Chapter 8
'We Are a Training and Development Organisation' – Research and Development in Finnish Polytechnics

Jussi Välimaa and Marja-Liisa Neuvonen-Rauhala

Introduction

Finnish higher education became a mass higher education system in the 1970s. The expansion of the higher education system from the 1960s to the 1990s was closely linked with a strong welfare-state agenda (Välimaa, 2001). The Finnish tradition of higher education is rooted in the Nordic ideology of a welfare state in which citizens and permanent residents may pursue a place in the tuition-free higher education system. In 2006, there were about 307,000 students in Finnish higher education. About 177,000 of them studied in universities and 130,000 in polytechnics.

Finnish polytechnics and universities are understood as 'equal but different'. This means that the mission of universities is to conduct research and provide undergraduate and postgraduate education based on it, whereas the polytechnics aim to train professionals in response to labour market needs and conduct R&D which supports instruction and promotes regional development in particular. This dividing line is, however, challenged both by higher education policies which have introduced research and development functions and master's degrees to polytechnics and by polytechnics themselves which have started to call themselves as 'universities of applied sciences'. In this chapter we will refer to them as polytechnics for simplicity. The aim of this study is to analyse how the research and development (R&D) function influences the internal dynamics of polytechnics.

There were 28 polytechnics and 20 universities in Finland in 2008. According to the Ministry of Education, there will be only 15 universities and 18 polytechnics by the year 2020. Polytechnics are located all over the country, and most of them (26) are multidisciplinary institutions operating under the Ministry of Education. In addition to the 26 polytechnics funded by the Ministry of Education, the category of polytechnics also includes the Police College (funded and steered by the Ministry of Interior) and Åland University of Applied Sciences, subordinated to the self-governing Åland Islands.

J. Välimaa (✉)
Finnish Institute for Educational Research, University of Jyväskylä, Jyväskylä, Finland
e-mail: jussi.p.valimaa@jyu.fi

S. Kyvik, B. Lepori (eds.), *The Research Mission of Higher Education Institutions Outside the University Sector*, Higher Education Dynamics 31,
DOI 10.1007/978-1-4020-9244-2_8,

The establishment of polytechnics was initiated at the beginning of the 1990s, when the Finnish state was hit by a severe and sudden economic recession after a decade of national economic boom. Within this context, the social crisis made new initiatives both politically and practically desirable. The Finnish government launched the polytechnic reform as an experiment – which is a typical Finnish reform strategy (Välimaa, 2005) – also because the decision-makers were quite unprepared for such a grand move to accept the rapid establishment of a new sector of higher education. The establishment of polytechnics was the major reform of the Finnish higher education in the 1990s. By 2000 all of the experimental polytechnics had developed into polytechnics operating on a permanent basis (Välimaa & Neuvonen-Rauhala, 2008).

All of the 19 regions of Finland have at least one polytechnic, while the more densely populated regions have several. The 26 polytechnics steered by the Ministry of Education have about 200 units in their regions – from single small units in small towns to several units in larger towns (OECD, 2003). The education provided by the polytechnics falls into seven main sectors. These are: (1) business and administration, (2) culture, (3) health care and social services, (4) humanities and education, (5) natural resources, (6) technology and communication, and (7) tourism, catering and institutional management (OECD, 2003).

Finnish polytechnics are most often local and regional establishments operated either by a federation of municipalities (10 polytechnics), a limited company of which most are operated by municipalities and/or federations of municipalities (11 polytechnics) or an urban municipality (5 polytechnics). Polytechnics can be divided into three categories on the basis of their student numbers, which is perhaps the best way to describe their regional influence (see Table 8.1). The category of small polytechnics consists of ten institutions, including two polytechnics not steered by the Ministry of Education. This category contains also one Swedish-speaking polytechnic, two nation-wide polytechnics and three polytechnics located in the more remote regions of Finland. The category of medium-sized polytechnics consists of 11 higher education institutions based all over the country, whereas the largest polytechnics (8 institutions) are located mainly in the Southern parts of Finland. The number of study fields offered by a polytechnic depends mainly on its traditions and region without any connection to its size. The smallest polytechnics may have 3–7 study fields, medium-sized and large polytechnics 4–8.

Table 8.1 Finnish polytechnics by student numbers in 2004–2005

Categories of polytechnics	Number of students	Number of polytechnics
Small polytechnics	<3,000	10
Medium-sized polytechnics	3,000–5,500	11
Large polytechnics	5,500–10,000	8

Source: OPM (2005, 2006).

The smallest polytechnic among those subordinated to the Ministry of Education has about 1,300 students (Humanistic Polytechnic), whereas the largest polytechnic by student number is Haaga-Helia University of Applied Sciences with about 10,000 students. The largest polytechnic is a new polytechnic, called Metropolia, with its 13,000 students in 2008. For the purpose of providing a comparative perspective it should be mentioned that there were 4,300 students in the smallest multidisciplinary university (University of Lapland) and 35,300 students in the largest one (University of Helsinki) in 2005.

National Policies for Research in Non-university Institutions

The Finnish higher education system is steered by the Ministry of Education. However, in line with the Nordic traditions of higher education, Finnish tertiary education institutions enjoy a high degree of institutional autonomy, which is both secured in the Finnish Constitution and guaranteed by laws governing universities (Universities Act 715/2004) and polytechnics (Polytechnic Act 351/2003). In this social context, it is natural that the institutions themselves take full responsibility for the standard and quality of the education and research they provide. According to the Polytechnic Act (351/2003, 4§), the tasks of the polytechnics are *to provide teaching which is based on scientific or artistic foundations aiming to produce high expertise in the related fields, to support the students' professional development, to conduct applied research and development which supports both the development of teaching and regional development and working life with the aim of advancing regional economic structures* (Free translation, J.V.).

