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Finnish Polytechnics in the Regional Innovation System
– Towards New Ways of Action

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Contents

List of figures

List of tables

Acknowledgements

My interest in studying polytechnics started at the beginning of the 2000s when I joined a research project in which Finnish polytechnic reform was being studied as part of the national innovation system. After that, my work on polytechnic research continued at the Work Research Centre at the University of Tampere, in a research project that investigated polytechnics' role in the regional context.

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Anu Lyytinen

Abstract

The aim of the research was to examine how the Finnish polytechnics have built their capacity for regional engagement. The framework of the analysis was based on the organisational change elements of the entrepreneurial university. Capacity building was examined from the viewpoint of the senior institutional management and the officers from regional authorities.

The study applied a multiple case study method using four case polytechnics: Jyväskylä Polytechnic, Satakunta Polytechnic, Seinäjoki Polytechnic and Tampere Polytechnic. Although all the case polytechnics were medium-sized, multidisciplinary and regional higher education institutions, they were located in different regional innovation environments which meant that they provided different perspectives of the research problem. The research data consisted of stakeholder analysis, thematic interviews and documents which were analysed using content analysis.

The research results indicated that the case polytechnics have built their capacities for regional engagement in several ways during recent years: polytechnics have developed and strengthened their managerial capacities. At the same time the collegial forms of governance have also been important for forming common strategies, practices and a shared culture for the whole organisation. Polytechnics have established diversified linkages to other actors in their environments even if the forms of these boundary spanning activities varied between the polytechnics. Differences existed also between the fields of education as to how close they are to the external environment and how easy and characteristic it is for them to adopt entrepreneurial behaviour.

Although polytechnics have built their capacity in several ways, there are still many factors that constrain polytechnics' development into more entrepreneurial organisations. When one is considering the extent to which the conceptualisations of the entrepreneurial university are applicable to the Finnish polytechnic context, it is important to realise the short history of polytechnics as well as their public mission which has been and still is particularly strong in Finland. The challenge is to find

ways of action that are appropriate in each region as well as to Finnish culture and society.

Key words: polytechnic, university of applied sciences, higher education, organisation, entrepreneurial, regional innovation system

Tiivistelmä

Tutkimuksessa tarkasteltiin, kuinka suomalaiset ammattikorkeakoulut ovat vahvistaneet kapasiteettiaan toimia alueellisesti responsiivisina korkeakouluina. Kapasiteetin vahvistamista tarkasteltiin yritysmäisen organisaation muutoselementtien viitekehyksessä ammattikorkeakoulujohdon ja keskeisten alueellisten sidosryhmien näkökulmasta.

Tutkimus toteutettiin monitapaustutkimuksena. Mukaan valittiin neljä monialaista ammattikorkeakoulua: Seinäjoen ammattikorkeakoulu, Satakunnan ammattikorkeakoulu, Jyväskylän ammattikorkeakoulu ja Tampereen ammattikorkeakoulu. Vaikka kaikki tutkimukseen osallistuneet ammattikorkeakoulut olivat monialaisia, keskisuuria ja alueellisia ammattikorkeakouluja, ne sijaitsivat erilaisissa alueellisissa innovaatioympäristöissä ja tarjosivat siten erilaisen näkökulman tutkimusongelmien tarkasteluun. Tutkimusaineisto muodostui sidosryhmäanalyyseista, teemahaastatteluista sekä asiakirja-aineistosta. Aineisto analysoitiin sisällönanalyysin avulla.

Tulokset osoittivat, että ammattikorkeakoulut ovat kehittäneet kapasiteettiaan monin tavoin: ammattikorkeakoulut ovat vahvistaneet johtamisjärjestelmiään ja yksilöjohtamisen edellytyksiä. Samanaikaisesti myös kollegiaaliset toimintatavat ovat olleet tärkeitä yhteisten strategioiden, käytänteiden ja jaetun kulttuurin luomisessa. Ammattikorkeakoulut ovat rakentaneet moninaisia yhteyksiä ja vuorovaikutussuhteita toimintaympäristönsä muihin toimijoihin. Nämä yhteydet olivat kuitenkin erilaisia eri ammattikorkeakouluissa. Myös koulutusalojen välillä havaittiin eroja siinä, kuinka luonteenomaista yritysmäisten toimintatapojen omaksuminen niille oli.

Vaikka ammattikorkeakoulut ovat vahvistaneet kapasiteettiaan monin tavoin, monet tekijät rajoittavat edelleen yritysmäisten toimintatapojen kehitystä ammattikorkeakouluissa. Kun ammattikorkeakouluja tarkastellaan yritysmäisen organisaation viitekehyksessä, on otettava huomioon niiden lyhyt historia korkeakouluina sekä julkinen missio, joka on ollut ja on edelleen erityisen vahva Suomessa.

Ammattikorkeakoulujen haastena on löytää sellaiset toimintatavat, jotka soveltuvat sekä sijaintialueen tarpeisiin että suomalaisen yhteiskunnan ja kulttuurin kontekstiin.

Asiasanat: ammattikorkeakoulu, korkeakoulutus, organisaatio, yritysmäinen, alueellinen innovaatiojärjestelmä

1
The change of the orientation of the higher education institutions in the Finnish polytechnic context

1.1   Policy context

Since the beginning of the 1990s, one of the topical challenges of international and national higher education policies has been to integrate higher education institutions more explicitly with the social and economic development of society (Hölttä 1995, 15; Maassen 2000, 377). The globalisation of the economy, supported by the liberalisation of trade and deregulation of the markets, as well as increased global trade competition and development of information technologies were the main reasons which aroused policy-makers into thinking that there was a growing need for strengthening knowledge-based innovation. This presupposed adoption of the science and technology system as the core element of societal development in many Western countries. Correspondingly, societies became more dependent on higher education for training and research and development. (Castells 2000; Nieminen 2005, 13–14; OECD 1999, 38; Schienstock 1999, 48; Slaughter & Leslie 1997, 25.)

In the Finnish context, these changes were amalgamated with several reforms comprising changes in the public administration's operating principles as well as in higher education, science, and technology policies. Even though these reforms were carried out separately, they formed a coherent unity that aimed at increasing the interaction between higher education institutions, research institutes and the business sector, as well as raising the efficiency of activities and competition between the actors. The assumption that competition increases the efficiency and effectiveness of activities has been favoured within public administration since the late 1980s. (Hakala, Kaukonen, Nieminen & Ylijoki 2003, 33, 39.) The idea was related to the changes in public administration which can be subsumed under the policy ideology called "New Public Management". Its basic idea is that public management – also

including higher education institutions – can be transformed so institutions move in a more entrepreneurial direction by adopting private sector styles of management, such as service and user-orientation and market-type mechanisms in the public sector. The implications of New Public Management were manifested in terms of deregulation, decentralisation and emphasising accountability in controlling and managing public sector organisations. A special feature of the Nordic countries has been efforts to modernise the functions of the state in the way it can deal with a changing environment. (Kickert 1997, 18–19; Lähdesmäki 2003, 69–70; Nieminen & Kaukonen 2001, 32; Nieminen 2005, 13–14; Pollitt & Summa 1997, 7.)

The principles of New Public Management were also applied to the steering of the higher education sector. In many countries governments considered that centralised planning would be an inefficient way for 'steering' higher education institutions in the rapidly changing society. The idea was that greater institutional autonomy would enable higher education institutions to adjust to or anticipate changing social needs and engage more actively in the economic and social development of society. In Finland, this was implemented in the first instance in the university sector by a governance model which transferred and increased the autonomy of the universities. In practice, the steering relationship between the Ministry of Education and universities was changed by simplifying the planning and budgeting dialogues between the Ministry of Education and universities as well as by adopting the system of performance negotiations and agreements as the main steering instrument. (Hölttä 1995; Hölttä & Rekilä 2003, 57–70; Nieminen 2005, 14–15; van Vught 2008.) Governments have encouraged higher education institutions to go beyond their traditional boundaries to make more direct contributions to "wealth creation", for example by establishing science parks, research and development centres as well as by initiating various programmes in order to promote knowledge transfer from universities and polytechnics to industrial and commercial users (Etzkowitz & Leydesdorff 1997, 1–2; Etzkowitz 2003, 109; Nieminen 2005, 13). In Finland, the implementation of the new steering model was linked particularly to the efforts to integrate higher education policy more closely with economic and industrial policies, and the development of information society (Hölttä & Rekilä 2003, 57). It is said that in Europe the governments have typically pushed higher education institutions in a more entrepreneurial direction 'top-down' (Etzkowitz 2003, 109).

The establishment of the Finnish polytechnic system during the 1990s was also integrated into the changes of the political-administrative strategy. Polytechnics,

Universities of Applied Sciences or the AMK system[1] as it is called in Finland – was established alongside the university sector to represent the professionally-oriented form of higher education. That is to say, the Finnish higher education system is differentiated into two types of institution: universities and polytechnics. These institutions have different roles in the system and they possess different views of student, faculty and administrative subcultures. The kind of single public system, which consists of a set of universities and a non-university sector financed primarily by the national government, is typical around the world (Clark 1983, 54, 102). However, in Finland, polytechnics are financed both by the central government as well as by local authorities, which is an internationally exceptional arrangement (Kohtamäki 2004, 49). That means polytechnics are affected by the exercise of bureaucratic and political coordination by both the state and local authorities (cf. Clark 1983, 120–121, 145–146).

