the regional public sector and third sector actors. The most important partners are the City of Jyväskylä and the instances organising the public services. The faculty has had significant co-operation also with the Jyväskylä Science Park for instance in the field of wellness technology (WDL, Viveca). The science park has had an activating effect especially on creation of networks. Regional co-operation with enterprises has been random. Direct contacts to enterprises have been created mainly through offering them services. There is a clear need to organize more systematic co-operation with enterprises.

Co-operation with the Jyväskylä Polytechnic has been based on clear division of tasks, so that the polytechnic has carried out testing and other applications. Co-operation could be increased, for example in the field of health sciences, with the support of Viveca concept.

Areas of strength and prioritising of activities

Gerontology is a promising area of excellence at the faculty and its role can become significant in the region. Productization of research and increasing co-operation in the region are growing areas. The functions of the faculty include many nationally significant small fields that are unprofitable but, however, indispensable. In prioritising of activities, the faculty emphasizes the importance of re-allocation of resources.

Faculty of Mathematics and Science

Role

The faculty provides education and research in mathematics, science and their applications. The faculty has established a strong position in the region, because of its long history (it was founded in 1965). An applied sciences project that mapped regional needs (including the decision-makers of municipalities and industrial enterprises) was launched in 1989 in the region. The effects of the project can still be seen in the present activities (e.g. networks). However, the faculty aims to emphasize scientific research, which does not typically serve firms and industries directly. Excessive regional orientation is thus considered a threat to basic research.

Starting points and channels of regional effectiveness

Regional effectiveness of the faculty is based on its core functions - education and research. The faculty carries out research projects in co-operation with regional operators. Often students' graduation theses are also connected to these projects. Students' employment into regional enterprises through practical training

and/or graduation thesis is a significant chain of regional effectiveness. The faculty keeps close contact with the actors in the region also when starting new functions, and organizes collaboration meetings to map out ideas and opinions of different actors.

Regional co-operation and the division of tasks

Of the intermediary organizations in the region, the faculty has co-operation with the Jyväskylä Science Park. The wide co-operation includes establishing start-up enterprises (incubator activity) and activities connected to funding and communication. According to the view of the faculty the role of intermediary organizations should be emphasized more already in the initial phases of an innovation process as the university's task is to create a good educational foundation and environment for creating new innovations.

The readiness of region's enterprises for utilising the research expertise of the faculty are fairly good and large enterprises (like Metso and Nokia) in the region consider the faculty to be a potential partner. The Jyväskylä unit of the Technical Research Centre of Finland (VTT) is also a significant research partner of the faculty.

Co-operation with the Jyväskylä Polytechnic has worked quite well, especially in the field of paper technology (applied physics and chemistry), electronics and environment (renewable energy). The roles of the university and polytechnic in the region have become clearer and healthy competition is considered a positive thing in the faculty. Co-operation with the polytechnic is expected to increase in the future.

Areas of strength and prioritising of activities

Almost all fields of study in the faculty (mathematics, physics, chemistry, and biology) are its areas of strength. One of the promising fields of spearhead research, from both national and international points of view, is nanoscience. Its development, however, requires long-term work and patience. From the regional perspective, renewable energy is also a promising field that enables wide co-operation with regional actors.

School of Business and Economics

Role

The Faculty of Business and Economics provides education based on high-level research in business (including management and leadership, accounting, marketing and entrepreneurship) and economics. Research focuses on the evaluation of business, organizations and labour market, and understanding their functions as a part of the society.

The Expert Division unit functioning within the faculty carries out the societal service task set on universities. Its areas of expertise are effectiveness and evaluation research and regional economic and business research. The unit's task is to produce and transfer research knowledge that serves the society.

Starting points and channels of regional effectiveness

Regional effectiveness of the faculty is mainly based on education as annually 20-40 of graduated students find a job and stay in the region. The faculty is small and thus its scarce resources and relatively narrow knowledge base limit the regional orientation of activities. Education in business and economics has, however, a long tradition in the region and considering the small size of the faculty, it has good networks with the region's businesses and the public sector.

Regional co-operation and the division of tasks

The faculty has co-operation with the public sector and intermediary organizations of the region, but the co-operation is not systematically organized. The most important partners are the Regional Council of Central Finland (various joint development projects) and State Provincial Office of Western Finland (educational projects). Co-operation with enterprises consists mainly of students' graduation theses. The most important partners among enterprises are Metso and Valtra. A new field in the faculty is rural entrepreneurship which aims to create close connections to regional business life and provide students an opportunity to integrate with the enterprises (creating contacts, graduation thesis, etc.) already during studies. As a whole, the co-operation with enterprises is expected to increase in the future.

The co-operation with the Jyväskylä Polytechnic has not been very significant so far. A clear division of tasks between the university and polytechnic is a prerequisite for increasing co-operation in the future. The field of renewable energy could provide opportunities for deepening co-operation with the polytechnic as well as with the other actors in the region.

Areas of strength and prioritising of activities

At the moment, the faculty performs well at the national level, and it is important to ensure the quality of basic education and research also in the future. To achieve the international level of expertise the volume of the faculty should be increased so that there would be enough critical mass. Prioritising of activities and finding synergy (common themes) between the different fields of study within the faculty present challenges. More resources will be allocated to the post-graduate (doctoral) education of the faculty and as a part of that process, the Expert Division unit operating within the faculty aims at integrating post graduate education more tightly in its operation.

Faculty of Social Sciences

Role

The Faculty of Social Sciences of the University of Jyväskylä is an educational unit specialized in psychology and social sciences. Its aim is to promote and conduct high level research and education in all fields of the faculty. The faculty produces socially relevant research knowledge and provides expert services based on multidisciplinary research and education. The activities of the faculty are mainly nationally and internationally oriented.

Starting points and channels of regional effectiveness

Because regional activities tie a lot of human resources, the general principle of the faculty is to participate only in regional activities which generate real value added to their own operation. The faculty has strong regional networks and the staff has a positive attitude towards regional co-operation. The regional commitment varies between the different subjects taught in the faculty. Social work, sociology, social gerontology and cultural politics co-operate most actively with the regional actors and their research is directed toward the region. The regional effectiveness of the Department of Psychology is channelled through the Research and Training Clinic in Psychotherapy, which offers a service otherwise not available in the region. In certain subjects, more work could be done in the field of applied service research in a way that would benefit both students (graduation thesis projects) and actors in the region.

Social innovations are seen as a great opportunity in the faculty. A regionally important form of activity connected to this is the Social Innovation Forum in Agora Center. The idea is to produce social innovations, which could be exploited regionally and nationally, in co-operation with different actors.

Regional co-operation and the division of tasks

The field of social work is strongly regionally oriented and works in close co-operation with the Central Finland's Centre of Expertise in Social Field (KOSKE), the City of Jyväskylä and the municipalities of the region. Psychology, which is mainly nationally oriented field of study, works in close research co-operation with the Niilo Mäki Institute located in Jyväskylä. The location of the unit of the National Research and Development Centre for Welfare and Health (STAKES) in Jyväskylä provides an opportunity for new regionally and nationally significant openings.

The faculty has joint development projects and co-operation in organizing work based learning of the students with the City of Jyväskylä and other municipalities of the region. There is also some co-operation with the instances organizing the services of public sector. The cooperation with firms has been minor and its role is not expected to increase. There has not been any significant co-operation with the intermediary organizations of the region either.

Co-operation with Jyväskylä Polytechnic has not started in a desired way despite many efforts. Differences in the administrative structures of the two institutions are seen as a major obstacle to co-operation. In certain subjects co-operation with polytechnic could include joint research projects and education focusing on special issues. Launching of the polytechnic master's degree education is seen as an opportunity for a closer interaction.

Areas of strength and prioritising of activities

A Centre of Excellence in Research (Human Development and its Risk Factors) nominated by the Academy of Finland operates currently within the faculty and two new Centres of Excellence (Learning and Motivation, and Political Thought and Conceptual Change) have been nominated for the years 2006–2011. However, at the regional level the significance of the Centres of Excellence is small. Social work, on the other hand, can be considered a promising field from regional perspective.

Open University

Role

The Open University of Jyväskylä is the largest institution providing open university education in Finland. It is a separate institute of the University of Jyväskylä which aims to ensure an opportunity for life-long learning for everyone regardless of age, educational background or place of residence. The operation of the Open University is partly bound to follow the curriculum set by the university. The education provided covers basic and subject studies, and language and communication studies. Teaching is also organized at the Helsinki unit and in approximately 140 educational institutions around Finland. Research is not part of the operation of the Open University.

Starting points and channels of regional effectiveness

The Open University is nationally oriented and regional projects are not part of its tasks, even if it would be capable of implementing them. The regional effectiveness of the Open University is based on sustaining the knowledge resources of population. More resources could be allocated for offering educational services to organizations. For instance, the Open University has negotiated with the City of Jyväskylä and some other municipalities of the region about how the Open University could assist in the career planning of the organizations' staff.

Regional co-operation and the division of tasks

The co-operation with the regional intermediary organizations (Jyväskylä Regional Development Company Jykes Ltd.) and the public sector organizations (Employment and Economic Development Centre and Regional Council of Central Finland) has been concentrated on common strategy and scenario work. The Open University has no significant co-operation with firms in the region. However, the co-operation is expected to increase in the future as studies change from science-based towards a more user-oriented direction. All in all, enterprises and other potential customer organizations need more information about the possibilities the Open University can provide for the development of their organizations.

Jyväskylä Polytechnic is connected to the Open University's activities through, e.g., the following chain: (1) the National Centre for Family Research has conducted a research project, (2) the Open University has provided basic studies of the same field in which teachers of the polytechnic have participated, and (3) after that the teachers have used their expertise, e.g., in the organization of specialization studies in the polytechnic. Moreover, the students of the Polytechnic have carried out development projects with working life based on their studies.

Areas of strength and prioritising of activities

The Open University provides high-level education especially in the fields of teaching and education (special education). Promising opportunities for the future can be found in multidisciplinary fields which are also breeding places for new innovations. Important targets of development include also family studies and development of educational products for Gerocenter and other instances.