This Polytechnic Act changed the traditional tasks of polytechnics quite radically, because it states that polytechnics are supposed to take care of applied research and development projects in cooperation with the enterprises in their regions. This is a radical change in Finland, because originally polytechnics were established as higher vocational teaching institutions. In the first Polytechnic Act (255/1995) research was connected to the polytechnic's teaching task. The definition was rather imprecise and led to different interpretations in practice.

The aims of the national legislation are translated into action through the Development Plan for Education and Research, written by the Ministry of Education for each new government (for a 5-year period). The present Development Plan for Education and Research covered the years 2003–2008, whereas the new one will cover the 5 years between 2007 and 2012. It is quite normal that Development Plans have a thematic continuity, even though every government normally wishes to emphasise the policy goals somewhat differently. This document is an important policy-making paper, because together with the Programme of the Government it sets the frames and objectives for national policy-making for the government. The Development Plan focuses on an abstract national level, but it is taken seriously by all the actors in the field of higher education policy-making, because it can be utilised as a point of reference in policy-implementation debates.

In the Development Plan (2007–2012) the primary mission of polytechnics is to provide and develop professional higher education closely connected with working life and to conduct R&D which serves working life and regional development as well as teaching (OPM, 2007). The Development Plan defines polytechnics as active partners in innovation networks, both through education in the workplaces and through R&D activities, especially with the service sector's business enterprises. The development plan also emphasises the quality of higher education and the need to continue 'structural development' of Finnish higher education.

The steering of the national higher education system is based on performance agreements. This means that each year every higher education institution signs a performance agreement with the Ministry of Education. In the social context of trust, performance agreements define the funding of higher education institutions and set the targets for their outputs (in terms of degrees) and development activities to be carried out. In the Finnish cultural context it is, again, natural for the institutions and academics to take the agreements seriously.

Strategic points emphasised in governmental documents and strategies are normally included in the strategies of polytechnics (see, e.g. OPM, 2004, p. 7). Consequently, it is commonly mentioned in the performance agreements that students with their teachers are seen as key actors in regional activities. Furthermore, practical working-life issues in need of development activities are seen as one of the most important starting points for R&D in polytechnics. Entrepreneurial objectives are also commonly mentioned in performance agreements.

Strategic Goals and Guidelines for Research

According to the Ministry of Education, polytechnics have already become essential actors in the regional innovation system, but they should enhance their regional impact with measures taken to develop the structure of education provision, to combine polytechnics' regional development projects into larger entities linking different sectors and to boost networking with different stakeholders, higher education institutions and schools (OPM, 2004, p. 8). Polytechnics' contacts with the world of work have also improved significantly with the aim of evolving into development processes, which benefit all the partners involved. Supporting small and medium-sized enterprises and developing welfare services is a special responsibility for polytechnics in the light of regional development. The networked regional higher education institutions composed of polytechnics and universities are also developed in response to regional needs. According to the Ministry of Education, the aim is to strengthen the role of polytechnics in the promotion of business incubators and to undertake projects to facilitate business successions and women's entrepreneurship.

'Structural development' is often used as euphemism to hide the fact that the number of Finnish higher education institutions (both polytechnics and universities) needs to be reduced. In this higher education policy context, Finnish polytechnics

have been 'encouraged' to merge into larger units. This has lead to merger operations between smaller units, or to the discontinuation of those units that were not seen as viable by the Ministry of Education in 2007. The aim of the 'structural development' is to create more efficient and viable higher education institutions and/or their combinations. One of the consequences of this policy objective is the fact that polytechnics have been active in starting merger operations by themselves. The first merger of two polytechnics took place at the beginning of year 2007.

One of the most important policy goals of the 'structural development' of Finnish higher education is to develop the polytechnic network and education. The goal is to achieve a balanced provision both as to the regions and the linguistic groups, to target provision according to the needs of working life and to build efficient units. The aim is to create a network in which each unit offering degree education is large enough to be able to provide education of a sufficiently high standard and to conduct R&D which serves the region. The restructuring aims at enabling each polytechnic unit to develop into an entity that provides degree education and conducts regionally relevant R&D, which also reaches high European and international standards. The aim is to develop the structure and education of polytechnics in order to enable them, as key players in the innovation system, to provide adult education and services which cater to the development aspirations of the local authorities in the region, local businesses and work communities, and local residents (OPM, 2004, p. 8).

The basis for this development and cooperation is created by higher education institutions' joint regional strategies and plans for the development of international research cooperation and the utilisation of research findings. Universities and polytechnics are encouraged to strengthen their relations with working life by developing their business know-how and innovation services and by developing the commercialisation of research findings. The aim is also to promote the social and cultural utilisation of their research and knowledge production. Furthermore, the Ministry of Education states that 'Prerequisites for university research and polytechnic R&D will be strengthened. Research development will stress internationally competitive and ethically sustainable high-quality research. The procedures for the commercialisation of research findings will be clarified' (OPM, 2004, p. 8).

As can be seen from these citations, the Ministry of Education does not make an essential difference between the aims of polytechnics and universities regarding R&D tasks. The only and primary difference is defined by the kind of research polytechnics and universities are expected to conduct. The focus of university research is on basic research, whereas polytechnics are expected to conduct research and development projects which promote regional innovations in particular.

Priority Setting Between Teaching and Research

The National Audit Office (NAO) audited R&D performance in polytechnics in 2006. The NAO report (2006, pp. 162–163) share the views of the Ministry of Education, when they state that the majority of the research and development

activities in polytechnics can be characterised as adaptive projects, which are linked to industry or which support teaching in their regions. These objectives are also those defined by the Ministry of Education, because it is expected that R&D in polytechnics both support teaching and take students into the research and development projects. These aims have also been emphasised in the postgraduate polytechnic degrees (or, polytechnic master's degrees). For the year 2007 the Ministry of Education emphasised the development of R&D in teaching and the connections between R&D and developing activities in polytechnics. The Ministry of Education expects that teachers and students should have better possibilities to take part in R&D activities and researchers and project staff should be connected to teaching more closely.