As was the case in many other countries, bringing the needs of the business sector and working life nearer to education institutions was a central political priority behind the polytechnic reform (see e.g. Hackl 2008, 29; Klumpp & Teichler 2008, 101; Kyvik 2008, 173; Tulkki 1993). The aim was to build up a professionally-oriented higher education system able to respond flexibly to changing know-how and the skills demands of the business sector and working life, especially at the regional level. The goal was particularly to improve the services of higher education in those regions that did not have their own university (Government bill 319/1994). In order to strengthen polytechnics' frames of action and to make their co-operation with industry more flexible, the steering and management systems of polytechnics have been reformed step-by-step. The permanent position of polytechnics – granted between 1996 and 2000 – strengthened polytechnics' options for developing and directing their activities and relationships with their environment. That is to say, they were granted the status of a higher education institution, with their own governance, finance and management system as well as personnel. (Maljojoki 2002, 216, 231.) However, an OECD evaluation group (2002, 27–28) was critical at the beginning of the 2000s, because in many cases, the Finnish polytechnics had not succeeded in creating effective, entrepreneurial management and governance

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1   The Finnish "ammattikorkeakoulu" does not have exact foreign role model in other countries. Thus, the term "ammattikorkeakoulu" has no direct English translation. AMK, University of Applied Sciences and polytechnic are the most typical English translations of ammattikorkeakoulu. The term "polytechnic" has been and is the most established term and counterpart for the "ammattikorkeakoulu" in official parlance: e.g. Ministry of Education and Culture and Eurydice use the term "polytechnic". However, it has been argued that the choice of English translation is an issue that belongs to polytechnics' own decision-making authority (Aarrevaara 2007, 269). The Rectors' Conference of Universities of Applied Sciences made a recommendation to Finnish polytechnics in 9.12.2005 to use the term University of Applied Sciences. Most of the AMKs translate their name University of Applied Sciences. The term "polytechnic" is used in this study because the research data was collected in 2003–2005 (before the December 2005) and polytechnic still is the most established term and counterpart for the "ammattikorkeakoulu" in official parlance.

structures. Instead, their governance structures reflected the strong emphasis on the regional and development dimension of the polytechnics that address the interests of regional stakeholders rather than linking these interests to the needs and interests of the polytechnic institution itself. In addition, the members of the ownership body of municipal polytechnics have been selected on the basis of their municipal involvement and not on the basis of knowledge of the polytechnic sector. This means that some members have given priority to the interests they represent rather than to the interests of the polytechnic.

Legislative reform in 2003 improved polytechnics' operation options and regional responsibilities. The Polytechnics Act (351/2003) expanded polytechnics' tasks by elevating applied research and development to the same level as a polytechnic's basic tasks, parallel with education. It also strengthened polytechnics' regional responsibilities by emphasising the responsiveness of teaching and applied research and development to the needs of working life and regional development. At the same time, the act stated that polytechnics have autonomy in dealing with internal issues. The central aim of strengthening their autonomy was to improve the possibility for polytechnics to co-operate flexibly and quickly with business and industry (Government bill 206/2002). The Government's Development Plan for Education and Research as well as the common objectives of the polytechnic system (for years 2004–2006) support these targets. By setting the general guidelines to improve the polytechnics' structure, education provision and project and service activities, polytechnics will be capable of supporting their development goals as well as creating and strengthening networks and co-operation with regional stakeholders, particularly universities (see also Ministry of Education 2004a, 46; Science and Technology Policy Council of Finland 2003).

It seems that the basic tasks of polytechnics are being continualy reassessed, particularly in terms of the contribution they can make to the socio-economic well-being of their environment. One can now speak about the third mission: outreach, community service or regional engagement by referring to the intensification of the linkages between higher education institutions and their regions through teaching and research. The regional responsibilities and co-operation relationships have also brought polytechnics nearer to entrepreneurial ways of action. (cf. Auvinen 2004, 158; Jongbloed et al. 2008, 306.) However, it is important to remember that the whole Finnish polytechnic system has been operating on a permanent basis only since August 2000 and the new tasks were confirmed in August 2003. Thus, the history of these activities is still young and they are still seeking their 'shape'.

1.2   Research context

The central aim of the innovation policy and related research in 1990 was to understand how higher education institutions and science change as part of the knowledge society (Miettinen & Tuunainen 2006, 16). The conceptualisations of triple helix relations between universities, industry and government (Etzkowitz & Leydesdorff 1997), the entrepreneurial university, enterprise university (Clark 1998a; Etzkowitz, Webster, Gebhardt & Terra 2000; Marginson & Considine 2000), academic capitalism (Slaughter & Leslie 1997), and Mode 2 knowledge production (Gibbons, Limoges, Nowotny, Schwartzman, Scott & Trow 1994; Nowotny, Scott & Gibbons 2002) have been influential attempts to redefine the social role of the university and science in the knowledge society (Miettinen & Tuunainen 2006, 16). The approaches emphasise changes at different levels: from institutional convergence between universities, industry and government to changes in organisation, academic work and the knowledge production process. It is essential for all of them to consider how higher education institutions and science can contribute more actively to the knowledge society.

The triple helix thesis considers that universities can have an enhanced role in innovation in knowledge-based societies. The basic assumption of the triple helix thesis is that knowledge production takes place on the network overlay between universities, government and companies in which communications and expectations reshape institutional arrangements among the actors. Each of these actors has their own tasks but the boundaries between institutions are getting dimmer and they have started to adopt each others' tasks. (Etzkowitz & Leydesdorff 2000; Miettinen & Tuunainen 2006, 18.) From the viewpoint of universities and other higher education institutions, this refers to incorporation of the traditional academic mission into a compatible relationship with the capitalisation of knowledge. In practice, this means that scientists have started to look at their work from the viewpoint of commercial potential while simultaneously pursuing theoretical and methodological advancement. (Etzkowitz 1998, 826–827; Tuunainen 2005, 278.)

Slaughter and Leslie (1997) have studied entrepreneurship from the viewpoint of academic work and professional labour. Their main argument is that the structure of academic work is changing as a response to the emergence of global markets. They argue that the competition for global market shares has pushed Australia, the United Kingdom and the United States to develop national higher education and research policies that have promoted market and market-like behaviour by academics. Slaughter and Leslie call that kind of behaviour "academic capitalism" which involves competition for funds from external resource providers and the institutional and professional efforts to secure external funds. According to Slaughter and Leslie, academic staff members increasingly have to use their time and human capital stocks in a competitive situation, competing for financial resources. These resources are often tied to market-related research that is applied, commercial, strategic and

targeted research, which is funded in the form of research grants, service contracts, partnerships with industry and government, or technology transfer. Slaughter and Leslie nominate academic staff as the state-subsidised entrepreneurs who act as capitalists from within the public sector. (Slaughter & Leslie 1997, 9, 209–211.)

Burton Clark (1998a) has studied the organizational pathways of universities to entrepreneurial direction through five case studies of English, Dutch, Scottish, Swedish and Finnish universities. Clark's basic assumption is that there is a deepening imbalance between environmental demands and the institutions' capacity to respond. Accordingly there is need to transform the organisational elements of higher education institutions to strengthen their capacity to respond more flexibly and selectively to changes taking place both in the external environment as well as in the knowledge domain of higher education institutions. (Clark 1998a; see also Sporn 1999a, 60.) As a result of the case studies, he summarised five organisational elements that he concluded to be important in transforming universities to more entrepreneurial ways of action. These elements are the strengthened steering core, the expanded developmental periphery, the diversified funding base, the stimulated academic heartland and the integrated entrepreneurial culture. (Clark 1998a.) That is to say, he analysed management and governance as well as the academic functions of universities. Instead of emphasising only managerial values, Clark sees it as important that traditional academic and managerial values and goals can and should flourish side by side (see also Hakala et al. 2003, 17). Even if Clark does not explicitly mention regional engagement as one of the transformation characters, the realisation of the universities' societal potential and relationships with the environment were significant ways through which the case study universities transformed themselves into entrepreneurial and responsive institutions (see OECD 1999, 41).

It is also argued that the knowledge production process has changed. The change is related both to the organisation of research as well as its cognitive dimension in terms of the goals of the research, how it is organised, and the reward systems and the mechanisms used to control quality (Gibbons et al. 1994; Hakala et al. 2003, 20; Nieminen 2005, 18; Nowotny et al. 2002). According to Gibbons et al. (1994), a characteristic of these changes is transformation from disciplinary-based and university-centred knowledge production to trans-disciplinary, application and problem-oriented research. Universities are no longer the only places where knowledge is produced. Research activities are also carried out in non-university institutions, government agencies and through consultancies. Typical for this Mode 2 knowledge is that it aims to be useful for someone whether it is to industry, government or society and also the value and quality of research is evaluated increasingly based on its ability to offer solutions to different social problems. That means social accountability permeates the whole knowledge production process, from defining research priorities and problems to interpretation and diffusion of research results. In addition, the process presupposes close interaction between many actors. The changes in the organisational and cognitive spheres of knowledge production have

integrated higher education institutions and science more closely into its social context. (Gibbons et al. 1994, 1–16; see also Hakala et al. 2003; Nieminen 2005, 17–18; Nowotny et al. 2002.) However, the disciplines' orientations are different and they respond differently to the needs of the market (Hakala et al. 2003, 193; Ylijoki, Lyytinen & Marttila in press).