Continuing Education Centre

Role

The Continuing Education Center is a separate institute of the University of Jyväskylä that operates entirely on external funding. It provides leadership education programmes and education tailored for the customer's needs whereas it does not conduct research. The Continuing Education Center operates in the whole country and its regional activities are in an initial phase. From the regional point of view, the Continuing Education Centre sees itself as a kind of intermediary organization between the University and regional actors, e.g., concerning working life (productization). The problem of the continuing education of the University of

Jyväskylä is a lack of coordination as the continuing education is also provided by some faculties creating competition within the university.

Starting points and channels of regional effectiveness

Existing networks of the staff facilitate the regional orientation. From the regional point of view, the leadership training for public administration, development of the organizations' staff and support in strategy work are essential channels of expertise of the Continuing Education Center. Center's know-how in productization of academic competence, connections to working life and strong national and international networks could be better exploited in the region.

Regional co-operation and the division of tasks

Of the public sector actors in the region, the key partners are the Regional Council of Central Finland, Employment and Economic Development Centre and Central Finland Health Care District. There has been co-operation with large businesses in the region, which has concentrated on leadership and personnel training. The regional actors often see the university as being too academic and theoretically oriented which hinders the co-operation.

The relationship with Jyväskylä Polytechnic is distant and the co-operation is minor. The problem is that the fields of operation of the institutions are not clearly defined, which results in an unhealthy competition. Creating close and equal co-operation between the university and polytechnic in the future is considered necessary, but it requires a clarification of the roles and co-operation fields.

Areas of strength and prioritising of activities

Important fields to be promoted in the future are leadership and development of enterprises. Also, the future of continuing education in the field of education has to be ensured. According to the view of the Continuing Education Centre, the integration of teachers' continuing education into regional strategies would be necessary for the region.

Agora Center

Role

Agora Center is a separate institute of the University of Jyväskylä that operates entirely on external funding. In Agora Center, results and resources of internationally networked research are compiled to support the development of product concepts and operational models from a human point of view. Research and development projects are implemented in co-operation with different fields of the university, businesses, public sector and other operators. The shared vision of the parties operating in Agora Center is to develop the future society from a human point of view and act as a source of spearhead ideas (human tech) in the region.

Agora Center has high visibility as an operator in the region, although it is partly still looking for its place. It has become known also because of its location (Agora building) and creating the brand has been a success as a whole. Moving the traditional faculty system towards multidisciplinary operation and changing the general attitude towards it more positive have been the challenges faced inside the university.

Starting points and channels of regional effectiveness

Agora Center carries out many regional projects, which aim to emphasize students' graduation theses, especially doctoral dissertations. The objective is to participate in regional activities which support its core functions. Promoting employability of students through practical training and graduation theses projects carried out with firms is an important channel of regional effectiveness, and more resources should be allocated to systematically develop it further.

Regional co-operation and the division of tasks

Jyväskylä Science Park is an important partner of Agora Center. It assists in building the concept and provides support in issues concerning commercialization and business in general. According to the view of Agora Center, the emphasis of the operation of its own and the whole university should be on developing substance knowledge and the other processes of the innovation chain should be outsourced to for example Jyväskylä Science Park.

Agora Center's partners from the public sector include municipalities and authorities. It co-operates also with a few large enterprises and small IT enterprises of the region. Increasing co-operation with enterprises through students' practical training is considered important. The R&D activity of the enterprises in the region is low which renders the efficient utilization of the university's expertise difficult. Other obstacles include the inability of the enterprises to recognize their own long-term needs and their lack of knowledge about the services provided by the university.

The co-operation with the Jyväskylä Polytechnic has been minor and it is not expected to increase in the future either. The main problem is that the fields of operation are not clearly defined and the operational cultures of the institutions are different.

Areas of strength and prioritising of activities

The main goal of Agora Center is to achieve international leadership in the field of understanding human mind. It also aims to create more contacts to enterprises. Two Centres of Excellence nominated by the Academy of Finland and five laboratories operate within the unit. Regionally important laboratories are: Agora game laboratory and innoroad laboratory, which is connected to road traffic. Agora Center's aim to become a leading international actor is considered to benefit the region as well.

Institute for Educational Research

Role

The Institute for Educational Research (IER) is a separate institute of the University of Jyväskylä, established in 1968. Half of its funding comes through the budget of the University of Jyväskylä. The basis of IER's activity is promoting the wellbeing of population through development of education and learning. The challenge is to combine science and theory for the benefit of individual learner. The activities of the IER are multidisciplinary in nature.

The national task of the IER is investigating, assessing and developing the Finnish educational system. Its research covers the whole of the educational system from pre-school to higher education, from vocational education to adult education and to the links between education and working life.

Starting points and channels of regional effectiveness

IER's regional effectiveness is channelled through personnel and teacher training. The institute has strong connections to the field of education of the region. Transforming research knowledge and education into a product is considered a real challenge.

The *Pedanet* project in Central Finland is an example of successful product formation. The aim of the project is to utilize the possibilities of modern information technology to increase self-direction and authenticity of learning. The project supports the possibilities of schools to develop their own learning environments. A special aim is to diversify and develop the quality of learning environments in small schools and schools located in rural areas. A tight interactive online network has been created in the course of the project.

Research of on-the-job learning is also considered to be an important regional development field. An evaluation focusing on integrating practical training of vocational education more tightly with operation of enterprises was carried out within the Taitava Keski-Suomi (Competent Central Finland) project. It provided useful information about, for example, educational needs of teachers and instructors.

The regional service task requires long-term work and a great amount of resources, which is often seen as being controversial with producing high-quality research knowledge. The participation in regional and other projects as well is based on evaluation of how much value added the institute can generate to the project.

Regional co-operation and the division of tasks

The Institute for Educational Research has co-operation in the field of education with the City of Jyväskylä, Regional Council of Central Finland and State Provincial Office of Western Finland. The services provided for the City of Jyväskylä include theme evaluations focusing, for example, on the need for continuing or pre-school education. The Regional Council of Central Finland has funded the *Pedanet* project. Co-operation

with private sector is case-specific, but it is considered important to get enterprises to utilize more actively the expertise of IER.

The IER has had co-operation with Jyväskylä Polytechnic for example in the fields of vocational teacher education and researcher training. However, launching joint R&D projects has been difficult despite the efforts (resource problem). The co-operation with polytechnic is expected to increase in the future. Developing on-the-job learning as a part of teacher education could be one significant field for co-operation.

Areas of strength and prioritising of activities

The Institute for Educational Research aims at specialising in four areas: higher education, international and national evaluation of education, links between education and working life (including vocational education), and exploiting information technology in education.

Information Technology Research Institute (ITRI)

Role

Information Technology Research Institute (ITRI) is one of the three departments of the Faculty of Information Technology at the University of Jyväskylä. As a research unit of the IT faculty, ITRI's objective is to conduct research and provide services for business and public organizations in the fields of expertise of the IT faculty.

The institute operates mainly at the national and regional levels. Its task from the regional point of view is to transfer technological knowledge to the industry and to develop local economy and business. The cross-disciplinary expertise at the University of Jyväskylä is reflected in the skills of ITRI's personnel.

Starting points and channels of regional effectiveness

ITRI has a significant role as an intermediate organization between the university and industry and the society. In that sense, it has a major role in universities' "third task" and has a significant impact on society and economy, regionally and nationally as well.

The regional effectiveness of the research institute is based on good contacts to enterprises and joint projects with them. In addition to National Technology Agency of Finland (Tekes) and EC research funding (FP6) based research projects (currently 4 ongoing), ITRI is carrying out several (currently 6 ongoing) EU structural funding (ESR and EAKR) based projects (MMEP, Opinpolku, OILI, MYLLY, MOTTO, NASTA) which have a significant impact for the regional economy and business.

Regional co-operation and the division of tasks

The research projects in ITRI have usually some level of collaboration with other national and international research institutes and researchers. The level of collaboration has varied from joint projects to common informal research co-operation at individual level. Regionally, collaboration with Jyväskylä Polytechnic in project work has gone well. This collaboration will be further developed in the future.

ITRI has good relationships with the industry and co-operation with the regional enterprises is close. During its existence, since 1989, more than three hundred enterprises have been involved in ITRI's projects. Regional, and small and medium size, enterprises form a major part of this collaboration. The projects of ITRI offer a good possibility for the small and medium size enterprises for networking and common R&D activities, as they have otherwise often limited resources for their development.

Important partners of the public sector include several municipalities and the Regional Council of Central Finland. Co-operation with intermediary organizations in the region is based mainly on project funding.

Areas of strength and prioritising of activities

ITRI's main expertise comprises of e-learning, organizational information management, enterprise architectures, mobile applications and business networks. In research, the strengths of ITRI are in designing, building and implementing information systems, and in software engineering, especially from the point of view of methods and processes.

Currently the priority of ITRI's development activities is further elaborating of its strengths, its project management expertise and co-operation with the enterprises and between the other research and education units locally, regionally, nationally and internationally.

Institute for Environmental Research

Role

The Institute for Environmental Research of the University of Jyväskylä is a national institute set up in 1968 to produce research data on the environment. The Institute provides scientific research, services, training and accredited laboratory services in the environmental field for authorities, private and public organizations and enterprises. The number of regular staff employed by the institute is 40, and 5-10 trainees and students working on their graduation thesis are recruited for projects yearly. The operation of the institute is funded by external sources. The operation area covers the whole Finland and approximately fifth of all activities is targeted to Central Finland.

Starting points and channels of regional effectiveness

The regional effectiveness of the research centre is channelled by various environmental development projects and laboratory services. Integrating certain functions of the Finnish Environment Institute with the University of Jyväskylä is seen as a great opportunity for increasing regional effectiveness in the future.