According to their report (NAO, 2006, pp. 163–165), the polytechnics and their stakeholders were asked to assess how R&D and teaching are connected to each other in polytechnics. One of the main outcomes is that there are many connections. Theses are generally seen as a key way for organising local R&D activities in polytechnics. Postgraduate polytechnic degrees emphasise theses in this context, because the function of a thesis is determined based on the development of the working life. Ideally, theses should be done in close connection with working life and with the R&D in polytechnics. A crucial question is: what kind of R&D should polytechnics conduct and how should it be organised? This question is significant, because the answer to it is strongly related to the ways in which R&D will be developed in polytechnics by their staff (Kainulainen, 2004).

Funding of Research

The exact estimation of R&D conducted in Finnish higher education institutions is rather difficult, because of the variation and mixture between basic and applied research. However, it can be estimated that R&D conducted in polytechnics formed about 10% of the R&D conducted in universities in 2004. Funding based non-governmental resources in polytechnics is only 15% of such funding in universities (NAO, 2006). According to the National Audit Office's report, the proportions of the polytechnics' own R&D funding have not changed substantially the funding of teaching in polytechnics, because polytechnics have other funding resources than governmental funding. However, polytechnics evaluate that their incomes from business activities do not cover the polytechnics' own share demanded for R&D funding. This means that there are pressures to transfer resources from teaching to R&D, especially when other funding instruments are not yet available for funding polytechnics and the EU funding period is ending.

Funding is defined as the main problem in R&D activities. There are many reasons for that. First, many funding decisions are directed to small projects and to many kinds of projects, instead of focusing funding on strategically important larger projects. Second, and traditionally, the Academy of Finland – the most important academic funding agency – does not allocate funding to polytechnics. The second

most relevant funding body is Tekes, which supports cooperation projects between researchers and business enterprises. However, Tekes allocates only partial funding to polytechnics, whereas universities receive total funding as long as they are civil service offices. Universities can not use governmental funding to co-fund Tekes projects but polytechnics are treated in a different way because of their different maintaining organisations. Third, the European Social Fund (ESF) is the most important funding body for R&D in polytechnics. However, one of problems for polytechnics is the fact that ESF funding will be reduced during the funding period of 2008–2012 (NAO, 2006, pp. 159–162).

The European Union is a very important funding body for funding R&D staff resources in polytechnics as can be seen in Table 8.2, because the staff funded by the EU funding instruments make up almost half of the total number of R&D staff. Staff in R&D means researchers, but it also includes teachers' working hours used for R&D (see also Table 8.4 for more details). Staff for business activities refers to continuing education funded by participants and enterprises, which often includes development activities. However, it may also means services that are for sale, for instance, restaurant and congress services, laboratory services for different purposes, etc.

Performance agreements between polytechnics and the Ministry of Education for the years 2007–2009 state that the quantitative objective for R&D resources is to collect 10% of the funding from other sources than the government.

Table 8.2 Characteristics of research and development in polytechnics

	2000	2001	2002	2003	2004	2005	2006
R&D costs (€ million)	32	44	56	49.6	88.7	99.6	
Staff (excluding. teachers) for projects funded by public institutions (incl. EU)	411	455	422	421	446	455	492
Staff for R&D	*	*	296	482	484	579	614
Staff for business activities	341	327	288	278	274	270	276

R&D was not a staff category until 2002.
Source: OPM (2004, p. 7, 2006, p. 42), AMKOTA Database.

Research Strategy in Non-university Institutions

All polytechnics have agreed with the Ministry of Education – in their performance agreements – that they will contribute to the regional higher education strategies and regional strategies with partners and working life. The Ministry of Education and polytechnics have investigated possibilities of advancing R&D. There are opportunities to develop the role of the polytechnics in the regional innovation systems. This means cooperation with other polytechnics and universities, intensification of working-life connections of teachers and other staff with

possibilities to take part in R&D activities, and the aim to motivate students to participate in R&D while studying for their postgraduate polytechnic degrees (NAO, 2006, p. 152).

Almost every polytechnic has an R&D strategy, and even those polytechnics which do not have it have included R&D into the general development strategy for the whole polytechnic. Most of the polytechnics emphasise that they are responsible for applied R&D (see, e.g. OPM, 2004, p. 7).

The Organisation and Management of Research

In 2004, the variation in the allocation of manpower for R&D in different polytechnics ranged from one person to as many as 100 persons allocated for R&D (OPM, 2004). Due to this variation, there are many different organisational solutions for meeting the needs of R&D in polytechnics. Most of the polytechnics emphasise that their R&D is connected to teaching, or at least they will strengthen this connection. Many polytechnics emphasise that their R&D is a part of teaching and for that reason R&D is tied to all educational activities. Some polytechnics have established an R&D unit to support R&D activities and projects, whereas other polytechnics have positioned research coordination into their service centres. Practically, all polytechnics have persons responsible for coordinating research projects, whether they are called project managers (or coordinators) or directors of research.

For example, Lahti University of Applied Sciences has established an Innovation Centre in order to promote and coordinate R&D projects. This polytechnic has also established the position of the Director of Research with the aim to better coordinate R&D in the institution. In HAMK University of Applied Sciences the organisational decision is to organise research and development into 'Centres of Know How', with the idea of combining R&D with teaching and student theses. Some polytechnics (like Jyväskylä University of Applied Sciences) have allocated, in turn, the responsibility for developing R&D to the Director of Development, while the actual R&D is carried out in R&D projects.