Studies such as the one by Slaughter and Leslie (1997) indicate that most research results point to the fact that entrepreneurial behaviour by higher education institutions is a consequence of changes external to the higher education institutions. These external factors include in particular political pressures and financial scarcity, especially cuts in budget funding (e.g. Slaughter & Leslie 1997; Marginson & Considine 2000; Williams 2003, 3–4). It is widely thought that higher education institutions only adapt reactively to environmental changes. That means, the policies and funding systems of governments push higher education institutions towards contributing to the development of the knowledge society (Etzkowitz 2003, 109; Shattock 2005). In addition, it is argued that different kinds of universities in different countries adopt dissimilar pathways towards entrepreneurialism (Tuunainen 2005, 284; Marginson & Considine 2000). Apart from Clark, little attention has been paid to the active role of higher education institutions or their actors that are able to transform their practices in ways that are meaningful from their own viewpoint (Clark 1998a; Nieminen 2005, 27).

In addition, studies emphasise primarily the economic aspect of entrepreneurship and consider it as the business-oriented activity that aims to gain additional funding and to generating economic profits. In that case, alliances with industry and company-formation are means for diversifying the funding base. (e.g. Slaughter & Leslie 1997; Etzkowitz & Leydesdorff 1997; Etzkowitz, Webster, Gebhardt & Terra 2000, 313–330.) However, in the higher education context, entrepreneurship is not only about generating resources or commercialising research results but it encompasses also academic dimension. That is to say enterprise is as much about generating institutional prestige as about income (Marginson & Considine 2000, 5). It can also be seen as an enabling process which stimulates research and innovation and generates activities that establish a distinctive institutional profile. That kind of activity can be new operational models, regional outreach programmes, business incubation programmes, distance learning ventures or investments in spin-off companies, for example (Etzkowitz et al. 2000, 51; Shattock 2005, 13; Shattock & Temple 2006; Williams 2003, 10).

In the Finnish polytechnic context, the primary benefits of external research and development collaboration are considered to come from expanding the networks and know-how of teachers and students as well as by developing degree programmes and curricula rather than generating financial resources (Lyytinen, Marttila & Kautonen 2008, 41–43; Marttila, Andolin, Kautonen, Lyytinen & Suvinen 2007, 57). It is argued that innovation processes often presuppose the exchange of commodities for which value is not easy to measure, such as know-how and technological capability which

are not easily handled through market transactions (Edquist 2001, 3). That kind of collaboration is based more often on a network form of organisation that is more dependent on relationships, mutual interests, trust and reputation than direct market transactions (Powell 1990, 295–336).

It is also important to realise that most of the results of the research regarding entrepreneurial universities reflect the change of higher education and research systems in Anglo-American countries in which universities gain a significant amount of their income from the markets. Actually, the lack of centralised control has forced American universities to become more entrepreneurially-run than their European counterparts and to develop their research and curricula to be more responsive to changing socio-economic demands. (Mowery & Sampat 2005, 215; see Ben-David 1968, 45–47, 87–92.) Even if the structures of Finnish higher education institutions are under construction and the higher education institutions are going to acquire more flexible frames of action, the situation is somehow different in Finland. Higher education institutions have a long tradition of being exclusively public and non-profit organisations. That is, the ownership, organisation and finance of the Finnish education system have been in public hands (Ojala 2003, 130). The regulative frameworks of Finnish polytechnics are set by the two-level public actors: state and the local maintaining organisations. That means polytechnics are legally and financially closely linked both to the Ministry of Education and Culture and their local maintaining organisations. (Kohtamäki 2009, 25, 57.) Since the beginning of 2011, four Finnish polytechnics have been operating under the ownership of municipalities and seven polytechnics under the ownership of joint-municipal bodies that are in charge of their polytechnics' budgets and strategic development. Accordingly, it is not possible to transfer without qualification the models of other countries to the Finnish context.

1.3   Aims of the research

The common feature of all the above-mentioned challenges has been the demand for higher education institutions to act as more open and responsive organisations in relation to their environment. The challenge is topical particularly for the polytechnics, whose mission includes being responsive to the needs of the local and regional economy. However, there are few studies concerning the polytechnics' role as part of the regional economy (e.g. Hazelkorn 2003; Kyvik & Skodvin 2003; Laine 2004; Lyytinen, Kuusinen & Niemonen 2003; Lyytinen, Marttila & Kautonen 2008; Marttila, Kautonen, Niemonen & von Bell 2004; 2005; Marttila et al. 2007; Suvinen, Kautonen, Niemonen, Marttila & Lyytinen 2006; Tulkki & Lyytinen 2001). This research contributes to the field from the viewpoint of Finnish polytechnics. The research task is to examine how the Finnish polytechnics have built their capacity for

regional engagement. The framework of the analysis is based on the organisational change elements of the entrepreneurial university (Clark 1998a). It is also an aim of the study to evaluate the applicability of these concepts to Finnish polytechnics' regional engagement.

The research questions can be formulated as follows:

- How have the polytechnics strengthened their institutional capacity for regional engagement?
- What kind of linkages have polytechnics established with the other actors of the environment?

The research has been carried out using a multiple case study method with four case polytechnics – Jyväskylä Polytechnic, Satakunta Polytechnic, Seinäjoki Polytechnic and Tampere Polytechnic. All of them are medium-sized and multidisciplinary polytechnics but they are located in different regional innovation environments. That means they provide different perspectives of the problem. The aim of the study is also to analyse across the cases whether the polytechnics' strategies to build their institutional capacity vary in distinct regional innovation environments (cf. Clark 1998a; Isaksen & Remoe 2001, 300).

1.4   Structure of the study

The study consists of eight chapters presenting the study's background, framework, methodological choices, and research results as well as conclusions and discussion. The first two chapters present the contextual framework of the study. The role of higher education institutions in society has changed since the 1960s following the general socio-political changes of the society. Chapter 2 describes the changing role of the higher education institutions from being the builder of the welfare state in the 1960s to becoming the central actor in the knowledge society and innovation system in the 2000s. The chapter also presents the steering system according to polytechnics' regional engagement.

Chapters 3 and 4 introduce the key concepts of the study. Chapter 3 starts with a discussion about the concept of innovation and the evolution of innovation from linear to interactive models and national and regional innovation systems. The conception of innovation as an interactive and systemic process highlights that innovation evolves in co-operation and interdependence with several actors. The entrepreneurial behaviour can be one strategy of a higher education institution to respond to the needs of the knowledge society (cf. Cooke et al. 2000, 34). Chapter 4 analyses how the research literature uses and applies the conceptualisations of entrepreneurship and entreprenerial university for describing and explaining the changing role of higher education institutions and science as part of the knowledge

society. The chapter concludes with Burton Clark's (1998a) study of the organisational dimensions of entrepreneurial university, which forms the framework of the study.

Chapter 5 deals with the methodology and data collection methods of the study. The study applies a multiple case study design which consists of four cases. Presenting the results of the study starts the within case analyses in Chapter 6. This chapter analyses how each case polytechnic has built its institutional capacity for regional engagement within the framework of organisational change elements which covered changes in management and governance, external linkages, funding, academic units and culture of polytechnics. Chapter 7 analyses the results across the cases. It describes the similarities and the differences among the cases. Chapter 8 gathers the research results together. It discusses the applicability of the conseptualisations of entrepreneurial university and especially Clark's concepts in the Finnish polytechnic context. It particularly analyses how well those concepts are suited to describing how Finnish polytechnics build their capacity for regional engagement.

2
Polytechninics in the changing environment

2.1 The changing role of higher education institutions in the knowledge society – challenges of the innovation policy to higher education institutions

2.1.1 Higher education institutions as part of the development of the welfare state

The regional role of higher education institutions has changed over time. As Cerych and Sabatier (1992, 1009) argue, the assumption that at least some higher education institutions should serve their surrounding regions has been the footing of development of higher education systems in many countries since the 1960s. Higher education institutions have been established particularly in regions either lacking educational opportunities or in those where existing options were considered to be insufficient compared with those available in other parts of the country. The focus was particularly on the regions which had hitherto been geographically, economically, socially or culturally disadvantaged. The goal of the establishment of the new higher education institutions was to respond to the specific needs of each region. Several reasons were behind the development, for example, criticism of traditional universities as "ivory towers", the aim of justifying the belief that education can be a powerful factor in economic growth in the region as well as in achieving the goal of interregional equalisation. (Cerych & Sabatier 1992, 1009.)

It can be said that emphasising the regional tasks of higher education institutions has been a typical feature particularly in Finland and other Nordic countries (Gulbrandsen 1997, 130; Williams 1992, 848). In Finland, the most important questions of science policy from the 1960s to the 1970s were the promotion of the welfare state and democracy. In those days, higher education was particularly considered to be the central tool of regional policy. (Hakala et al. 2003, 32; Hölttä &

Pulliainen 1996, 119.) Respectively the most valuable attributes of scholarly research were considered to be social relevance and the advancement the goals of the welfare state through democratic social policy and planning. These priorities implied an essential role for the social sciences. At the same time, university-industry co-operation was often dicussed in a critical manner. (Kaukonen & Nieminen 1999, 174.) That is to say, the regional role of the higher education institutions was strongly intertwined with the development of the welfare state. Simultaneously the local economies were growing and social services expanding at the regional and municipal levels. As consequence, there was an increasing need for a qualified labour force. The aim of higher education policy was to secure equal educational possibilities in all parts of the country as well as to speed up the regions' economic growth and to diversify their cultural activities. Thus, higher education institutions were given a special role, particularly in the rural regions. By increasing access to the universities and by motivating talented persons to move to rural areas, the government aimed at promoting social and geographic equality. Between the years 1960 to 1970, new universities were established in all central provinces of the country. It was assumed that the existence of higher education institutions as such would generate many indirect and long-term positive impacts on the regions. (Hölttä 1988, 91; Hölttä & Pulliainen 1996, 119; Välimaa 1994, 150; Välimaa 2001, 29.)