Regional co-operation and the division of tasks

The institute has intensive co-operation with regional intermediary organizations (Jyväskylä Regional Development Company Jykes Ltd. and Jyväskylä Science Park) focusing, e.g., on regional strategy work (research strategies and other operational strategies). Connections to large-scale industrial firms of the region are based on customer co-operation whereas the small and medium-sized enterprises of the region participate in many development projects. However, due to the small size of the Jyväskylä region it is not able to exploit the whole potential of the institute's expertise, and thus it is impossible to maintain the large environmental laboratory by regional resources alone.

The Institute for Environmental Research carries out annually at least one large project in co-operation with the Jyväskylä Polytechnic. Both institutions aim to increase co-operation in the future.

Areas of strength and prioritising of activities

The strength of the Institute for Environmental Research is versatile expertise. The operations are expanded by the accredited laboratory services and co-operation with other units of the university. Areas of research and development expertise include watercourses, air quality and environmental noise, soil and contaminated areas, biological effects of contaminants, and questions connected to waste management, water treatment and other environmental technology.

Regional stakeholders

Jyväskylä Regional Development Company Jykes Ltd.

Role of the organization

The main tasks of the Jyväskylä Regional Development Company Jykes Ltd. are (1) developing the regional enterprises and supporting innovation processes (especially in the business competence phase) and (2) creating preconditions for an innovative operational environment (infrastructure, availability of competent labour force, developing networks and entrepreneurial atmosphere, and increasing the attractiveness of the region etc.). Jykes provides services especially for smaller growth enterprises in low technology fields.

Defining the roles of regional actors is considered important, although, from the point of view of Jykes, co-operation already has a good foundation. The importance of co-operation is further emphasized when the new period of EU funding starts, and instead of having small individual projects, new projects have to form large-scale programmes with multiple participating actors. Jykes co-operates closely with the Jyväskylä Science Park. The Regional Council of Central Finland and Employment and Economic Development Centre are the most significant financiers of Jykes' projects. The goals of provincial development and development of the Jyväskylä region are not considered to be controversial.

Role of the HEIs

Jykes' view is that the primary task of the HEIs is to create a knowledge base. The importance of know-how and education as a basis for the competitiveness are emphasized with globalization. It is seen essential that study programmes are formed in a way that they support the business structure of the region and thus enable students to find a job in the region. An ability to react to changing environment for example through adapting of study programmes is expected of the HEIs. Jykes operates in the field of business and aims to transfer information about regional development needs to HEIs (e.g. anticipation). In order to increase the efficiency of communication between the regional organizations and HEIs the representatives of Jykes are members of the board of several other organizations or HEIs and vice versa (crosswise operation). Project and funding co-operation with HEIs is considered to go quite well, examples of this being wellness technology and Wellness Dream Lab (WDL), GeroCenter and Innoroad project.

Operation of the Central Finland Learning Network – OPTIIMI is considered successful and the HEIs are also closely participating in it. OPTIIMI plans the Central Finland expertise programme until the year 2008.

Weak spots and areas to develop in the co-operation with the HEIs

It is not always easy to find expertise (right person to contact) in the HEIs and Jykes sees this as a challenge also for its own activities. The University of Jyväskylä is often seen as a distant actor among firms, because the possibilities for applying its expertise and operations are not known well enough in the region. Jyväskylä Polytechnic, on the other hand, is a relatively new actor in the region and it takes time to become known.

Increasing the efficiency of utilising the know-how of the HEIs should start by strengthening the knowledge about their operations among regional actors. This could be done for example through marketing events or news flashes organized by Jykes, in which the operations of HEIs would be introduced through practical examples.

Prioritising of activities is considered a regional challenge. At the moment there are too many spearhead fields in the region. In the future, the forestry cluster and paper technology, bioenergy, nanotechnology, some environmental special field and knowledge intensive services would be possible spearhead fields. The most important thing now would be to assemble the core issues of the regional strategies and start focused implementation of them.

City of Jyväskylä

Role of the organization

The City of Jyväskylä creates opportunities and promotes interaction between regional operators. The Jyväskylä region is being developed according to the network city model and positive development of all the surrounding municipalities is considered important. The strategies of the whole province are in accordance with the plans of the City of Jyväskylä.

Role of the HEIs

Jyväskylä is a significant student city and most of its population is students. However, only a part of the students stay in the urban area after graduating as they move to the surrounding municipalities. According to the view of the City of Jyväskylä, the primary task of the university is to produce research knowledge, whereas the tasks of the polytechnic include applied research and active connections to working life. The HEIs should move towards a more cross-disciplinary co-operation, because the best opportunities for new openings and for developing innovations can be found in the horizontal interfaces. Viveca (WDL), Agora Center, and Nanoscience Center are considered good examples of cross-disciplinary cooperation. Increasing open co-operation between the HEIs and between the other actors (e.g. joint projects) is considered necessary for the favourable regional development.

It is not seen purposeful that the university invests too many resources into increasing the number of degrees awarded because of external pressures. This might cause the high-level research to decrease which might endanger the competitiveness.

Weak spots and areas to develop in the co-operation with the HEIs

Both the city and other regional authorities are almost unanimous about the fact that now is the critical time for change and for seizing on new opportunities to ensure Jyväskylä region's success also in the future. The structures of regional development have been built during the past years and now it is essential to make those structures efficient and exploitable. At the moment, the focus of regional development is on operating at the interfaces of business, services and research.

A plan about new pilot programme focusing on the models and tools of innovations of new generation, implemented in co-operation between the Jyväskylä and Oulu regions, is considered a new significant opening. This programme embodies the notion of *innovation institute* that integrates research, education, development organizations, product development of companies, and market information into one competitive unit. Furthermore, it helps enterprises in commercialising business ideas, internationalization, product and technology development, and in utilising co-operation networks. The plan is based on the WDL process, in which existing good practices would be embedded widely also in other fields. Wellness technology would be the spearhead field starting the programme. Utilising the strengths of the HEIs and connecting them to the concept would be an essential part of the innovation institute.

Jyväskylä Science Park

Role of the organization

Jyväskylä Science Park acts as an organizer of innovation processes, aiming at turning the ideas into business. It supports the commercialization phase and creating networks in particular. Activity is developed from the starting points of focused business know-how. Provincial and regional strategies define the intent of functions, whereas the most suitable tools and policies to realize that intent are chosen on the basis of the strategies of The Finnish National Fund for Research and Development and the National Technology Agency of Finland.

While Jykes Ltd. concentrates more on basic industries, the Science Park targets enterprises and business ideas based on new information and technology. In creating operational environments, it is thought that the role of Jykes Ltd. is to create wider basic conditions for regional business, whereas the Science Park emphasizes the close environment (facilities and service concepts) of enterprises. However, it is hard to make a clear distinction between the roles of Jykes Ltd. and the Science Park.

Role of the HEIs

The main task of the HEIs in the regional innovation system is to create ideas. Developing entrepreneurial atmosphere should be further enforced in HEIs. The Science Park has much co-operation with the University of Jyväskylä, but less co-operation with the polytechnic. However, increasing co-operation is considered beneficial.

The Science Park utilizes the expertise of the HEIs in substance competence and there are representatives of the HEIs in almost every expert team. Still, co-operation could be more systematic.

The interface of the university and the polytechnic is considered a potential foundation for the growth of business activity. Efficient combining of the university's research activity and the applications and business expertise of the polytechnic is possible at the interface.

The view of the science park is that the regional technology enterprises are willing to co-operate with the HEIs and the proximity of the university is an important factor. The biggest problem, especially with smaller enterprises, is the lack of financial resources, which could be solved by gathering enterprises together on the basis of their generic development needs.

Weak spots and areas to develop in the co-operation with the HEIs

Efficiency of the flowing of ideas and of recognising potential ideas could be further increased in co-operation between the Science Park and the HEIs. At the moments ideas are screened at yearly business idea competitions and continuously through direct connections. An area of development would be finding new mechanisms for increasing the volume of ideas. The aforementioned was also seen an opportunity to increase

the potential of growth enterprises. The process of productising and development of technology should also be made faster.

With the new university law (especially on inventions and commercialization), deepening the co-operation with the HEIs has become even more important than before. This includes developing services, allocating resources and organising functions for example so that the HEIs (the university) would buy certain services from the Science Park.

All in all, the co-operation between the Science Park and the HEIs is considered to be working quite well. However, sometimes the competition between the different departments of the university on the same projects and on funding causes problems. Sometimes there are also problems in the reporting chain and general project management (for example in keeping on schedule) of joint projects.

Regional Council of Central Finland

Role of the organization

Regional councils of provinces are authorities legally in charge of regional development and they act as a kind of interest group of the municipalities. The Regional Council of Central Finland sees itself as the coordinator of regional development that gathers all the operators around it and is responsible for provincial strategy work. The conflict between the goals of development for the Jyväskylä region and the whole province has cleared considerably during the last years, and the importance of a strong central region is recognized more widely all the time.

Role of the HEIs

Strengthening competence is a clear area of emphasis in provincial development. In this both vocational educational organizations and the HEIs have a significant role. Vocational institutions in particular, but also Jyväskylä polytechnic in increasing amounts, produce skilled human resources to the needs of the province. This is why the allocation of starter places of educational institutions to right fields of study is essential for the supply and demand of labour to meet in the region. From the point of view of the innovation chain, the university delivers the internationality, the knowledge and high level of competence, whereas the polytechnic operates closer to the SMEs. In terms of provincial development, the University is seen more in the national and international networks. With the societal service task, there is the need for discussion about increasing regional orientation also at the University. The general conception of the Regional Council of Central Finland in HEIs is that it is a distant financier. Creating real co-operation requires more development.

Weak spots and areas to develop in the co-operation with the HEIs

Connecting and unifying the strategies of the HEIs and the Regional Council of Central Finland is becoming increasingly important for supervision of the interests and for acquiring resources. It is necessary to create stable models of co-operation for this. At the same time, more programmatic thinking should be integrated in to the thinking of the HEIs. Enforcing the regional development thinking within staff and sending positive signs that emphasize co-operation to the region are considered important, especially for the university.