Again, the Ministry of Education is supporting organisational and developmental issues of R&D in polytechnics by funding the cooperational network of polytechnics called AMKtutka (R&D as a part of tasks of polytechnics) during years 2007–2009. The network is coordinated by one of the polytechnics – Mikkeli University of Applied Sciences. The aim of the AMKtutka is to develop connections between teaching and R&D. The network aims at developing new pedagogical innovations, strategic and structural solutions for connecting all the tasks of polytechnics. The goal is also to develop and share common concepts and views concerning R&D in polytechnics. It may be argued that the 'equal but different' higher education policy principle guiding the cooperation with universities will also guide R&D to be developed in the forthcoming years (see also Vesterinen, 2006; Kainulainen, 2004).

Collaboration with Universities and Industry

According to a study by Marttila, Kautonen, Niemonen, and von Bell (2004, pp. 60–65), polytechnics collaborate extensively with industry. In some cases most of the studied companies had connections with polytechnics in Central parts of Finland and in the Tampere Region. The most common cooperation took place through student theses, but contract research and development projects were also usual ways of organising cooperation. According to Marttila et al. (2004, p. 61), companies that collaborated with polytechnics did it also with universities and research companies or with other consultation organisations. This cooperation was supported by the funding of public finance organisations.

The most common method of collaboration between industry and polytechnics is an R&D activity and working-life connection through teaching. This involves student theses, practicing periods in companies and different kinds of projects. The second most common method is through service activities offered by polytechnics to companies. These activities include continuing education and renting buildings and facilities. The third method of collaboration includes organising recruitment, presentations or meetings with the boards of education in the fields where polytechnics offer teaching (Marttila et al., 2004).

Marttila et al. (2004, pp. 103–104) conclude that locality is the most important factor when companies choose whom they collaborate with, even though the activity of polytechnic teachers is crucial when the collaboration starts. However, the intensity of collaboration also depends on the general economic situation.

Human Resources and Careers

In 2004, Finnish polytechnics employed 955 senior teachers, 3,431 lecturers and 1,493 full-time teachers and 5,921 other staff (AMKOTA, 2004). The composition and structure of the polytechnic teaching staff differs significantly from that of the universities, because there are neither professorships nor assistantships. This is due to polytechnics' tradition and mission to provide vocational education. The most prestigious category of polytechnic teachers is the senior lecturer (*yliopettaja*), who is responsible for developing the professional fields. Required by the Ministry of Education, polytechnics aim at recruiting PhDs or holders of licentiate degrees to these positions also because they are defined as equal further education degrees by the Ministry of Education. Polytechnics have also succeeded rather well in achieving this objective, as can be seen in Table 8.3.

Polytechnic lecturers' job profiles resemble those of traditional university lecturers, because neither of them is expected to do research. Most lecturers and full-time teachers in polytechnics hold either an MA or a professional degree. Senior lecturers, lecturers and full-time teachers have a permanent position, unlike part-time teachers. The high proportion of women teachers may be explained by the polytechnics' orientation. In social work, health care, culture and tourism women are

Table 8.3 Staff in Finnish polytechnics funded by the Ministry of Education by gender and degree in 2004

	Proportion of female staff (in 2005)	PhD	Lic.Phil	M.A.	B.A.	Polytechnic degree or other	Total (*N*)
Senior lecturer	40.2%	30.5% (291)	39.2% (375)	26.8% (256)	1.1% (11)	2.3% (23)	(955)
Lecturer	62%	2.1% (72)	5.7% (195)	84.2% (2,888)	1.8% (62)	6.4% (219)	(3,431)
Full-time teacher	53.4%	1.7% (26)	3.1% (47)	55.6% (830)	8.9% (133)	30.7% (458)	(1,493)
Project staff	49.5%	4.6% (43)	2.4% (22)	32.5% (302)	1.6% (15)	51.4% (478)	(860)
Total (N)	58.3%	6.4% (432)	9.5% (639)	63.5% (4,276)	3.3% (221)	17.5% (1,178)	(6,739)

Source: AMKOTA database.

the majority. These are also strong fields in most polytechnics (OECD, 2003). Increasing numbers of staff members are engaged in research and development activities. In 2004, polytechnics had 484 people with duties of this kind in addition to 446 project workers. These expanding staff groups – called here the 'project staff' – are an interesting group also from the point of view of policy, because they indicate a growth in research and development activities.

The Extent and Output of Research

In order to see more precisely what the activities carried out in Finnish polytechnics are, we will rely on two different sources. The National Audit Office (NAO) audited R&D performance in polytechnics in 2006, whereas Statistics Finland has analysed the use of working hours in Finnish higher education between various tasks (Statistics Finland, 2006). The category of research consists of several different activities carried out in universities and polytechnics. These are as follows: (1) completing one's doctoral dissertation (or licentiate thesis), (2) other research tasks (including management of research), (3) artistic work, (4) participation in scientific and professional meetings, and (5) participation in other training.

The statistical analysis is based on the survey sent to a sample of Finnish higher education staff members (teachers and researchers), who were funded by the Ministry of Education in 2004. The response rate was 53.8% for polytechnics and 58% in universities. However, the statistical analysis excludes the staff not funded through direct budget funding from the Ministry of Education. This also explains why the number of posts differs from the data provided by the AMKOTA database (Table 8.4).