2.1.2   Higher education institutions in the national innovation policy and system

Since the 1980s, the values and priorities for higher education institutions and their role as social institutions have changed a lot (Hölttä 1988, 91). These developments were affected by the economic recession of the 1970s, the internationalisation process, and the economic challenges from Japan and some "just industrialised" countries. Globalisation and increased global trade competition had been hastening the demand for innovation since the late 1980s. (Nieminen 2005, 13.) From the Finnish and European viewpoint, the development was strongly intertwined with the construction of the European Union and its policy priorities and instruments. Science and technology have been at the core of the European political formation from the beginning. Innovation expanded the action agenda at a time when the member states wanted the European Union to be the most competitive knowledge-based economy in the world. (Borrás 2003, 1–2.) The aim of the so-called Lisbon strategy is particularly to close the gap between Europe and its main competitors, the United States and Japan, and to make Europe the world's most competitive and dynamic economy. For this purpose, the Commission is building an innovation-oriented strategy around the concept of a European Research Area (ERA). (de Bruijn & Lagendijk 2005, 1153–1154.)

At the same time, the socio-economic development of societies has become even more dependent on knowledge production by universities and colleges. In many

countries, socio-economic development has been linked to the development of the knowledge-based economies in which the role of the higher education institutions and research institutes were considered to be significant in producing, transmitting and transferring knowledge. (Gornitzka & Maassen 2000, 225; Nieminen 2005, 13, see also OECD 1996.) In practice this means that higher education institutions are expected to develop and provide new research knowledge, educate and develop human resources as well as disseminate knowledge and provide more direct and short-term problem-solving to the needs of industry and other organisations (Nieminen 2005, 13, see also OECD 1996). However, in Europe there is a lot of diversity in attempts to get higher education institutions to become engaged more effectively in innovation (Lundvall 2001, 282). The governments have integrated higher education institutions more strongly into social-economic development by increasingly allocating discretionary research and training funding into programmes that focus on production aspects of the higher education, programmes that complement areas of innovation in the industrial sector and / or focus on the national priorities of economic development (Maassen 2000, 377; Slaughter & Leslie 1997, 14, 17). It is claimed that in the USA, Canada, Australia and the United Kingdom, the integration of higher education institutions into society has taken the form of market-type interactions while in Continental Europe, the relationship between higher education and society can be characterised mainly as the network-type of relationship. In these countries, the state has continued to be an important actor. (Maassen 2002, 23.)

The structural change of society as well as the economic recession at the beginning of the 1990s also challenged the Finnish government to adapt the policy priorities and to change direction. The main changes were manifested in terms of deep economic recession, changes in the production structure as well as efforts to develop Finland into an information society. (Nieminen 2005, 60.) During the 1980s, economic growth was faster in Finland than in many other industrialised countries. However, at the beginning of the 1990s, Finland descended into one of the worst recessions in its history. The gross domestic product dropped about 14 per cent from 1990 to 1993. In addition, unemployment rose from 3 per cent to 20 per cent in four years. As a consequence, mass unemployment became one of the biggest problems for the public policy of the 1990s. (Ali-Yrkkö et al. 2000, 6; Miettinen 2002, 68; Nieminen 2005, 60.)

Finland has traditionally been known for its forest economy, especially the pulp and paper industry. During the past 20 years, the production structure of the industry has changed a lot in terms of increasing knowledge-intensive production, rapid technological development and growth of production. In addition, the export industry was significantly diversified and internationalised. Four factor intensities – capital, raw materials, energy and economies of scale that previously characterised the production structure have mainly been depicted by one factor, knowledge. As a whole, the development can be characterised as the transition from a factor-driven to a knowledge-based economy. (Ali-Yrkkö et al. 2000, 6; Lemola 2001, 43; see also Vartia & Ali-Yrkkö 1996.)

At the end of the 1980s, political attention was focused increasingly on the integration of science and technology (Hakala et al. 2003, 32; Nieminen & Kaukonen 2001, 31). The aim was to integrate these so far separately organised science and technology policies into an integrated innovation policy (Miettinen 2002, 60). A concrete outcome of this integrated innovation policy was the establishment of the *Science and Technology Policy Council* of Finland in 1987, the successor of which from the beginning of the 2009 was the Research and Innovation Council (Figure 1). The Science and Technology Policy Council was established as the expert body of the government and ministries. It directed, integrated and set guidelines for science and technology policies and defined the general strategy of the national science and technology policy in its three-yearly review. The Council was part of the national science and innovation policy decision-making process and it consisted of ministers, representatives of central funding agencies, universities and labour market organisations. The Prime Minister acted as the chair of the Council. The Council co-ordinated co-operation between the Ministry of Education and the Ministry of Employment and the Economy and the Council's planning officers were located within those ministries. (Hakala 2003, 192–193; Miettinen 2002, 60; Ministry of Education 2010a.) Alongside these duties, the new Research and Innovation Council deals with tasks relating to the comprehensive monitoring and promotion of innovation policy. The Council's membership criteria have also been changed: there are fewer quota-based memberships but the total number of members remains unchanged (max. 18 members). (Finnish science and technology information service 2010a.)
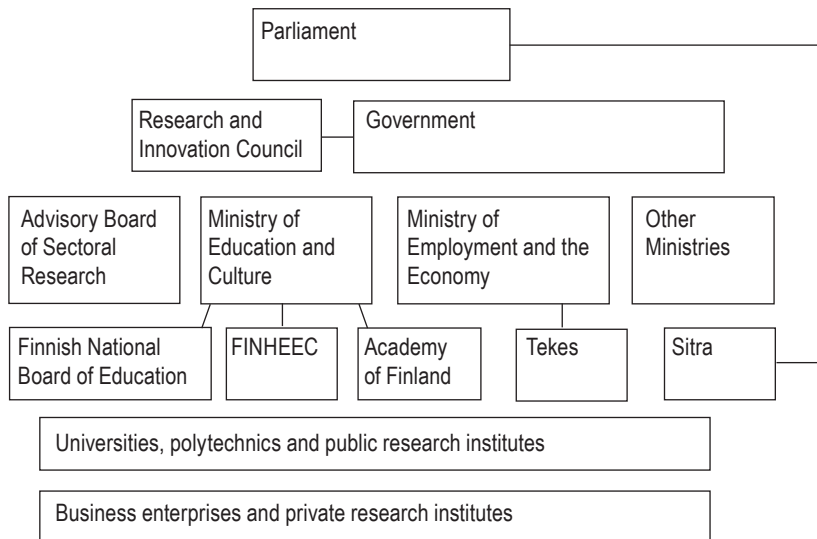
Source: Adapted from Finnish science and technology Information Service 2010b (Research.fi)

FIGURE 1. The administration of Finnish higher education institutions and research

The Ministry of Education, the name of which was changed to the Ministry of Education and Culture from May 2010, plays the role of the education and science ministry. It controls higher education institutions – universities and polytechnics – by regulation, funding and information provision as well as channelling funding through the *Academy of Finland*. (Hakala 2003, 192–193; Miettinen 2002, 60; Ministry of Education 2010.) The Academy of Finland is the central financing and planning body of high-quality scientific research. It is composed of the national research councils (Science and Technology Policy Council of Finland 1990, 8). The main instrument of the Ministry of Employment and Economy[1] is to allocate funding to applied research and development mainly through *The Finnish Funding Agency for Technology and Innovation* (*Tekes*) (Hakala 2003, 192–193). Tekes finances and activates challenging research, development and innovation activities of universities, higher education institutions, research institutes and companies in Finland (Tekes 2010). It has a strong role in supporting public – private sector research and in the development of collaboration between the higher education institutions, research institutes and industry and business. The role of Tekes can be seen as being two-dimensional: Tekes provides finance and creates environments (through technology programmes) for higher education institution – industry cooperation. In addition, it helps potential partners to find each other. (Nieminen & Kaukonen 2004, 203.) Co-ordination of research funding through Tekes and the Academy of Finland has made research funding more competitive since the funding is allocated competitively and is based on the relevance of the research proposals (Nieminen 2005, 68).

The Advisory Board for Sectoral Research, established in 2007, co-ordinates the overall oversight of state 'sectoral' research. Sectoral research refers to research activity that produces knowledge that can be utilised in certain administrative branches. (e.g. Ministry of Education 2006, 10.) For example, the Technical Research Centre of Finland (VTT), which provides its clients with high-level technology solutions and innovation services, operates in subordination to the Ministry of Employment and the Economy (VTT 2009, 4). Correspondingly, the National Institute for Health and Welfare acts in subordination to the Ministry of Social Affairs and Health. This means that sectoral research is mainly carried out in the research institutes which operate under the budgets of various Finnish ministries but it is also carried out in university units. The Advisory Board of Sectoral Research oversees and develops sectoral research and its utilisation within government, co-ordinates and puts forward proposals for the implementation of sectoral research programmes, and monitors the implementation of programmes. (Ministry of Education 2010b.)