More open co-operation between and mutual loyalty in considering the division of tasks between Jyväskylä Polytechnic and the university is wanted. New innovation activity, that can find its highest potential at the interfaces of co-operation, is expected of the HEIs. It would be necessary to integrate a way of thinking that is holistic from a regional developmental point of view, into both HEIs.

The intermediary organizations in the region form a significant resource in the region's innovation chain together with the HEIs. It would be important to further tighten the co-operation between these operators, so that the efficiency of screening of commercially viable ideas and the number of enterprises in the region would increase.

The importance of OPTIIMI and the regional competence programmes it has developed are emphasized. The view of the Regional Council of Central Finland is, that OPTIIMI is an excellent instrument of communication and co-operation between the HEIs and the regions, and more investments should be made in order to fully utilize it.

Employment and Economic Development Centre of Central Finland (TE-Centre)

Role of the organization

The Employment and Economic Development Centre of Central Finland is regional service centre of the government, which operates under three ministries (The Ministry of Trade and Industry, the Ministry of Agriculture and Forestry, and the Ministry of Labour). It provides advisory and development services, as well as education and funding for different kinds of operators. The TE-Centre is also the largest specialist and contributor of EU funding in the region. Its operation is channelled through three departments: the Business Department, the Labour Market Department, and the Rural Department. The Business Department is further divided into the technology unit (Tekes), enterprise funding unit, development unit and a small international unit.

The Employment and Economic Development Centre co-operates closely with regional development companies. Because the activities of the TE-Centre are nationally directed, it is not strongly committed to regional strategies.

Role of the HEIs

The University of Jyväskylä co-operates mainly with the Business Department, whereas most of the Jyväskylä Polytechnic's contacts are with the Rural Department. Co-operation with the HEIs is mainly based on funding. The exploitation of the HEIs' expertise is not systematically organized.

Weak spots and areas to develop in the co-operation with the HEIs

According to the view of the Employment and Economic Development Centre the biggest obstacle for co-operation is the lack of knowledge about the expertise and functions provided by the HEIs. More active interaction between the operators would allow increasing the knowledge about the operation of each others. It would also be important to find the right channels for finding the right kind of expertise from HEIs, which a problem with the university in particular.

Co-operation with HEIs could be increased through practical training of students, for example (joint projects with enterprises, graduation theses). Considering this, it would be important to develop the competence of the staff of the HEIs to act as instructors for students' in co-operation with the working life. According to the experiences of the TE-Centre the guidance of students and sharing of responsibilities has sometimes been insufficient. Systematic participation of the HEIs (especially the polytechnic) in strategy work is seen as a potential area of co-operation in the future, whereas the technological know-how of the university (e.g., IT, nanotechnology) could be better utilized.

Organizations promoting entrepreneurship in Central Finland

Role of the organization

There are two organizations for entrepreneurs in the region: The Central Finland Chamber of Commerce and the Entrepreneurs of Central Finland. The task of the organizations is the supervision of the entrepreneurs' interests in the region and creating a favourable operational environment for competitive business.

The Central Finland Chamber of Commerce together with the 20 other Finnish Chambers of Commerce promote the business environment and competitive position of Finnish companies both in Finland and in the European Community. They provide, e.g., training, up-to-date information on economic management, legal advice, tax counselling, as well as export documents. The number of member firms of the Central Finland Chamber of commerce is approximately 520 representing various fields and branches of trade and industry with more than 32 000 employees in total.

The Federation of Finnish Enterprises with 21 regional organizations is the largest central business organization in Finland. Out of all the interests of small- and medium sized enterprises are covered most extensively. Training, information and advisory services in regional policy are offered for member firms.

The organizations emphasize the importance of entrepreneurship and well-being in the strategic goal setting of the province. The main co-operation partners are the Regional Council of Central Finland and the administrative authorities of municipalities.

There are many small enterprises targeting the nearby region, to which the success and attractiveness of the region are (availability of labour force) essential factors. The entrepreneurs' organizations also emphasize securing production in the region, because it is seen as a precondition for the development of the service sector. From the point of view of enterprises, there is some overlapping in the tasks of intermediary organizations, and on the other hand, there are also gaps in which expertise would be needed.

Role of the HEIs

The HEIs in the region are considered important creators of knowledge base and innovations and producers of competent labour force. Jyväskylä Polytechnic has more connections to working life and the enterprises see it as being closer to them as an operator than the university. There are a lot of resources unutilized in the co-operation with the HEIs.

Weak spots and areas to develop in the co-operation with the HEIs

The enterprises consider for example the difficulty of getting a trainee, insufficient guidance and ignorance about the functions of the HEIs problems in the co-operation with the HEIs. The individual nature of the projects and their lack of concreteness make operating difficult, because there is no feeling of continuity among enterprises and they get no sense of what kind of extra value the project adds to their operation. The enterprises' working life needs and their needs for research should be the starting points in planning projects. That way the expertise of the HEIs could be efficiently utilized.

In regional enterprises the on-the-job learning of students of the HEIs is also considered an important area, in which there is much room for development. Improving the teachers' knowledge of working life and their instruction skills, and building a holistic system to support on-the-job learning are primary measures in utilising the expertise of the HEIs and in integrating students in the region already during their studies. As a part of this, introducing internationality to regional enterprises through practical training of foreign students is seen as an important area to be developed.

Teacher education is a significant area of expertise in the region's HEIs and integrating entrepreneurship education in the curricula is considered an essential factor in promoting the entrepreneurial attitude. Despite efforts, this change has not yet started.

It would also be fundamental to create a channel, through which the needed expertise can be easily found in the HEIs. At the moment, creating contacts with the HEIs (especially the university) can be hindered because of not knowing who or what instance to contact. The polytechnics have hired development managers to take care of this problem.

The vision of the Y4 (Promote entrepreneurship in society by co-operation) entrepreneurship project of the entrepreneurs' organizations and the regional operators (the Regional Council of Central Finland, the Employment and Economic Development Centre, and Finnvera plc) is to develop Central Finland into a province that motivates and encourages people to entrepreneurship work and that is based on innovativeness, entrepreneurial way of working, and entrepreneurship. Representatives of the HEIs have now been also invited to join this project that aims at strengthening the entrepreneurial atmosphere and culture. The aim is to find out the needs for promoting entrepreneurship that appear when the baby boom generation leaves working life, and on the other hand, the effects of Y4 to the current state of affairs, and continue and further expand the project. It was hoped that the university would contribute to implementing this project by lending its expertise.

Appendix 3 Analysis of the most significant industries in Central Finland

Methodology

The most significant industries were specified by dissecting the location quotient and relative size of industries (figure 1). The location quotient shows the specialization degree of industries compared to the national level and, respectively, the relative size of different industries as an employer in regions. By using these two indicators simultaneously, the structure of regional industries can be described in a more versatile way. The use of location quotient merely, does not take into account the weight of industries as an employer in regions, and the use of the relative size of industries without the location quotient does not take into account the regional degree of specialization of industries compared to the national level.

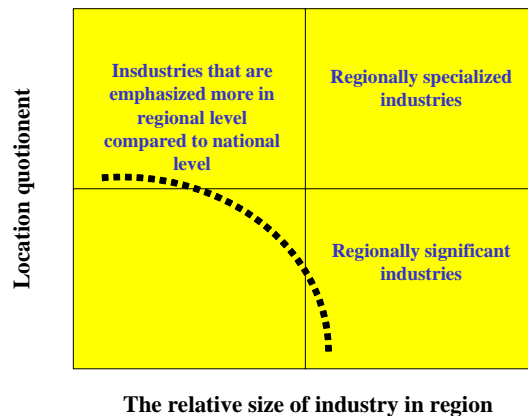


Figure 1 Intersection of the location quotient and relative size of industries

The dissection of the most significant industries of regions is not relevant without taking into account their growth potential or the confines of growth. The growth orientation of different industries in regions was specified by examining the growth of employment in 1995-2000, and comparing the development of regional industries to national growth (figure 2). In this case, the results show whether the growth of different industries at regional level has been more rapid than at national level.

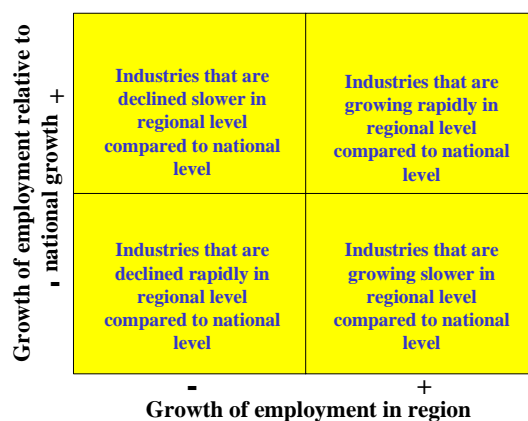


Figure 2 Growth of employment at regional level related to the national development

By interpreting the results of the indicators that show the most significant industries and growth, the regional industries can be divided to (1) *spearhead industries* (regionally specialized industries, which are important employers and have been growing faster compared to the national level), (2) *growth industries* (regional industries, which have been growing faster compared to the national level) and (3) *regionally significant industries* (regionally specialized industries, which are important employers but can not be classified into

spearhead industries due to the slower growth compared to national level) (figure 3). (Ritsilä & Haukka, 2005).