Teaching is the most important activity in all groups of polytechnic teachers. Lecturers and full-time teachers use most of their working hours for teaching (75–81%), whereas senior lecturers use two thirds of their working hours for teaching activities. Also, the group of researchers is rather active in teaching, using almost one third of their working hours for teaching. The category of teaching consists of many kinds of different activities and tasks. It includes both preparatory hours for basic level (bachelor) teaching and contact teaching hours. It also includes other basic level teaching and tutoring. Furthermore, literary and other examinations belong to teaching activities, as well as teaching of professional teacher

Table 8.4 Weekly working hours of polytechnic teachers and researchers, and proportion of time spent on different activities (funded through direct budget funding/Ministry of Education), in 2004

Staff category	Teaching (%)	Research (%)	Other	Total h/week	(N)
Senior lecturer	64	16	20	42	(747)
Lecturer	75	8	17	42	(2,740)
FT teacher	81	7	12	40	(1,098)
Researcher	30	47	24	35	(49)
Total	74	10	16	41	(4,635)

Source: Statistics Finland (2006).

training. Teaching also consists of open higher education tutoring and preparatory hours, and higher level (master's level) contact teaching and its preparatory hours.

It is quite natural that researchers are the most active group carrying out research. They used almost half of their working time for research activities. The total amount of research done by researchers is, however, rather small due to their small number in polytechnics: 49 persons is only about 1% of the whole population funded through direct budget funding. However, when we take into account also the staff for R&D funded through other sources – 484 persons in 2004 (see Table 8.2) – it is evident that the research mission is becoming rather extensive also in polytechnics (Statistics Finland, 2006).

Crucially important for the research function in polytechnics is the fact that senior lecturers use as much as 16% of their weekly working hours for some kind of research activities. This indicates that it is socially accepted and expected of them to conduct research projects and to take care of the research development in polytechnics. This is also quite natural, because as many as 64% of them have an academic research training (see Table 8.3). The most research-active group of senior lecturers consists of people aged 30–50 years. They use as much as 19% of their working time for research, whereas the senior lecturers older than 50 years of age use only 14% of their working time for research (Statistics Finland, 2006).

Lecturers and full-time teachers do very little research, only 7–8% of their weekly working hours. According to the survey, this research work consists of doing their doctoral dissertations or licentiate theses (1 h/week). This university research category is, however, quite problematic in polytechnics, where the common rule is not to allow lecturers to write a dissertation during office hours. It consists of other research (1.3 weekly working hours) and participating in scientific conferences and meetings (1.8 weekly working hours), which makes about 4 h a week, whereas senior lecturers use almost 7 working hours per week for these activities (Statistics Finland, 2006).

The most 'research-intensive' fields of research in polytechnics are culture (14% of working hours allocated for research) and social work, health and physical education (11% of working hours allocated for research), whereas the fields of natural resources (with 6% of working hours allocated for research) and humanities (with 7% of working hours allocated for research) are the least 'research-intensive' fields in polytechnics.

We can also see remarkable differences in the time allocated to research between different polytechnics. There is a group of polytechnics (four polytechnics) which allocate 14–18% of their working hours to research. The most 'research-intensive' polytechnics are the Swedish-speaking polytechnics. Also, some Finnish-speaking polytechnics belong to this group. The second group allocates 9–13% of their working time funded by the Ministry of Education to research. This is the largest group consisting of 13 polytechnics. The third group consists of polytechnics, which allocate 5–8% of their working time to research. This group consists of 12 polytechnics (Statistics Finland, 2006).

As to the time allocated to research, no simple causal relationship exists between the study fields and polytechnics, because all polytechnics consist of a combination of 3–8 study fields. It is evident, however, that institutional traditions play a role. In addition, the local situation (close to universities) and conditions may play a role in this kind of statistical information gathering. For example, full-time concentration on doing one's dissertation or licentiate thesis may have a significant impact on the average hours calculated in one's institutions, especially in small polytechnics (Statistics Finland, 2006).

When comparing these figures with those of universities, it can be seen that universities allocate 43% of their working hours to teaching, which is almost half of that allocated in polytechnics (74%). Working time allocated to research is 39% in universities, which is almost four times more than the time allocated to research in polytechnics (Statistics Finland, 2006).

R&D in Two Non-university Institutions

In order to understand the relevance of research for regional community better, we will analyse the cases of Lahti University of Applied Sciences and that of the Jyväskylä University of Applied Sciences. Lahti represents a polytechnic where the aim is to organise research and development through a special 'Innovation Centre', whereas Jyväskylä represents a polytechnic where R&D is more integrated into the normal teaching activities. Both of these polytechnics received extra funding from the Ministry of Education on the basis of their performance in R&D in 2006. These case studies are based on the web pages of the polytechnics, interviews and literary sources (Karppanen et al., 2007; Käyhkö et al., 2006).

The Case of Lahti University of Applied Sciences

Lahti University of Applied Sciences (LUAS) is a multidisciplinary higher education institution located in the city of Lahti in the southern part of Finland, with 5,000 students and 450 staff members. LUAS aims at creating innovations which promote welfare, economic and cultural life in the region and internal development in the higher education institution itself. Research and development is defined in LUAS as a systematic action to increase the amount of information and to apply the gained information to finding new applications and solving practical problems. The criterion for R&D is to pursue, find or produce something that is not only new, but also consequential.

The majority of the R&D projects are led and run by project staff working in the Innovation Centre, which is a specific unit within LUAS. It was established in 2004 with the aim to lead, coordinate and develop research and development in LUAS. The volume of R&D has developed rapidly from €1.1 million in 2003 to

€3.8 million in 2005. The organisational role of the Innovation Centre has been evaluated as central for LUAS (Karppanen et al., 2007.)

There were approximately 30 on-going projects in LUAS in the autumn of 2007. They were partly funded by The European Social Fund (ESF) or by the European Commission, together with funding from companies and using the funding of the LUAS. Most of the projects aimed (1) to develop the know-how and the skills of the staff in companies, or (2) to develop education. The other project categories include: (3) developing business, competitiveness and internationalisation and establishment into new market areas; (4) entrepreneurship and business succession; (5) tourism development; (6) anticipating future needs of the labour force and education, and (7) promoting R&D activities and education in disciplinary fields. The projects include, for example, staff training projects for business enterprises to teach new ICT technologies and visual design, or leadership training. Educational development projects aim at developing cooperation between higher education units and training development in a specific educational fields or target groups. Some of the projects are conducted in cooperation with partners from different countries.