The Finnish Innovation Fund (*Sitra*) is an independent public fund, which operates under the supervision of the Finnish Parliament. It aims to promote the welfare of the Finnish society. Sitra's operations are organised as the fixed-term programmes

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1   The operation of the Ministry of Trade and Industry and the Ministry of Labour expired on 31.12.2007. Their activities have been transferred to the Ministry of Employment and the Economy, which started its operations on 1.1.2008.

that are comprised of studies, strategy processes, innovative experiments, business development and corporate funding. (Sitra 2006.)

It was the Science and Technology Policy Council that initially introduced the new concept of the *national innovation system* as the comprehensive tool for analysing, studying and assessing the function of the science and technology system in the early 1990s (Hakala 2003, 193; Nieminen 2005, 57; Science and Technology Policy Council 1990, 21–23). The development of the national innovation system was considered to be a strategic choice of the country in the situation of economic recession of the 1990s (Miettinen 2002, 68). The concept was not a Finnish invention, however. The economist Christopher Freeman (1987) had already introduced it in the international scientific context in the late 1980s and Bengt-Åke Lundvall (1992) developed it further. Along with the scientific discussion, the innovation system concept was established in the political agendas in many countries. Among these countries, Finland was the early adopter of the concept. It took several years before the discussion was extensively widened within the OECD, which is the central discussant of the economic development in the industrialised countries. (Miettinen 2002, 60–61.)

In Finland, the new ideology was based on three core concepts: the national innovation system and its basic elements, knowledge and know-how. The Science and Technology Policy Council (1990, 21) defined the national innovation system as the whole set of actors influencing the development and utilisation of new knowledge and know-how. The new conceptualisation made it possible to consider science and technology policies in a wider framework and to consider different elements of the development and utilisation of knowledge and know-how in one entity as well as to analyse the interrelationships between the different actors. The close interaction and co-operation among the actors characterises innovation system. Both the research and development system and the education system were considered to be the core of the innovation system. (Lemola 2001, 44–45; Nieminen 2005, 58; Science and Technology Policy Council 1990, 21–23.) Accordingly, the policy emphasised the role of the higher education institutions and research institutes as the integral parts of the national infrastructure as well as engines of knowledge and technology development, which presupposes them even closer and more direct co-operation with industry sector (Hakala et al. 2003, 32–33; Hölttä & Malkki 2000, 231; Hölttä & Pulliainen 1996, 119; Lampinen 2000, 82). In other words, it saw the role of higher education and research primarily as the instrument for producing economic and social prosperity for the country. The Science and Technology Policy Council first regarded polytechnics to be part of the innovation system in its report in 2000 (Science and Technology Policy Council 2000).

The government supported the development by its financial investments in research and development, particularly in the technical and natural scientific fields, extending researcher education, launching the centre of excellence policy and by

encouraging companies to conduct research and development of their own (Eela 2001, 16, see Nieminen 2005, 55–56; Hakala 2003, 194).

The government invested in research and development by increasing the share of national gross domestic product that is devoted to research and development. It decided to increase research funding by FIM 1.5 billion between 1997 and 1999. Most of this extra funding was allocated to companies through Tekes and to higher education institutions through the Academy of Finland. In addition, an extensive share of the money was allocated through research and technology programmes. These programmes have supported the development of certain disciplinary and multi-disciplinary fields as well as increased co-operation between higher education institutions and the business sector. (Hakala et al. 2003, 29; Hara et al. 2000, 9.)

The policy also emphasised the role of the postgraduate education of the staff required for research and development (Husso 2005, 53; Science and Technology Policy Council 1990, 21–23). It had been observed that the previous system had several shortcomings: postgraduate degrees were taken at a relatively old age, there were shortcomings in the quality of education, and collaboration between universities at the national and international levels was inadequate. In addition, persons with postgraduate degrees had placement difficulties in the labour market and poor career prospects. (Science and Technology Policy Council 1990, 18–19.) The economic recession increased pressures for postgraduate education to be intensified and reorganised. The funding (8.1 million euros) allocated to higher education institutions through the supplementary budget in 1994 made it possible to establish the graduate school system quickly in Finland. The graduate school system expanded progressively in Finland. The first 69 graduate schools with 722 places started their operations at the beginning of the 1995. In 2003, the Ministry of Education funded 114 graduate schools and 1426 places. (Husso 2005, 53–56.)

In practice, the establishment of the graduate school system meant reformation of the organisation and workings of postgraduate education. Universities were obliged to provide systematic guidance, teaching and courses as well as provide postgraduate students with work premises and facilities. The American graduate school system operated as the role model for the Finns. (Aittola & Määttä 1998, 12; Hakala et al. 2003, 38.) However, special characteristic for the Finnish graduate school model is that most of the schools are network schools under one department or several departments/universities. The role of the Academy of Finland is important in the selection process of the graduate schools and in funding courses: It makes decisions on doctoral programme positions and operating grants for doctoral positions. The Ministry of Education and Culture allocates the doctoral programme positions to universities in accordance with these decisions. (Dill et al. 2006, 37–40.)

Another significant reform of the 1990s was the centre of excellence policy and the establishment of the centres of excellence in research and the centres of excellence in university and polytechnic education. The Academy of Finland is in charge of making proposals for the centres of excellence in research. The selection

is based primarily on high scientific quality. The Ministry of Education and Culture chooses the centres of excellence in education from proposals of the Finnish Higher Education Evaluation Council. (Hakala 2009, 46–47; Hakala et al. 2003, 36–37.)

Supporting education and research in technical and natural scientific fields was also at the core of the government's policy. In order to respond to the shortage of skilled personnel, the Ministry of Education launched a special programme between 1998 and 2002 to expand education leading up to a university degree in fields relevant to the information industries (e.g. electrical engineering, information technology, electronics, telecommunications and data processing). The programme consisted of three main elements. The number of professional upgrading programmes was increased, researcher training focusing on the information industry fields was expanded, and in addition, educational supply within these fields was enhanced by increasing undergraduate student intakes. (Hara et al. 2000, 9; Kivistö & Aarrevaara 2005, 8, 10; Ministry of Education 1998.) During the 1990s, the number of new information technology engineering students increased fivefold (Tulkki 2001, 45–46).

Another significant reform of the science and technology policy of the 1990s was the strengthening of the regional dimension of the innovation policy. The importance of spatial – regional but also international dimensions of the innovation system was emphasised, particularly as consequence of the visible role of the European Union and its Structural Funds. (Hakala 2003, 204–205; Lemola 2001, 47; Nieminen & Kaukonen 2004, 201.) The practical implication of regional innovation policy was the diversification of the actors contributing to innovation activities at the regional level. Among these were the establishment of regional science parks, centres of regional expertise and the polytechnic system (Science and Technology Policy Council 2000, 2003). It is even argued that the establishment of the Centre of Expertise Programmes and the regionally extensive polytechnic system have been the most influential signs of the new focus of Finnish regionally-oriented innovation policy (Schienstock & Hämäläinen 2001, 213; Schienstock, Kautonen & Koski 2004, 128).

2.1.3   Regional innovation policy and higher education institutions

Regional innovation policy and regional governance
The reason for strengthening the regional dimension of innovation policy was based on the view that innovation activity is also a territorial phenomenon. That means innovation is stimulated by co-operation between local actors and location-specific resources. Accordingly, innovation processes are seen to be interactive learning and knowledge upgrading processes that are socially and territorially embedded. (Isaksen & Remoe 2001, 286, 288; Lundvall & Borras 2005, 614.) That is to say, regions are considered to be dynamic units of economic and innovation development. According to Cooke, Boekholt and Tödtling (2000, 2) regions have to be understood as the

meso-level entities which operate politically and administratively between local and national governments. It is also characteristic for regions to have significant administration capability and coherence which is separate from the state and other regions. Many European Union memberstates have regional governments which have varying degrees of influence over innovation policy. During the recent years the regions' options and capacities for making and implementing decisions have been increased and so to improved their capability of responding to the changes in their operational environment. (Cooke et al. 2000, 2; Lascoumes & Le Galés 2003; Lähdesmäki 2003, 217.) The regional-level significance of the innovation policy lies its capacity to exert an influence over the supply of education, the professional skills of the workforce, frames of research activities, utilisation of new technology and knowledge as well as the formation of internal and external co-operation networks (Lievonen & Lemola 2004, 15). Instead of state governance and top-down control it is considered that the driving force of regional development should be based on local initiatives, entrepreneurship and networking. The focus of the policy is thus on strengthening the regions' own development as well as co-operating at the national and international levels. (Virtanen 2002, 13.)

In Finland, the development of regional dimension of innovation policy was particularly related to the development of the European Union and its regional and innovation policies as well as on reforming the Finnish public sector. The regionalisation of the innovation system and innovation policy proceeded slowly until the recession of the 1990s. Regions were earlier considered not to be as important from the viewpoint of the national economy or national innovation system. European integration, economic recession and the related crisis in the national economy, however, opened up new possibilities for developing innovation policy at the regional level. (Lemola 1999, 134; Riepula 2004; Schienstock et al. 2004, 127–128.)