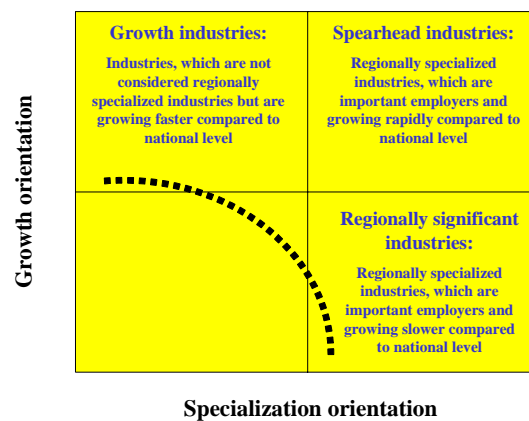


Figure 3 Classification of industries based on their regional performance

Results

By analyzing the results of different indicators (location quotient, relative size and growth of employment), the Manufacture of pulp, paper and paper products; publishing and printing (DE) was clearly the most important spearhead industry in Central Finland. In addition, Manufacture of other non-metallic mineral products (DI), Manufacture of basic metals and fabricated metal products (DJ), Manufacture of electrical and optical equipment (DL), Manufacture of transport equipment (DM), Construction (F), Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods (G), Education (M), Health and social work (N) and Other community, social and personal service activities (O) were considered growth industries in the region. Hotels and restaurants (H) was regionally significant industry, although its growth has been slower compared to national level.

Note: The authors wish to thank Researcher Jukka Haukka for his significant contribution to this analysis.

Appendix 4 Regional effects (input-output analysis) of the HEIs in the Jyväskylä region

Input-output analysis

The input-output analysis is used in examining the economic effects. The method enables assessing the direct and indirect economic effects of certain fields on both regional and national level. The method of analysis is used to evaluate the economic effects of the University of Jyväskylä and Jyväskylä Polytechnic especially in the Jyväskylä region. The input-output model, which is based on knowing the correlation (the input-output correlations) between different fields, can be used to evaluate the direct and indirect effects of any branch of industry and the effects of changes in it (increase or decrease) on the output of different fields of operation. The main purpose of the model is to show how much the output of each field has to be increased regionally and nationally in order to satisfy the demand caused by the output of a certain field of operation. Based on this output effect, the effects of the activity under examination on the income and employment of households, enterprises and the public sector can be further evaluated so that all multiplier effects can be taken into account.

A simplified scheme of impact analysis of economic effect of education, based on the input-output model is presented in Figure 1. The first step of the analysis is to derive the direct and indirect output effect of the demand impulse. Income effects in different sectors of economy and effects on employment are then derived based on output effects.

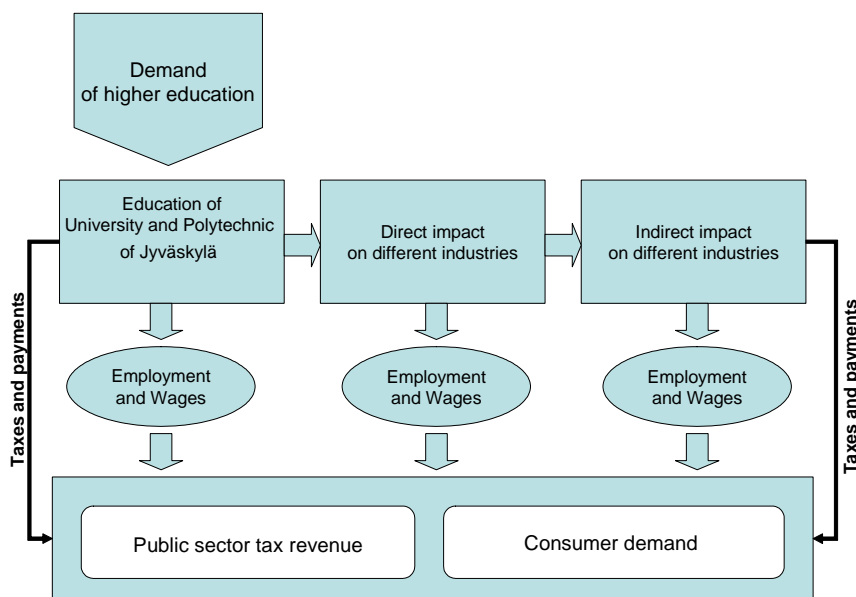


Figure 1 Simplified scheme of economic impact of education

Output effects

The starting points of input-output analysis are the charts of the regional input-output research conducted by Statistics Finland in 1995, in which the economy has been divided into 37 fields of operation. The fields of operation have been combined according to statistics on production, thus forming a classification system of 16 categories. The input-coefficients of the input-output table of Central Finland have been localized into the Jyväskylä region by using the Cross Industry Location Quotient method (CILQ). The input-coefficient table shows the amount of different inputs needed per production unit in each field of operation: for example the input required from the other fields by the field under examination (education). On the other hand, these fields of operation require input from the other fields to be able to supply products to satisfy demands created by education. This reaches also fields that do not produce goods or services directly needed by the field under examination. To calculate the indirect effects and the holistic impacts the Leontief inverse matrix

created on the basis of the input-coefficient table. The Leontief inverse matrix produces the coefficient matrix.

Income effects

The income effects of a field of operation are calculated with basic inputs by multiplying the transposed matrix of the basic inputs by the inverse matrix created from the input-coefficient matrix. The basic input structure consists of imports, commodity tax, salaries, social insurance contributions, expenditure of fixed capital and operating surplus. For the region under examination, the input structure created from the input-coefficient matrix of the Central Finland region has been used as the basic input structure of production of fields of operation, because the same input structure can be expected to be used in the same field of activity regardless of the region. Importing from the other regions of the province becomes one of the basic inputs in the regional table of the Jyväskylä region.

Employment effects

The effects of the field of operation on employment can be calculated using the employment multiplier. The multipliers can be derived by dividing the amount of labour force (in man-years) by the production of the field (in millions of euros). In other words, the employment multipliers indicate the amount of workers needed to achieve the output of million euros. The employment effects of education, for example, are calculated by multiplying the millions of euros it produces to different fields of operation by the employment multiplier of these fields. The aforementioned income effects provide income for households in the form of salaries (and entrepreneurial income). Consumption of households also has employment effects, mostly in the fields of trade and personal services. The amount of jobs created in this way can also be estimated with employment multipliers.

Output effects of the University of Jyväskylä and Jyväskylä Polytechnic

Output effects of employment in different fields of operation are presented in the next table. Figures from 2004 have been used as to mark the output of education: The overall funding of the University of Jyväskylä is EUR 152 million and the net revenue of the polytechnic is EUR 46.1 million.

Table 1 Output effects of the University of Jyväskylä and Jyväskylä Polytechnic in different fields of operation, EUR million

Industry	Direct effect (EUR million)	Indirect effect (EUR million)	Total effect (EUR million)
Agriculture and fishing	0,02	0,08	0,09
Forestry	0,00	0,07	0,07
Manufacture of food products and beverages	1,58	0,66	2,24
Manufacture of wood and paper	1,97	0,32	2,29
Manufacture of metal products	0,08	0,09	0,17
Other manufacturing	0,82	0,29	1,11
Construction	0,56	0,29	0,85
Trade	2,69	0,32	3,01
Hotels and restaurants	0,76	0,11	0,87
Transport, storage and communication	2,31	0,64	2,95
Financial intermediation	0,21	0,06	0,28
Real estate, renting and business activities	0,71	0,66	1,37
Public administration and defence; compulsory social security	0,83	0,15	0,97
Education	8,42	0,43	8,85
Health and social work	2,64	0,33	2,98
Other community, social and personal service activities	2,08	0,27	2,35
Total	25,69	4,77	30,46

The overall value of production created by education with multiplicative effects in the Jyväskylä region is EUR 228.6 million. The value of the University of Jyväskylä and Jyväskylä Polytechnic's output is therefore EUR 198.1 million (university EUR 152.0 million and polytechnic EUR 46.1 million) and the direct production costs in different fields are EUR 25.7 million. In addition, indirect output effects amount to EUR 4.6 million. Education is a service trade, in which human resources play a significant part and output effects remain significantly smaller than in for example industrial fields, where the use of intermediary products has a significantly larger part in production. Examining different fields of operation reveals that the greatest input in the field of education is produced by the field of education itself. The input of other fields (social and health care services, other societal and personal) is also significant. From the fields in the private sector, trade and transport, storage and data communications produce the most input for the field of education. Within the industrial fields, the field of education uses the inputs of the paper industry and the food industry the most.

Income effects of the University of Jyväskylä and the Jyväskylä Polytechnic

Income effects are products of the use of basic inputs in the field under examination, as well as of using the basic inputs necessary for the growth of output, created in the other fields. For economy, the most important fields are import, salaries and capital instalments, operating surplus, and expenditure of fixed capital. The income effects of output, totalling EUR 198.1 million, are presented in the following table (Table 2).

Table 2 Income effects of the University of Jyväskylä and Jyväskylä Polytechnic, organized by level of basic input

Basic input	%	Income effect (EUR million)
Regional Import	4,4	8,7
Use of domestic import in total	11,1	22,0
Use of foreign import in total	3,3	6,6
Value added tax	2,9	5,7
Product taxes	0,4	0,8
Product subsidies	-0,2	-0,4
Salaries, fees and social security payments of employers	67,5	133,7
Other production taxes	0,02	0,03
Production subsidy fees	-0,15	-0,3
Other value added	10,7	21,2
Total	100,0	198,1

The table above (Table 2) consists of income effects of the University of Jyväskylä and Jyväskylä Polytechnic in different categories of basic input. The share of salaries and the employers' social security costs of the total is 67.5% (EUR 133.7 million). From this sum the employers' social security costs amount to 6% and the amount of salaries is therefore EUR 125.5 million.

Table 3 Distribution of gross income produced by the University of Jyväskylä and Jyväskylä Polytechnic to households into different sectors (EUR million)

Distribution of salaries	EUR million
Salaries and entrepreneurial income	125.5
State taxes (12.5%)	15.7
Municipal taxes (18.5%)	23.2
Net income of households	96.6
Saving (3.0%)	2.6
Consumption	84.0

The public sector receives tax income from salaries: with tax percentage of 18.5%, the communal tax amounts to EUR 23.2 million and the state tax amounts to approximately EUR 15.7 million with tax percentage of 12.5%. The savings rate of households has been very low during recent years and therefore the savings rate of 3% has been used in the calculations. After deducting taxes (31.0%) and savings (3%), EUR 84 million is left to households for consumption. This consumer demand creates output effects that can be added counted as output effects of education. This also created employment effects, which amount to 1016 when calculated using an average employment multiplier. A part of this consumption flows outside the

Jyväskylä region through for example tourism, so the employment effect has only a partial impact on the region.