The promotion of entrepreneurship takes place in degree education and it is supported by the FINPIN Network (Finnish Polytechnics Entrepreneurship Network), which is run by LUAS for all the Finnish polytechnics. All these activities are professionally administrated and run by the Innovation Centre. However, and in addition to these projects, there are many activities which are connected to teaching and learning, and taken care of by teachers and senior lecturers. These activities include students' project works and theses done in companies and other organisations as part of their degree studies. The director of research at LUAS also emphasised that the R&D activities connected to teaching will be crucial in the near future in polytechnics. When defining the purpose of LUAS, he said that 'we are a training and development organisation'.

The Case of Jyväskylä University of Applied Sciences

Jyväskylä University of Applied Sciences (JUAS) is a multidisciplinary institution with several units located around the city of Jyväskylä – also in two rural communities. This higher education institution includes the following eight schools: Cultural Studies, Business, Engineering and Technology, Information Technology, Health and Social Care, Tourism and Services Management, Institute of Natural Resources and Teacher Education College, which is responsible for training vocational education teachers. The number of students is about 8,000 and that of the staff 780 in 2007. There were 32 bachelor-level study programmes and two master's-level study programmes.

According to their web pages JUAS 'assumes responsibility for the development of Central Finland and reacts quickly to the region's educational needs. Our responsibilities include research and development activity concerned with enterprise and working life. Our activities emphasise, in particular, the promotion of small and medium-sized enterprises as well as development within the public sector.' In 2004,

JUAS allocated about 100 working years for R&D projects, and currently they have about 50 on-going R&D projects, which can be categorised according to their focus as follows:

- Agricultural training and development projects
- Business skills development projects
- Education
- Energy/Bio-energy development projects
- Internationalisation
- IT development and training projects
- Regional business development projects
- Social infrastructure development projects
- Tourism
- Wellness technologies.

These projects aim at the development of the region with the help of training and information gathering and analysis. In this sense, they differ from traditional university research projects, which primarily focus on research and only secondarily think about the possible implementation into practice. The aim of these projects is to develop a variety of regional activities through training and network building. These development projects focus on the region of Central Finland. According to the rector of the JUAS, the mission and objectives of R&D are to promote internationally oriented training and the development of the community, which enhances competences, competitiveness, entrepreneurship and well-being for the population in the Central Finland. This means that the JUAS is a practically oriented organisation aiming to solve the problems raised by working-life organisations (Halttunen, 2006). According to Kainulainen (2004, p. 73), useful research means results which are quickly transferred and implemented into practice.

There are a number of critical factors when analysing the nature of these R&D projects. First, teachers normally act as the project researchers in the R&D projects. This means that the JUAS do not have a special category of a 'project researcher', who would be responsible for running projects. There are only a couple of exceptions to this rule. This institutional policy also means that teaching and the development of projects are integrated activities that aim at developing both teaching and the region. Second, students practicing in local labour market are seen as a very important source (and channel) of new ideas. This means that students often produce new ideas, which are further developed by their teachers. Third, there is a systematic way to strengthen the weak signals from the region in order to establish development projects which the region benefits from.

The crucial elements in this systematic way to strengthen the weak signals include the following practices: (1) it is recognised that the best ideas are born over a cup of coffee. In other words: there are informal social structures, which favour the brainstorming of new ideas and exchange of ideas in the study fields, (2) every study field has a project manager, who is responsible for developing new ideas into new projects, (3) there is also institutional support for developing ideas into projects.

The staff responsible for developing ideas into projects (three people) are located in the central administration. They choose the best projects and help to find funding for them. (4) The strategy of the JUAS guides the activities in these R&D projects.

A good example of the nature of an R&D project is provided by the Wellness Dream Lab, which is a project based on cooperation between regional business, JUAS and the University of Jyväskylä. The project employs four people (and a project manager), and it consists of 40–50 projects initiated by business enterprises. Normally, the students of the JUAS are employed by and in business enterprises. The project aims at and has succeeded in integrating the research capacity of the university with the interests of regional business and the development of teaching in the JUAS. The project has been funded mainly by public sources (Marttila et al., 2004).

The performance of the JUAS has been evaluated as one at an excellent level and it was rewarded by the Ministry of Education as one of the four centres of excellence for the regional development impact in Finland (Käyhkö et al., 2006). It was evaluated as being especially efficient in creating and implementing its strategy, with the main aim of the development of the Central Finland region. The strategy also guides the functioning of the polytechnic in all its activities, thus creating no need for a special strategy for regional development. In order to develop the functioning of the regional development further, the evaluators also suggested that JUAS should focus its activities on selected fields. In addition, they recommended that the polytechnic should increase cooperation with the University of Jyväskylä (which is located in the same city) (Käyhkö et al., 2006, pp. 46–48).

It has been argued that successes with R&D in the JUAS is made possible, at least partly, by the fact that practically all full-time teachers were transferred into total working-time in 2000, because of a new collective bargaining agreement. This, together with the new Polytechnic Act, is seen as the key to expanding the R&D work in polytechnics (Halttunen, 2006). However, in some polytechnics old staff members may be in a different agreement, which is based on the idea of counting teaching hours as the only basis for salary. In practice, this means that all work (except for teaching) has to be negotiated separately and teachers do not attend polytechnics full time.