In Finland, regional governance was reformed in several ways during the 1990s. The reforms aimed at reducing the state's responsibility for regional governance, strengthening the structures of regional governance by collecting the regional governance together as well as improving economic efficiency. In addition, the goal was to promote provincial aggregations of municipalities (Riepula 2004, 3). However, characteristic of the Finnish system is the strong central and local governments and in practice the regional governance means state agencies at regional level as well as intermunicipal co-operation for organising certain services and functions beyond municipal borders (Sotarauta & Kautonen 2007, 1087).

As a consequence of the reform, the responsibility for regional development was transferred from state governance to *regional councils* that represent municipal self-governance. The division into regions was updated accordingly, based on provinces. In addition, certain authorities of state's district administration were aggregated in to Employment and Economic Development Centres. They represented and offered services from the Ministry of Trade and Industry, the Ministry of Labour

and the Ministry of Agriculture and Forestry at the regional level[2]. The role of the Employment and Economic Development Centres has been essential particularly in allocating the resources that focus on regional development. (Riepula 2004, 3, 9–14.) The operational preconditions of the Employment and Economic Development Centres were subsequently improved by establishing technology units in the Centres (Science and Technology Policy Council 2000, 39).

Simultaneously with the reforms in regional governance, the regionally extensive Finnish polytechnic system was established (Virtanen 2002, 23). The Science and Technology Policy Council (2003, 21) evaluated that the establishment of the polytechnic system was a significant structural reform of the innovation system. It was planned that the polytechnics' role will be important particularly at the regional level. The Science and Technology Policy Council recommended that "polytechnics must be developed into knowledge and know-how centres to enable them to make a more significant input into innovation in their regions". At the same time it emphasised co-operation with the other actors, particularly with universities, by recommending that "measures must be taken to increase cooperation between universities and polytechnics in regional development" (Science and Technology Policy Council 2000, 51). The Science and Technology Policy Council specified that the polytechnics' role in the regions is important particularly in providing education and offering services to small and medium-sized companies: "Alongside other partners, polytechnics have an ever clearer role at the regional level within the development of education and working life and especially in expertise which serves SMEs in various ways." (Science and Technology Policy Council 2000, 24). Since the year 2000, the role of polytechnics has grown more. The Council emphasised the polytechnics' practical and regional role as the partner of regional companies on the one hand and it recommended that polytechnics should increase their co-operation with universities and university consortiums on the other (Science and Technology Policy Council 2003, 40; Science and Technology Policy Council 2006, 49).

Regional development programmes as the tools for building networks between higher education and industry as part of the regional innovation system

The changes in the operational environment also challenged Finnish regional policy. The centrally-controlled policy was considered to be obsolete in the complex and differentiated environment. During the 1990s, Finland adopted programme-based development as the tool for regional development along with its membership in

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2   The regional governance was reformed again from the beginning of 2010. The operations of the County Administrative Board, the Employment and Economic Development Centres, the Regional Environment Centres, the Environment Permission Offices, road districts and Industrial Safety Offices were closed down and their responsibilities were transferred to the Regional State Administration Agencies and Centres for Economic Development, Transport and the Environment.

European Union. A common feature in the new regional political guidelines was that they aimed to recognise and support the strengths and differences of the regions as well as their own development needs and possibilities. Characteristic of programme-based development are strategic thinking and project-based and temporary ways of working. On the other hand, different follow-up systems and indicators as well as evaluations have been developed to monitor the performance of the programmes. At the regional level, the central tools for carrying out programme-based development are provincial programme work, the EU Structural Fund programmes, the Centre of Expertise Programme, the Regional Centre Programme as well as other special programmes. (Ritsilä et al. 2006, 30–34, 53.) Along with programme-based regional development, the role of higher education institutions was emphasised. The partnership principle of regional strategy and programme work meant that actors from different fields collected together. That is, polytechnics were established in an environment in which the new forum for co-operation and discussion by different stakeholders was formed. (Maljojoki 2002, 215; Puoskari 2004, 28.)

The *Centre of Expertise Programme* is the specialised programme the Government launched in 1994 in order to support the development of regional innovation environments. The programme aims particularly to promote the exploitation of top-level knowledge and know-how in order to develop entrepreneurship, employment and the resources required for regional development (Regional Development Act 12.7.2002/602; Ministry of Interior 2003, 33). Its central tool for attaining this goal has been to create institutional frames and to support networking between regional industry, research units and higher education institutions on the basis of the regional innovation system (Nieminen & Kaukonen 2004, 201). The programme aims to focus on the special characteristics of each region, such as the region's industrial fields, know-how areas and co-operation relationships. The objective is to achieve high-level business activity in co-operation with higher education institutions, research institutes and companies. By emphasising know-how and the regions' own activity the regional Centre of Expertise Programme reflected the new direction of Finnish regional innovation policy. (see Ministry of Interior 2003, 33; Schienstock et al. 2004, 139.)

The Government nominated eight regional and three network centres for expertise in the first programme period (1994–1998). In the second period (1999–2006) 14 regional and two network centres of expertise were involved. The centres focused especially on technology development within the central national clusters. At the national level, the co-ordination of the Centre of Expertise Programme is based on actions that cross the borders between sectors. There are representatives of the central large companies, ministries, higher education institutions, regional development authorities as well as central science and technology actors. At the regional level, Centres of Expertise are typically organised with a technology centre. Technology centres offer a place and infrastructure for the activity as well as national and international co-operation networks. The Centre of Expertise organisation has

management and steering groups on which the central regional development actors are represented. (Ministry of Interior 2003, 28–29, 38.)

Important tools for programme-based regional development also include *Regional Centre Programmes*, *Provincial Programmes* and the *EU Structural Fund Programmes*. The Regional Centre Programmes aim to support the strengths and the specialisation of the regional centres and they support networking between the different regions. The preparation of the Regional Centre Programmes is based on local initiatives and actors' work there. They are also part of the provincial strategic planning and development work. The regional council is in charge of the provincial plan and programme as well as proposals of programmes of regional structural funds. (Regional Development Act 602/2002; Ritsilä et al. 2006, 14, 34.)

Through its directed funding programmes and mechanisms the European Union has had a central role in financing the research and development activities of higher education institutions and research institutes in different countries. The allocation of EU Structural Funds and innovation subsidies to regions has also been a significant factor in enabling Finnish polytechnics to increase their options for engaging in regional development activities and co-operation with industry. (Cooke et al. 2000, 3; Lemola 1999, 134; Neave 2003, 9–10; Nowotny et al. 2002, 67, 75.) Polytechnics have used EU Structural Funds as the tool to intensify their connections with working life, expanding their mutual co-operation and creating a range of service products for companies (Science and Technology Policy Council 2000, 40). It has been evaluated that there has been an increase in polytechnics' active communication with the other actors involved in regional centres of expertise. Therefore, polytechnics, companies and development organisations have found common interests and projects through the centre of expertise activities that promote their co-operation. The evaluation noted that polytechnics are becoming the central actors in regional know-how networks. (Ministry of Interior 2003, 162–164.)

2.2 The Finnish polytechnic system as part of the changing higher education policy

2.2.1 Establishment of the Finnish polytechnic system as the response to the needs of the knowledge society

The establishment of the Finnish polytechnic system was the biggest reform of the Finnish higher education system during the 1990s (Raivola et al. 2001). The reasons behind the reform related mainly to internal functional troubles within the Finnish education system, discernible and foreseeable changes of labour markets as well as international influences (Salminen 1997, 312–325). The structure of secondary-

level education and degrees was considered to be outdated and to compare badly in the international context. In addition, the education system was too multi-storey and sector-based for the needs of the knowledge-based society (Numminen et. al. 2001, 9). Polytechnic reform aimed at being one response to the need to improve the effectiveness of the education system and particularly to make vocational education more flexible, functional and attractive to the needs of and changes in labour markets and environment. The concrete aims were to raise the standard of education, improve its international comparability and compatibility and to make it more responsive to the changing needs of the labour market and regional development. (Salminen 1995, 319; Salminen 1997, 315.) As in many other European countries, it was argued that the Finnish polytechnics would represent the practical form of higher education, linked closely with industry, business and the professions. The aim was also that polytechnics would have clear regional role and task. (Government bill 319/1994; Davies 1992, 1067; de Lourdes Machado et al. 2008, 251, 255; Ferreira et al. 2008, 199; Hackl 2008, 29; Kotila 2003, 191; Kyvik 2008, 171–173; Verhofen 2008, 45.)

The establishment of the polytechnic system proceeded in stages. The reform started in autumn 1991 with an experimental period. The purpose of the experiment was that one or more post-secondary level vocational educational institutions and higher vocational level educational institutions could merge to become the temporary multi-disciplinary polytechnics offering teaching that lead to polytechnic degrees. The aim of merging institutions was not only to achieve administrative- and cost-effectiveness but also to deepen the knowledge-base and pedagogical solutions of the new institutions. (Lampinen 2000, 116; Lampinen & Savola 1995, 49–50.)