Employment effects of the University of Jyväskylä and Jyväskylä Polytechnic

In an input-output research conducted in 1995, an employment multiplier was calculated for each field. It indicates the number of man-years per output of million euros in each field. The employment effects of education can be evaluated with these employment multipliers and output effects calculated for each field earlier.

The direct employment effects calculated from the output of the University of Jyväskylä and Jyväskylä Polytechnic in 2004 (EUR 198.1 million) amount to approximately 4 100 person years (Table 4). The share of education in the employment effect produced by the output of educational institutions is nearly 96%. The direct and indirect effects of the examined education to other fields amount to 186 man-years.

The indirect employment effect of the University of Jyväskylä and the polytechnic is approximately 4 100 man-years. In addition, almost 370 person years are created through the activities of these educational institutions (Table 4). The field of education benefits the most of the employment effects created by the educational institutions. There are also significant effects on the public sector and the field of trade. When evaluating the employment effects, also the significant employment effects created by consumer demand have to be borne in mind. Including these the employment effect amounts to nearly 5 500 person years.

Table 4 Overall employment effects of the University of Jyväskylä and Jyväskylä Polytechnic per field of operation in 2004.

Industry	Labour income coefficient (employees per output of one EUR million)	Jobs
Agriculture and fishing	72,2	6,8
Forestry	9,0	0,6
Manufacture of food products and beverages	5,6	12,5
Manufacture of wood and paper	4,3	9,9
Manufacture of metal products	7,9	1,4
Other manufacturing	8,7	9,7
Construction	14,1	12,0
Trade	24,0	72,3
Hotels and restaurants	22,8	19,9
Transport, storage and communication	13,1	38,5
Financial intermediation	8,4	2,3
Real estate, renting and business activities	5,7	7,8
Public administration and defence; compulsory social security	19,2	18,7
Education	20,7	4101,6+183,2
Health and social work	28,8	85,7
Other community, social and personal service activities	20,2	47,5
Total	12,1	4470,9

Note: The authors wish to thank Senior Researcher Esa Storhammar for his significant contribution to this analysis.

Appendix 5 Reform of regional structure: Three different models of municipal structure are under public debate

- **Basic model** aims at forming municipalities of 20 000-30 000 inhabitants based on the commuting areas. In this model the number of hospital districts would be decreased and a demanding health care would be concentrated on certain units. The municipalities would still be responsible for the finance and provision of services.
- **District model** is defined by the Ministry of Social Affairs and Health. The idea of the model is to restructure the municipal social services and the whole health care by shifting responsibility of services to new 20 social and health care districts. Each district would comprise of 100 000-200 000 inhabitants. The model does not suggest the ideal number of municipalities.
- **Regional model** is based on 20-25 regional municipalities and approximately 415 vicinity municipalities. The formers would take care of, e.g., social and health care, secondary education and planning of land use. The latter ones would be responsible for the local services like day care of children but they would not have right of taxation.

Appendix 6 Central regional strategies connected to the operation of HEIs

Entrepreneurship strategy of Central Finland

Innovation strategy of Central Finland

Internationalization programme of Central Finland 2006-2008

Municipal strategies

Provincial plan of Central Finland

Regional strategy for the Regional Centre of Expertise Programme

Regional strategy for the Regional Centre Programme

Regional industrial strategy (Elinkeinostrategia)

Regional development strategy of the HEIs in Central Finland 2005-2009

Regional strategy of structural funds

Regional strategy of sustainable development

Strategy of the Y4-agreement 2003-2009

Sub-regional expertise programmes (as a part of the operation of OPTIIMI) (Seutukunnittaiset osaamisohjelmat)

Technology strategy of Central Finland 2005-2011

Appendix 7 Provision of education in Finland

Comprehensive school. The nine-year comprehensive school is obligatory for all children. In addition, local authorities provide pre-school teaching for six-year-olds. Participation in pre-school teaching is voluntary and determined by the holders of parental responsibility. Local authorities can also provide additional teaching in the form of a voluntary tenth grade. Basic education, including study materials, a daily meal, school health and dental care, is free in Finland.

The curricula follow the same principles throughout the country. Students can choose a specialist school focusing on languages, physical education, natural sciences, the arts, mathematics, or music. Local authorities evaluate the quality of teaching jointly with schools, parents and students. After completing basic education, students can choose whether to go on to upper secondary school or to a vocational institute.

Upper secondary school. Study at upper secondary schools is based on study periods, non-year classes, self-motivated study and a wide range of elective subjects both in the school studies and in the final matriculation examination. National guidelines steer the curricula of individual schools. Eligibility for higher education is given by the matriculation examination. Additionally, a person who has completed the upper secondary curriculum but has not taken the matriculation examination is eligible to apply to a polytechnic. Teaching, meals, health and dental care are free at upper secondary schools, but homes have to pay for school books and transportation to school.

Vocational education. Vocational education takes three years to complete and includes a minimum of six months' on-the-job-training. There are seven vocational study fields leading to several qualifications. A three-year vocational qualification yields eligibility for all forms of higher education. About 85% of all vocational education is arranged by local or joint municipal authorities. Education is free of charge.

Adult education. There are special upper secondary schools for adults and adult study lines in regular upper secondary schools where adults can complete the basic level of education and then go on to the upper secondary school, which ends in a national matriculation examination. Upper-secondary day schools, upper secondary schools for adults, and regular upper secondary schools take private students. Some folk high schools offer adult study lines in basic and upper secondary education. Comprehensive and upper secondary school curriculum subjects can also be studied at adult education centres and summer universities.

In vocational training, skills examinations are independent of how professional skills have been acquired. Qualification in the form of skills examinations can be taken in apprenticeship training, self-motivated training, employment training for adults, and in-service training. Vocational qualifications and specialist qualifications can also be taken in a variety of subjects.

Higher education. The Finnish higher education system consists of two sectors: universities and polytechnics.

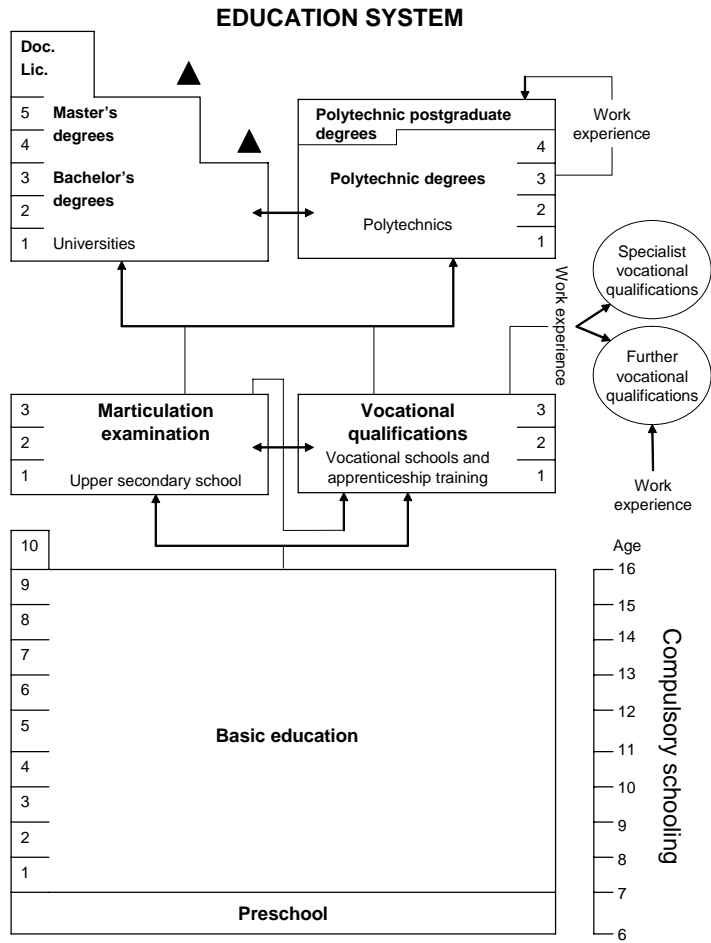


Figure 1 Finnish education system (Ministry of Education, 2005)

Appendix 8 Statistical information on Finnish HEIs

Table 1 Universities in 1994-2004 (Source: KOTA database)

	All universities			University of Jyväskylä		
	1994	1999	2004	1994	1999	2004
Applicants*	61 601	62 478	70 200	5 851	6 571	5 805
New students	17 289	19 373	20 420	1 355	1 944	1 855
Number of students	128 031	151 734	174 047	9 219	12 060	14 027
Doctoral students	14 730	19 842	22 105	975	1 429	1 616
Foreign degree students	2 566	3 473	4 673	156	205	262
Master's degrees conferred	9 615	11 856	12 588	804	1 093	1 367
Teaching staff	7 722	7 270	7 939	563	615	721
Other staff	14 675	19 800	21 954	989	1 433	1 547

* Participated in entrance examination.

Table 2 Polytechnics in 1998-2004 (youth education) (Source: AMKOTA database)

	All polytechnics			Jyväskylä Polytechnic		
	1998	2001	2004	1998	2001	2004
Applicants	90 098	86 680	93 898	5 516	6 081	6 269
New students	26 077	25 662	26 411	1 050	1 149	1 211
Number of students	65 065	100 362	109 489	2 649	4 667	5 432
Foreign degree students			3 765		106	129
Degrees completed	5 345*	14 096	16 404	177**	639	855
Teaching staff (full-time)	5 013	5 597	5 879	205	276	308
Other staff	2 945	4 064	4 610	101	231	335

*The polytechnic education was launched in 1991 in temporary polytechnics.