Dilemmas and Challenges

Research and development in general did not originally belong to the objectives of polytechnics, but they were introduced to the polytechnics about 10 years after their establishment. This new task has raised a number of dilemmas and challenges. The basic question is always, which should come first: teaching or research? What is the nature of R&D in polytechnics, and who should do it and how? These issues have also been debated by the staff members of polytechnics over recent years. In this context, it is therefore understandable that the Ministry of Education supports activities like AMKtutka for building up common principles and practices. This indicates that there are emerging issues in polytechnics regarding the need to clarify

what R&D polytechnics should be involved in, and how R&D should be implemented. In order to contribute to this discussion, we have conceptualised two different solutions for organising and managing R&D in polytechnics.

The Organisation and Management of Research

There are two major strategies for promoting research (in the sense of Weberian ideal types) to illuminate the main ways of organising R&D in Finnish polytechnics. These can be called *the strategy of centralisation* and *the strategy of integration.*

The strategy of centralisation describes an organisational solution for concentrating all R&D activities into one separate R&D unit. The aim is to make R&D as efficient as possible through central steering of the development projects. The establishment of a central unit helps to recognise the importance of R&D. It also makes the use of resources more efficient, because of the qualified project management personnel. The emergence of a specialised staff, taking care of the development projects, enables the accumulation of project development and management expertise in the higher education institution. However, there can also be some problems with this strategy, because the emergence of a group of research specialists may lead to a situation in which people are more interested in finding new funding for paying their salaries than in thinking about the needs of the region. Another problem is the question of strengthening weak signals from the region.

The strategy of integration describes, in turn, the other end of the same continuum. According to this ideal type, the objective is to create institutional support structures for promoting the execution of R&D projects in the polytechnic and to integrate teaching development with R&D. This way of organising the R&D aims at strengthening weak signals from the region systematically and developing them into R&D projects. This activity is steered by the institutional strategy. This strategy also more easily integrates teachers with the R&D projects, which helps to maintain institutional curriculum development and regional development projects. However, the main problem with this strategy is the accumulation of expertise to run R&D projects. How to secure the accumulation of project management expertise, when there is no specialised group of staff members specialised in R&D projects?

Teaching and Research

Teaching higher vocational skills is the main objective of Finnish polytechnics. There are, however, three different traditions defining the purpose of teaching and training. According to Kotila (2004), the first of these may be called *apprenticeship ideal* with the social structure of novice (apprentice), journeyman and master. Basically, this is the continuation of traditional craft-guild model (Välimaa, 2007), which is based on the transfer of tacit knowledge from the master to the apprentice. Pedagogically, it takes support from the constructionist perspectives to learning and from the idea of learning by doing. The second tradition may be called the

tradition of vocational training. It is strongly influenced by the traditions of (former) secondary level vocational schools. Historically, it is important to remember that the present 28 polytechnics have been formed by merging some 215 vocational education institutions. Pedagogically, this tradition emphasises a strong teaching profession and hierarchical social structures between students and teachers. The *university tradition* is the most recent one. It exists in study fields that are closest to the disciplinary traditions in universities. Pedagogically, it repeats teaching methods used in universities in their respective disciplines. Basically, the main idea is to implement theoretical knowledge into practice.

These different traditions may be seen interacting with each other in Finnish polytechnics. Theoretically, we can see tensions between the aims to develop (tacit) skills through conceptualising the processes of making, producing and working in work places, as opposed to a traditional academic way which is based on the implementation of theoretical knowledge into practice (Pohjola, 2007). These tensions are related to the dichotomy between theoretical knowledge and praxis, or practical knowledge (see Dewey, 1929). There are also tensions between the expectations of students, who value learning by doing as opposed to the expectations of teachers, who belong to the tradition of vocational training with its emphasis on teaching the right skills to the students in the context of strong teaching profession.

These questions are connected back to the organisation of R&D in polytechnics. Namely, if one assumes that the university tradition should be followed, then one should organise R&D by following the model provided by the universities, where research outcomes are implemented into practice. The nature of the process would then be that of an implementation of research. However, if one assumes that apprenticeship ideal should be followed, the challenge is to conceptualise the practices in work places in order to reveal their tacit knowledge. These two extremes thus aim at pointing out that the organisation of R&D and teaching are closely related to each other in polytechnics. Therefore, it is quite important to decide which of the R&D implementation strategies will be followed.

Discussion: R&D or T&D Projects?

The two cases presented help to raise a fundamental question on the applicability of the concept of research and development, when trying to describe what is done in the name of R&D. Namely, the nature of the projects described above resembles that of ‘training and development’ more than that of ‘research and development’ projects. The idea of R&D may even be misleading, since it focuses attention on the traditional academic process of knowledge production with the aim to implement research findings into action. However, the training and development (T&D) projects are developed in the context of application – thus reminding us about the nature of Mode 2 knowledge production (Gibbons et al., 1994) – aiming at changing practices in cooperation with practical actors. This is not to say that these T&D projects would not utilise research. What we intend to say is that research activities are applied in the course of the T&D project, if and when needed. For this reason,

the traditional academic research is not necessarily the starting point for a development project. A case study conducted by Hyrkkänen (2007) also supports this argumentation. She noted that when R&D was started systematically in polytechnics, there were different views not only about the role of the students' theses in these projects, but also about the targets, contents, actors and the ways of organising training and development activities. In her research Hyrkkänen (2007) studied how teachers redefined the thesis process and its connections to R&D. She concludes that the concept of research and development is new to polytechnics, and when implemented, it requires the adoption of developmental research methods with different actors building the activities in polytechnics through discussions, analyses and arguments. This means that R&D as an idea needs to transport certain intellectual devices and techniques (from academic research) in order to be an efficient instrument for polytechnics.

Our concern for a proper concept has also a practical dimension, if and when we assume that concepts influence practices. We should investigate more closely the extent to which the category of R&D (as introduced by OECD) is a relevant concept for describing the T&D processes taking place in Finnish polytechnics. This is not to say that we should cancel the category of R&D, but the aim is to say that we should understand what it means in the context of polytechnics, which have both apprenticeship ideals and vocational and academic traditions influencing their organisation of teaching and development processes.