The position of polytechnics was strengthened in 1995 when the Act on Polytechnic Studies (255/1995) came into force. The legislation defined the criteria needed for a polytechnic to obtain a permanent operating licence. These criteria were the polytechnic's business idea; the necessity of the degree programmes offered; the functionality of the combinations of the fields of education; having strong areas of activity; being of an appropriate size to fulfil the education task; teachers' education level; having adequate library and information services; and co-operating with universities, higher education institutions and working life at regional and international levels as well as arranging evaluation. Applications for polytechnic operating licences and founding projects were evaluated by the polytechnics' evaluation group and the Finnish Higher Education Evaluation Council. (See Act on Polytechnic Studies 255/1995; Finnish Higher Education Evaluation Council 2006; Lampinen 2000, 115–116.) The polytechnics were established between 1996 and 2000. The polytechnic system has been operating on a permanent basis since August 2000. The system was created by merging about 210 previous post-secondary level and higher vocational level educational institutions into 29 polytechnics. The basic idea was to get the different fields of education into a state of functional co-operation. Therefore, most of the polytechnics are multidisciplinary higher education

institutions. (Government bill 206/2002; Numminen et al. 2001, 80; Salminen 2001, 83.)

Despite having followed international higher education policy guidelines and discussions and development of higher education systems in other countries, it is argued that the Finnish polytechnic system has no actual role model in other countries and their systems of professionally-oriented higher education institutions. The Finns had followed the development of the British higher education system for a long time. Thus, the British polytechnics were known in Finland but they did not become the role model because of the low respect they had in Britain. Awareness of the German "Fachhohschule" model as well as the Norwegian and Dutch models increased during the 1990s at the same time as the Finnish polytechnic system was being established. (Lampinen 2002, 60–79; Salminen 1997, 321–322; Salminen 1998, 36–42.)

Strengthening of institutional capacity: decentralisation, regionalism and autonomy

The polytechnic reform aimed at improving the functional and administrative capacity of the professional education system. Finnish higher education policy and polytechnic reform as part of it followed the international trend towards policy of decentralisation. Its central idea was that tight governmental control limits the innovative capacities of higher education institutions. Accordingly, transferring economic and administrative decision-making powers to an individual higher education institution or its sub-unit will make the higher education institution capable of responding more successfully to external and internal challenges. (Neave 2003, 9–10; Van Vught 1994, 322–323.)

According to the Government's bill (319/1994), the preconditions for strengthening polytechnics' authority would be supported by establishing bigger and stronger units in the economic and human resources senses. The aim was also to rationalise the decentralised educational network and to unify the diversified system of licence holders. The central means for fulfilling these goals were attained by merging several post-secondary level and higher secondary level educational institutions into multidisciplinary polytechnic institutions. It was presumed that the new multi-disciplinary institutions would enable the development of new and flexible education options that crossed the traditional boundaries of educational institutions and fields of education. In addition, polytechnics and their licence holders' options for deciding how education should be arranged were essentially increased in agreement with the arrangements for regulating the university sector. (Government bill 319/1994.)

Raising the level of education and professional skills

In connection with the reform, the new polytechnics became part of the Finnish higher education system. The aim was to offer a competitive higher education alternative that would lead to expertise in meeting the challenges of working life.

The new role as higher education institutions challenged polytechnics to raise the level and standard of education and professional skills. In practice, this has meant particularly raising the education level of teachers and developing teaching methods and curriculum. The means of fulfilling the goals were development of a teachers' appointment system, raising their qualification requirement and launching teachers' postgraduate programmes. The emphasis on reforming teaching methods and curriculum was particularly at developing teaching methods that presuppose independent study methods, seminars and project-oriented working. (Government bill 319/1994.)

In fact, it is possible to say that the polytechnic reform was a major curriculum reform itself. The aims of the curriculum reform were to systematise and raise the standard of the education provided and to increase students' freedom of choice. In connection with the reform, the former nationwide curriculum was abandoned. The new legislation defines only the degrees and their structure. Thus, each polytechnic is able to decide on the contents and nomenclature of its own degree programmes. The essential changes in all reformed polytechnic curricula were the components of study common to all students, more optional study components, and a thesis writing project that was more extensive and demanding than earlier. The overall goals were to establish extensive study modules instead of small courses and to add co-operation with the business sector. It can be said that the curriculum forms the basis of interaction between polytechnics and the business environment. (e.g. Raivola et al. 2001, 57, 75.)

Strengthening regional impact

One major idea of the polytechnic reform and establishment of multidisciplinary polytechnic institutions was to enhance their role in regional development. The aim was that Finnish polytechnics would have a clear regional task – through their education, research and development tasks – to develop infrastructure that supports working life and standards of living within the regions. The goal was particularly to improve educational services in those regions that did not have their own multi-disciplinary university. Polytechnics were expected to contribute to regional development by raising the level of education and know-how in the regions by offering multifaceted education, producing a high-level workforce and participating in creating sustainable innovation processes in the regions according to their own know-how profiles. (Government bill 319/1994; Government bill 206/2002.)

In many regions, there were strong ambitions to have a polytechnic, and major efforts were taken in the interest of establishing them. Compared with the previous history and traditions of the post-secondary level vocational educational institutions, this assumes closer interaction between the polytechnics and their environment, new ways of co-operation and of a co-operation culture. One can see the almost idealistic picture of the polytechnic institution to be a unique higher education institution

with a profile built around its own expert areas and having a significant role to play in its region. (Raivola et al. 2001; Salminen 1995, 311–322, 1998, 37; Toikka 2002, 49.)

Improving international comparability

In addition to the goals of developing the national education system, the Finnish polytechnic reform was integrated into international higher education policy and its development. In many industrialised countries, the higher education systems were expanded particularly by creating a non-university sector alongside the traditional universities. Thus, the central aim of the Finnish polytechnic reform was to improve the international comparability of professionally-oriented higher education. By elevating the polytechnics to become part of the higher education system, the Finnish system was in parallel with the higher education system in many European countries. This also enabled the development of the polytechnic sector according to international, especially European, development lines. (Government bill 319/1994.)

At the European level, the central aim has been to strengthen the competitiveness of the European higher education inside and outside Europe particularly in relation to the United States and Asia, by evoking the European higher education area by 2010. This goal was integrated with the so-called Sorbonne-Bologna process, which aimed to improve the comparability and intelligibility of degree structures by harmonising the national higher education traditions, especially by unifying the degree structures. The process started as a project of the traditional European universities. The need to include professionally-oriented higher education as part of it emerged just after the signature of the Bologna declaration. (Government bill 206/2002; Lehikoinen 2002, 344; Rinne 2002, 98.)

2.2.2 Frames for the polytechnics' regional engagement

Due to previous history, the steering and regulative environments of Finnish polytechnics are the responsibility of two levels of actor: the state and the local maintaining organisations (Kohtamäki 2009, 57). That means the steering system and funding mechanism of the Finnish polytechnics are divided between the central government and local authorities (Kohtamäki 2004, 49–50). The Ministry of Education and Culture is responsible for development of national higher education policy. The local maintaining organisations of the polytechnics are the owners of the polytechnics as well as the licence holding bodies (Kohtamäki 2009, 19). The Council of State grants a polytechnic's operating licence to a municipality, a federation of municipalities or a registered Finnish community or foundation. That means polytechnics can be public or private and their ownership is primarily in local hands (Kohtamäki 2004, 31). The idea has been that local ownership structure supports polytechnics in carrying out their regional task (Government bill 319/1994; Kohtamäki 2009, 24).

The main tools available to the Ministry of Education and Culture for steering the Finnish polytechnics are legislation, the Government's Development Plan for Education and Research, target negotiations and contracts, and funding. The local maintaining organisations are in charge of strategic development of polytechnics. Their main tasks also include approving polytechnics' action and economic plan and the budget and appointing of polytechnic's rector. (Kohtamäki 2009, 48–49; Polytechnics Act 351/2003.) Through these tasks, the maintaining organisations have central role in strategic steering of polytechnics' research, development and innovation activities (Ministry of Education 2010, 24).

The general medium-term policy guidelines and development goals of polytechnics – including polytechnics' regional engagement and the polytechnics' role as the regional service providers – are stated in the four-year Development Plan for Education and Research which is accepted by the Government (Polytechnics Act 351/2003). The Development Plan 2003–2008 set the development of polytechnics' structures and diversification of their external co-operation relationships and networks as the central goals. According to the Development Plan, the aim of the higher education policy was to develop polytechnics' structure and supply of education in order for polytechnics to be capable of supporting the development goals of municipalities, the enterprise sector and work communities. Polytechnics were also to support citizens' own development goals through mature age education and service activities. In addition, polytechnics' regional impact was to be increased by gathering regional development projects as the wider entities and increasing polytechnics' networks with different partners in regional development work. The Development Plan defined polytechnics' sphere of responsibility in regional development work particularly in supporting small and medium-sized entrepreneurship as well as developing welfare services. It also emphasised that polytechnics' research and development work should support innovation activity especially at the regional level. (Ministry of Education 2004a, 45–46, 55.)

The Polytechnics Act (351/2003) and Polytechnics Decree (352/2003) provide detailed regulations about polytechnics' status in the education system, their mission, administration, management, evaluation, teaching and degrees, the eligibility of polytechnic graduates for further studies, teachers' qualification requirements, and the principle of free polytechnic degree education (Ministry of Education 2004b, 14–15). The first Act on Polytechnic Studies (255/1995) was decreed in 1995. It was mainly concerned with polytechnic studies and degrees. The Act was amended in 2003 (Polytechnics Act 351/2003). The central aim of reforming the Polytechnics Act was to renew the definition of polytechnics' responsibilities to correspond to polytechnics' expanded and developed research and development tasks, regional tasks and internationalisation. The goal was to guarantee polytechnics the same kind of autonomy that institutions in the higher education sector generally have. By strengthening the autonomy of polytechnics, the Act aims to improve the higher education community's options for deciding on teaching arrangements as well

as making contracts with the industrial sector more flexible. (Government bill 206/2002.) That means the prerequisites for Finnish polytechnics' entrepreneurial and externally-oriented behaviour were reinforced by the reform of the Polytechnics Act. The Act defines polytechnics' tasks as follows.