**Jyväskylä Polytechnic was established in 1992 as an experimental polytechnic.

Appendix 9 Patents as indicators of R&D activity

Table 1 Patents per 1000 inhabitants in Central Finland, Jyväskylä and Finland

Region	1995	1996	1997	1998	1999	2000	2001	Average
Whole Country	0,27	0,28	0,31	0,35	0,35	0,36	0,33	0,32
Central Finland	0,34	0,28	0,41	0,53	0,49	0,41	0,51	0,43
Jyväskylä	0,50	0,41	0,60	0,80	0,69	0,63	0,73	0,62

Table 2 Patents per 100 enterprises in central Finland, Jyväskylä and Finland

Region	1995	1996	1997	1998	1999	2000	2001	Average
Whole Country	0,66	0,64	0,68	0,74	0,74	0,74	0,69	0,70
Central Finland	0,91	0,70	1,00	1,25	1,15	0,96	1,16	1,02
Jyväskylä	1,34	1,06	1,49	1,94	1,64	1,50	1,72	1,53

Appendix 10 Statistics on financing of HEIs

Table 1 Budget funding and external funding* of universities in 1994-2004, EUR 1 000 (Source: KOTA database)

	All universities			University of Jyväskylä		
	1994	1999	2004	1994	1999	2004
Budget funding (1 000 €)	644 123	977 418	1 234 894	45 899	74 074	90 453
External funding (1 000 €)	283 531	521 478	690 011	17 473	39 397	50 721
- Academy of Finland, %	15.0	16.7	20.9	14.7	20.2	24.4
- Tekes, %	-	16.2	13.2	-	8.2	7.5
- Domestic firm, %	-	14.6	14.5	-	10.6	6.1
- Other domestic source, %	79.9	41.6	37.4	83.7	51.0	42.0
- EU-funding, %	-	8.0	10.7	-	9.0	19.8
- Foreign firm, %	-	1.1	1.5	-	-	0.2
- Other foreign source, %	5.1	1.7	1.7	1.5	1.0	-

* The relative shares of different funding sources of total external funding are represented.

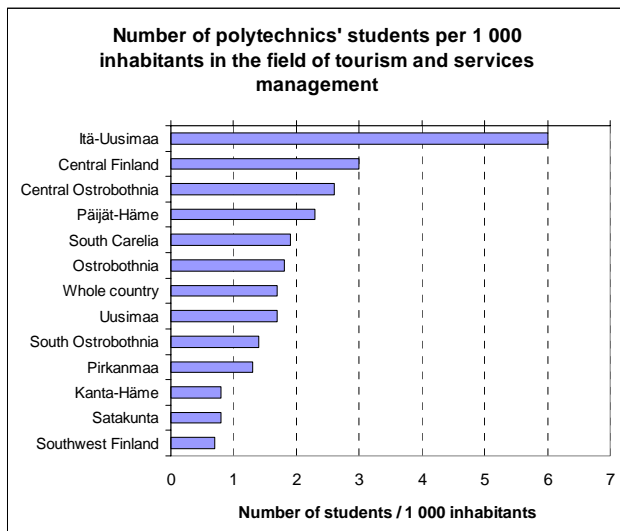
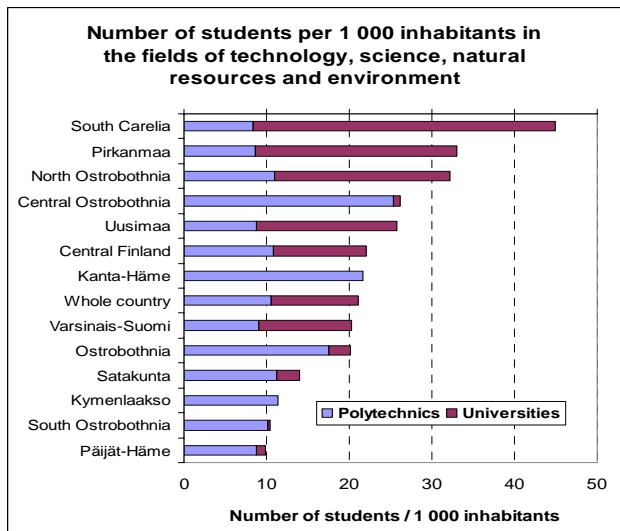
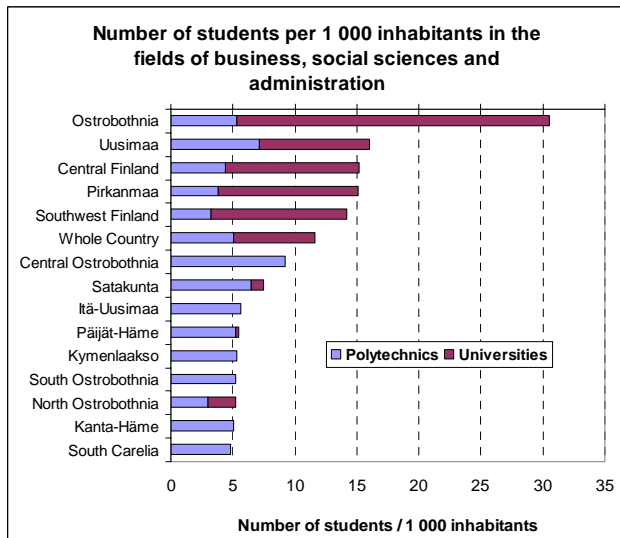
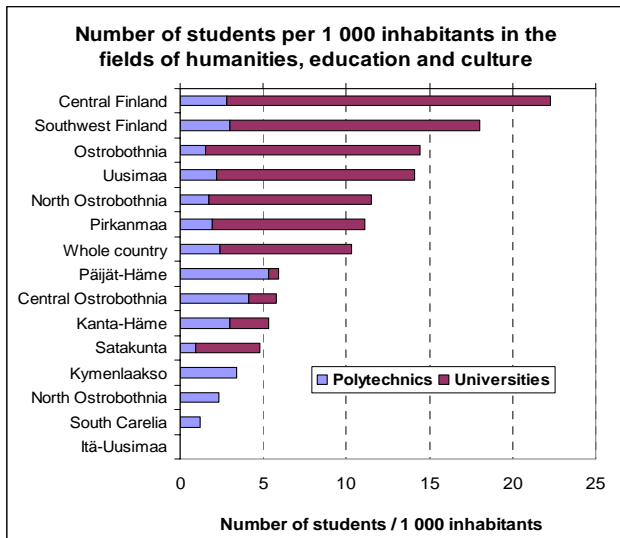
Table 2 External research funding of the Universities in 2000-2004, EUR 1 000 (Source: KOTA database)

	All universities			University of Jyväskylä		
	2000	2002	2004	2000	2002	2004
Total external research funding	331 503	384 044	438 666	24 193	21 752	31 574
- Academy of Finland, %	28.6	28.7	32.0	32.1	37.1	39.2
- Tekes, %	27.4	21.0	20.5	19.8	12.1	12.1
- Domestic firm, %	10.8	12.5	12.2	6.7	5.5	8.8
- Other domestic source, %	21.6	23.2	22.4	26.0	27.5	28.3
- EU-funding, %	7.1	9.5	8.8	13.4	17.1	11.2
- Foreign firm, %	2.0	2.5	2.0	-	-	0.3
- Other foreign source, %	2.5	2.5	2.0	1.9	0.6	-

Table 3 Financing of the Jyväskylä Polytechnic in 2001-2004, EUR 1 000

	2001	2002	2003	2004
Turnover	38 665	41 916	43 597	46 072
External T&K funding	3 466	3 422	4 709	6 051
- EU/State, %	-	-	75.1	71.7
- Municipal funding, %	-	-	6.9	5.9
- Private funding, %	-	-	4.2	3.9
- Other public funding, %	-	-	5.0	4.8
- Other funding, %	-	-	8.9	13.7

Appendix 11 Number of higher education students in different fields at the provincial level (in Western and Southern Finland) in 2004



Source: Laakso et al., 2005

Appendix 12 Labour market activity of graduates of HEIs

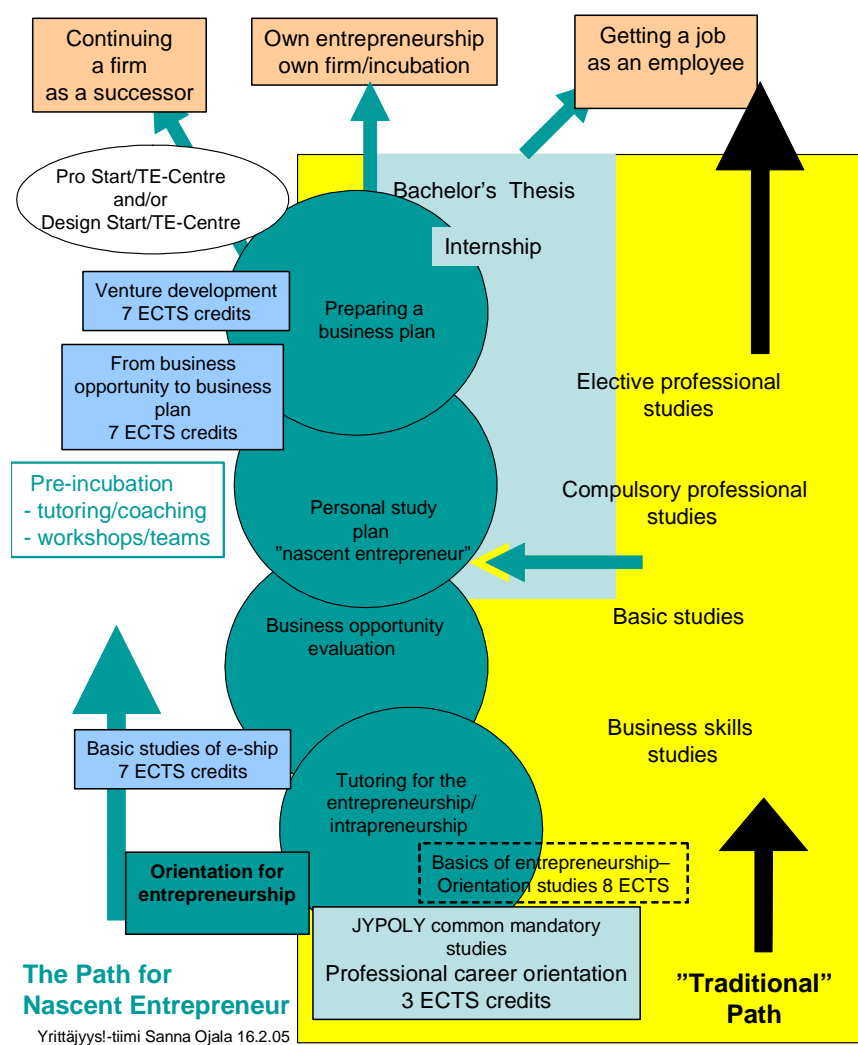
Table 1 Labour market activity of university graduates, who have completed their Master's degree in 1998-2002, at the end of the year following their graduation (%) (*Source: Ministry of Education: University statistics*)