References

AMKOTA Database. (2004). Official statistics of polytechnic education in Finland. www.amkota2csc.fi

AMKtutka. The updated project plan 16.4.2007 (in Finnish), available at www.amktutka.fi *Ammattikorkeakoulujen tutkimus- ja kehitystyö. Nykytila ja tavoitteet*. Arene ry. 2007.

Davies, J., Weko, T., Kim, L., & Thulstrup, E. (2006). *Thematic review of tertiary education. Finland. Country note*. Paris: OECD.

Dewey, J. (1929). *The quest for certainty. A study on the relation of knowledge and action. Vol. 4. The collected works of John Dewey, later works*. Carbondale: Southern Illinois University Press.

Gibbons, M., Limogenes, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The new production of knowledge: The dynamics of science and research in contemporary societies*. London: Sage.

Halttunen, J. (2006). Ammattikorkeakoulun t&k-toiminta yliopistovetoisessa toimintaympäristössä. In *Korkeakoulutieto*, 2006 (3–4), 28–30.

Hyrkkänen, U. (2007). *Käsityksistä ajatuksen poluille: Ammattikorkeakoulun tutkimus- ja kehitystoiminnan kehittäminen*. Helsingin yliopisto, käyttäytymistieteellinen tiedekunta, kasvatustieteen laitos.

Kainulainen, S. (2004). Oikein, totta ja hyödyllistä. In H. Kotila & A. Mutanen (Eds.), *Tutkiva ja kehittävä ammattikorkeakoulu* (pp. 68–77). Helsinki: Edita.

Karppanen, E., Tornikoski, E., Töytäri, R., Urponen, H., Uusitalo, T., & Holm, K. (2007). *Lahden ammattikorkeakoulun laadunvarmistusjärjestelmän auditointi*. Helsinki: The Finnish Higher Education Evaluation Council (FINHEEC).

Käyhkö, R., Hakamäki, S., Kananen, M., Kavonius, V., Pirhonen, J., Puusaari, P., et al. (2006). *Uudenlaista sankaruutta. Ammattikorkeakoulujen aluekehitysvaikutuksen*

huippuyksiköt 2006–2007. Helsinki: Korkeakoulujen arviointineuvosto. Korkeakoulujen arviointineuvoston julkaisuja 13:2006.

Kotila, H. (2004). Tutkimus- ja kehitystoiminnan haasteet ammattikorkeakoulussa. In H. Kotila & A. Mutanen (Eds.), *Tutkiva ja kehittävä ammattikorkeakoulu* (pp. 11–23). Helsinki: Edita.

Marttila, L., Kautonen, M., Niemonen, H., & von Bell, K. (2004). *Yritysten ja ammattikorkeakoulujen T&K-yhteistyö. Ammattikorkeakoulut alueellisessa innovaatiojärjestelmässä: koulutuksen ja työelämän verkottumisen mallit, osaprojekti III*. Tampereen yliopisto, Yhteiskuntatieteiden tutkimuslaitos, Työelämän tutkimuskeskus. Työryhmäraportteja 69/2004.

NAO (National Audit Office of Finland). (2006). Valtiontilintarkastajien kertomus K 16/2006 vp.

OECD. (2003). *Polytechnic education in Finland. Reviews of national policies for education*. Paris: OECD.

OPM. (2004). *Development plan. Education and research 2003–2008*. Helsinki: Ministry of Education.

OPM. (2005). Ammattikorkeakoulut. Taulukoita AMKOTA-tietokannasta. *Opetusministeriön julkaisuja, 23*.

OPM. (2006). Ammattikorkeakoulut. Taulukoita AMKOTA-tietokannasta. *Opetusministeriön julkaisuja, 42*.

OPM. (2007). *Draft for development plan. Education and research*. Helsinki: Ministry of Education.

Pohjola, P. (2007). Taito, toiminta ja taustatieto. In H. Kotila, A. Mutanen, & M.-V. Volanen (Eds.), *Taidon tieto* (pp. 164–179). Helsinki: Edita.

Statistics Finland. (2006). *Yliopistojen ja ammattikorkeakoulujen ajankäyttötutkimus*. Helsinki: Edita.

Tutkimus- ja kehitystyö suomalaisissa ammattikorkeakouluissa. Opetusministeriön työryhmämuistioita ja selvityksiä 2004:7.

Välimaa, J. (2001). The changing nature of academic employment in Finnish higher education. In J. Enders (Ed.), *Academic staff in Europe: Changing contexts and conditions* (pp. 67–91). London: Greenwood Publishing Group.

Välimaa, J. (2005). Social dynamics of higher education reforms: The case of Finland. In A. Amaral, Å. Gornitzka, & M. Kogan (Eds.), *Reform and change in higher education* (pp. 245–268). Dordrecht: Springer.

Välimaa, J. (2007). Two training models in the continuum of Finnish doctoral training. In B. M. Kehm (Ed.), *Looking back to look forward* (pp. 73–92). Kassel: INCHER-KASSEL.

Välimaa, J., & Neuvonen-Rauhala, M. L. (2008). Polytechnics in Finnish higher education. In J. S. Taylor, J. B. Ferreira, M. L. Machado, & R. Santiago (Eds.), *Non-university higher education in Europe* (pp. 77–98). Dordrecht: Springer.

Valtiontilintarkastajien kertomus 2006. K 16/2006 vp.

Vesterinen, M. L. (2006). Tutkimus- ja kehitystyön kokonaisuus. In H. Kotila & A. Mutanen (Eds.), *Tutkiva ja kehittävä ammattikorkeakoulu* (pp. 40–67). Helsinki: Edita.