	All universities			University of Jyväskylä		
	Wage earner	Entrepreneur	Unemployed	Wage earner	Entrepreneur	Unemployed
1998	83.3	1.1	5.1	83.8	0.9	4.9
1999	84.5	1.2	4.5	84.3	0.6	4.6
2000	84.7	1.2	3.5	84.5	1.3	4.3
2001	83.5	1.1	3.2	83.1	0.4	4.5
2002	82.3	1.2	3.1	80.5	0.7	6.5

Table 2 Labour market activity of polytechnic graduates, who have completed their degree in 1999-2003, at the end of the year 2003 (%) (*Source: Ministry of Education: Polytechnic statistics*)

	All polytechnics			Jyväskylä Polytechnic		
	Wage earner	Entrepreneur	Unemployed	Wage earner	Entrepreneur	Unemployed
99-03	80.0	1.9	7.8	78.8	1.8	8.1
2000	83.1	2.2	4.4	81.7	2.5	4.4
2001	83.1	1.7	5.1	81.9	2.1	4.9
2002	82.1	1.7	7.0	79.6	1.4	6.7
2003	72.0	1.7	14.9	73.2	1.4	14.0

Appendix 13 Entrepreneurship path: New tool for promoting entrepreneurial thinking of students at the Jyväskylä Polytechnic



Appendix 14 Master's Programmes at the University of Jyväskylä in 2005

(According to the Plan of the Operation and Economy of the University of Jyväskylä 2006-2009 – Jyväskylän yliopiston toiminta- ja taloussuunnitelma 2006-2009)

Faculty of Humanities

Master's Programme in Music, Mind and Technology
Master's Programme in Music Therapy
Master's Programme in Nordic Arts and Culture Studies
Master's Programme in Digital Culture
Master's Programme in Intercultural Communication

Faculty of Information Technology

INMIDE – Master's education programme of the Faculty of Information Technology (*EU funded programme*)

- The INMIDE-lines for student:

- Digital Media
- User-friendly Information Technology
- Mobile Computing
- Software Business
- Telecommunication (Mobile Systems)

Faculty of Education

Master's Programme of Study Tutors

Faculty of Sport and Health Sciences

European Master of Science Programme in Biology of Physical Activity (*EU funded programme*)
Master's Programme in Sport Science and Management
Master's Programme in Sports Technology (Vuotech) A (*EU funded programme*)
Master's Programme in Wellbeing Technology (WELLKO)

Faculty of Mathematics and Science

International Aquatic Master's Programme (AMP) – Sustainable Management of Inland Aquatic Resources
International Master's Programme in Nanoscience
Master's Programme in Renewable Energy (*EU funded programme*)
Master's Programme in Biotechnology
Master's Programme in Nanoelectronics (*EU funded programme*)
Master's Programme in Medicinal Chemistry (in cooperation with the University of Kuopio)

School of Business and Economics

TUKEVA – Master's Programme in Business
Corporate Environmental Management Master's Programme

Faculty of Social Sciences

Master's Programme in Development and International Cooperation
Women's studies Master's programme
Master's Programme in Cultural Policy

Chydenius Institute

Master's Programme in Information Industry (*EU funded programme*)

Appendix 15 Overall national funding and contribution of funds (ERDF, ESF and EAGGF) to projects of the University of Jyväskylä and Jyväskylä Polytechnic with social, cultural or ecological objects (in Central Finland), in 1.1.2000 – 30.6.2005

Social projects	Main focus	National and EU funding, €
HYTEKI - Hyvinvointiteknologian investointiohjelma	Welfare technology: Investment programme	201 826
WELLI - Liikuntabiologisen hyvinvointiteknologian laitetukiohjelma	Welfare technology: Support device programme	54 000
HYTEKNO - Hyvinvointiteknologian koulutusohjelma	Welfare technology: Training programme	403 652
Hyvinvointiteknologian innovaatioiden tuotteistamisohjelma (INTO)	Welfare technology: Product formation programme of innovations	263 611
Hyvinvointiteknologian tuotekehitysympäristö - User Centred Design Centre (UCDC)	Welfare technology: Developing user centred design centre	589 800
Wellness Dream Lab -kehittämishjelman II vaihe	Welfare technology: Research, training, R&D and product formation of innovations	331 856
WELLKO - Hyvinvointiteknologian liikuntabiologinen koulutusohjelma	Welfare technology: Training programme	306 111
Hyvinvointiyrittäjyyden edistäminen	Welfare entrepreneurship	153 400
Koulutuksen ja työelämän yhteistyön tavoitteena sairaanhoitajien urakehitys SURAKE	Developing health services	106 379
Pro Competence (tutorointiosuuden rahoittaminen / Pro SME)	Social inclusion	9 641
WIRE II (IkiVire - Seniorit takaisin työelämään)	Social inclusion	81 613
WIRE III	Social inclusion	486 891
WIRE II	Social inclusion	989 273
WIRE I	Social inclusion	1 053 845
PROKES - koulutusmalli keskeyttäneille IT-alan opiskelijoille	Social inclusion	254 400

Cultural projects	Main focus	National and EU funding, €
Keski-Suomen Mediaklusterin KUVITEK-projekti (Kulttuurin, Viestinnän ja uuden Teknologian Koulutuksen kehittämisprojekti)	Developing education and training in culture, communication and new technology	220 028
Mennään maailmalle! Välineitä kansainvälisyyteen ja monikulttuuriseen työelämään	Developing multicultural working life	52 500
Keski-Suomen luontomuseon perusnäyttelyn rakentaminen	Building up exhibition (nature museum)	97 997
Liiketoimintaosaamiskoulutus luoville aloille (LINKO)	Developing business know-how in creative industries	127 600
Suomalainen musiikkikampus	Developing finish music campus	356 221
Keski-Suomen kulttuurin palvelukeskuksen toimintamalli	Developing cultural service centre	15 137
KULO - Kulttuuriset oheispalvelut 2002	Developing cultural by-services	23 200

Ecological projects	Main focus	National and EU funding, €
Uusiutuvan energian demonstraatio-ohjelma (UENDO)	Developing renewable energy sector: developing demonstration programme	147 000
Uusiutuvan energian koulutusohjelma (UENKO)	Developing renewable energy sector: Training programme	361 300

Uusiutuvan energian tutkimusohjelma (UENTO)	Developing renewable energy sector: Research programme	137 000
Bioenergiasektorin kehittäminen Pohjoisessa Keski-Suomessa	Developing renewable energy sector	51 730
Pohjoisen Keski-Suomen bioenergiaverkoston kehittäminen	Developing networks in renewable energy sector	219 958
Keski-Suomen peltoenergia	Developing renewable energy sector	50 000
Bioenergiasektorin koulutuksen kehittäminen	Developing training in renewable energy	105 200
Opetus- ja demonstraatiokäyttöön soveltuva biolämpökeskus	Developing renewable energy sector: biological heating plant for training and demonstration use	60 000
VISU - Virtuaalisuo-oppimisympäristö Leivonmäelle	Virtual training environment in ecological training	108 874
Hajautettujen energiajärjestelmien koulutusohjelma (HENKO)	Training programme for decentralized energy systems	264 300
Keski-Suomen maaseutumatkailun koordinoitihanke	Coordination project for countryside tourism	39 032
Metsästysmatkailun mahdollisuudet Keski-Suomessa	Developing nature tourism	5 380
Keski-Suomen luonto- ja liikuntamatkailun markkinoinnin web-pohjainen tietopankki	Developing nature tourism	16 226
Pohjoisen Keski-Suomen luontomatkailestrategian laadinta	Developing nature tourism strategy	19 173
Talousjätevesien käsittely viemäriverkostojen ulkopuolisilla alueilla	Developing sewage treatment in territories outside sewer networks	14 632
Jyväsjärvi - takapihasta osaamis- ja tutkimusympäristöksi	Developing research in ecosystems	353 032
LABIN - Ympäristölaboratorion investointihanke	Investment project for environmental laboratory	336 376
Tutkimus- ja kehittämishanke: "Yhdyskuntajätteen kaatopaikkojen biokaasun puhdistaminen liikennekäyttöön"	R&D project: developing the use of landfill gas in traffic	158 240
Vesiympäristötiedon ja -tekniikan tuotteistaminen - Päijänteen osaamis- ja tutkimusympäristö	Productization of know-how in water environment and technology	157 300
Jyväsjärven kunnostaminen (v.2005-2006 rahoitus)	Restoring of Lake Jyväsjärvi	56 000
Jyväsjärven vesiympäristön hoito ja kunnostaminen	Restoring of Lake Jyväsjärvi	201 826

Appendix 16 Operational expenditure of the University of Jyväskylä in 2003 and 2005

	2003		2005	
	1 000 €	%	1 000 €	%
Core funding	74 247	84.9	85 138	89.2
Funding of national tasks	3 145	3.6	750	0.8
Funding of national programmes	6 740	7.7	5 477	5.7
Project funding	1 992	2.3	1 395	1.5
Performance based funding	1 299	1.5	2 641	2.8
Total	87 423		95 401	

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