According to the Act 4§

> *The task of the polytechnics is to offer teaching which responds to the demands of the working life and its development as well as is based on the research and artistic starting points leading to the professional tasks of an expert.*

> *The task of the polytechnics is to practice applied research and development work which serves polytechnic's teaching, supports working life and regional development as well as takes the region's industrial fields into consideration.*

The Act strengthened the position of applied research and development work as the second task of the polytechnics which is also new for the polytechnics. The Act 5§ further specifies and defines polytechnics' regional orientation and relationship with their environment.

> *Polytechnics have to co-operate with the region's business and other working life as well as Finnish and foreign higher education institutions and other educational institutions when carrying out their tasks.*

As one can see, the Polytechnics Act (351/2003) emphasises close interaction particularly between polytechnics and the representatives of business and other working life and higher education institutions. It highlights that teaching, and research and development in polytechnics have to be of use to those in working life and regional development and in addition, they have to be carried out in co-operation with the region's business and other work participants. In particular, research and development activities are supposed to support regional development. At the same time, the Act points out that research and development activity should also serve polytechnics' teaching which will in fact reinforce the integration of the activities together.

The Polytechnics Act (351/2003) also strengthened polytechnics' autonomy. According to the Government bill (206/2002) the basic principles of autonomy of higher education institutions in the international context are freedom of teaching and research as well as right to decide the issues of concern to polytechnics' internal governance and their right to select teachers (see also Varis 2004, 65). Kohtamäki (2009, 52–53) argues that the areas of autonomy which can be drawn from the Polytechnics Act (351/2003) include internal governance and administration, student issues and the appointment of teachers. That means that the authority for deciding on an institution's internal governance, administration and organisation

belongs to the polytechnic itself. This is according to the Polytechnics Act (351/2003) and Polytechnic Decree (352/2003). (Kohtamäki 2009, 52.) However, the detailed content of the polytechnics' autonomy is not defined in the legislation. Because the Polytechnics Act is new, the interpretations on autonomy in polytechnics and their maintaining organisations is an ongoing process (Kohtamäki 2009, 52–53).

Polytechnics have the authority to decide on their teaching and research arrangements (Kohtamäki 2009, 54). The Ministry of Education and Culture confirms the degree programmes but the polytechnics can define the content and the implementation of the programmes (Salminen 2000, 40). Polytechnics are also able to decide about participation and implementation of their research and development projects, participation in co-operation projects as well as the implementation of the research and development projects (Varis 2004, 66–69).

Target negotiations and agreements form the central strategic tool of the Ministry of Education and Culture for controlling polytechnics based on the national polytechnic policy. During the target negotiations the Ministry of Education and Culture, the maintaining organisation and the polytechnic negotiate the central goals, follow-up of these goals and the focal national development projects set for the polytechnics. (Ministry of Education 2004b, 14–15; Polytechnics Act 351/2003.) The main contents of the agreements are the polytechnics' strategic plans and long-term goals in terms of the tasks the polytechnic is responsible for. The target document also specifies polytechnic's resources but it does not fully link targets and resources with each other (Kohtamäki 2009, 47). In addition, the contracts include polytechnics' performance analysis of the previous year. Polytechnics' regional engagement and development task is included both in the common goals of all polytechnics as well as in the development plan of each polytechnic. In addition, the task and structural development of most of the polytechnics brings out the regional dimension. (The base of the performance agreement between polytechnics, maintaining organisations and the Ministry of Education in 2004–2006.)

During the agreement period 2004–2006, the main argument in terms of polytechnics' regional engagement was that polytechnics' role in the regional innovation system should be strengthened. On one hand, the focus of the regional task is on strengthening polytechnics' internal activities which include the supply of adult education, research and development work and service activities and on the other hand, intensifying the interaction with other regional actors, particularly universities. (Objectives common to the polytechnic system as a whole 2004–2006.) In addition, the Ministry has directed polytechnics' research and innovation activities through special regulations. The Ministry has requested that polytechnics update their research and development strategies as well as their regional co-operation strategies for co-operation between polytechnics and universities. The areas of interest were particularly the polytechnics' role in the regional innovation system, regional needs, polytechnics' co-operation and networks with other polytechnics, universities and public organisations and internationalisation. Other areas of interest

included polytechnics' internal capacity to respond in terms of higher education institutions' profiles and specialisation areas, teachers' working life connections and preconditions to do research and postgraduate degree students' options for participating in research and development work. (Ministry of Education 2004c.)

The Polytechnics Act (351/2003) obligates polytechnics to develop the quality of their education and other activities and to participate regularly in external evaluations. The external evaluations and the monitoring database AMKOTA form the key tools for the Ministry of Education and Culture in information-based steering (Ministry of Education 2004b, 17). The Finnish Higher Education Evaluation Council is the body in charge of external evaluations of polytechnics and universities. It has evaluated the implementation of polytechnics' regional task by carrying out the evaluations of polytechnics' regional development impact in 2001, 2003, and 2006. The focus of the evaluation has been based on the polytechnics' own impact (e.g. strengthening of the region's knowledge capacity and social capital and building of the regional innovation environment), and its influence on regional activities (e.g. participation in the building of regional strategies and programmes and other development projects) (Impiö et al. 2003; Käyhkö et al. 2006). Based on the results of these evaluations, the Ministry of Education has allocated a small portion of performance-based funding to the polytechnics. However, the standard, quality or effectiveness of polytechnics' research, development and innovation activity has not been evaluated on national level (Ministry of Education 2010, 26).

In Finland both the state – via the Ministry of Education and Culture – as well as local authorities is in charge of polytechnics' public funding which is part of the state grant system. The public funding system is the same for all the polytechnics regardless of the form of their maintaining organisation. (Kohtamäki 2009, 41–42.) According to the Act on the Financing of the Provision of Education and Culture (1998/635), 57 per cent and the 43 per cent of the operating costs of the polytechnics are funded by the state and the local authorities respectively. In practice, the share of the state is smaller (about 46 per cent) and the share of the local authorities bigger (about 54 per cent) because the state has increased the share of funding it distributes to local authorities. The state provides the funding to the local maintaining organisations through which it is channelled to the polytechnics. (Kohtamäki 2009, 42; Kohtamäki 2004, 49.)

The funding provided by the Ministry of Education comes in three forms: unit price funding (core funding), project funding and performance-based funding (Ministry of Education 2004b, 16; Polytechnics Act 351/2003). In addition, the maintaining organisations can provide other funding to polytechnics and their development (Polytechnics Act 351/2003). Unit price funding is the largest and the polytechnics' most important funding source, comprising 77–79 per cent of polytechnics' operating funding (Kohtamäki 2009, 44). Until the end of 2005, the funding criteria of the government's core funding was totally input-based. The input indicators were based on student numbers and the previous year's operational expenditure per student for

all institutions (Kohtamäki 2004, 49–50; Kohtamäki 2009, 43). The core funding system of the polytechnics was reformed in 2006 as part of the legislation reform of the state grant system. As a consequence, the principles of the formulation of unit-prices were changed. In the current system, the calculation of polytechnic specific unit-price funding is based on student numbers calculated with the formula per year as well as the average number of completed basic degrees and postgraduate degrees in two previous years. The number of degrees emphasises the output element of the funding system (Kohtamäki 2009, 43). However, the weight of the input element – the number of students enrolled still forms 70 per cent and the output element – number of degrees completed 30 per cent of unit cost (Act on the Financing of Education and Culture 1998/635; Kohtamäki 2009, 43).

Polytechnics obtain almost all their financing for degree programmes from public funds (Ministry of Education 2004b, 16). The unit price funding is directed to a polytechnic's education and applied research and development tasks according to the Polytechnics Act (351/2003). However, the unit price funding does not include separate elements for applied research and development work (Kohtamäki 2009, 42). Critics have suggested that the funding system does not take into account polytechnics' diversified tasks (Ministry of Education 2002, 27; Lyytinen & Marttila 2008, 36; Marttila, Lyytinen & Kautonen 2008, 423–424). Accordingly, there are many variations between polytechnics in terms of whether they allocate the funds or not and extent to which core funding is applied to research and development activities. The core funding covers approximately 42 per cent of polytechnics' research and development activities and the share of external funding is about 57 per cent. However, the share of external funding varies a lot among the polytechnics. (Ministry of Education 2010, 14, 24.) The most significant external funding source has been the European Union, primarily the EU Structural Funds, which covers almost one-quarter of polytechnics' research expenses. The share of the funding provided by the Academy of Finland and Tekes has typically been below five per cent. The share of funding from private companies is approximately five per cent (Lyytinen et al. 2008, 44–45; Lyytinen & Marttila 2008, 36; Marttila et al. 2005, 17–20; Marttila et al. 2008, 418; Ministry of Education 2010, 14–15; Statistics Finland 2001–2008).

Project funding is earmarked funding and it has been targeted mainly at the polytechnic support programme, basic prerequisites of research and development and the development of the Virtual Polytechnic (Kohtamäki 2004, 52; Ministry of Education 2004b, 16). The Ministry of Education and Culture also allocates small amounts of performance-based funding to the polytechnics annually. The performance indicators are defined in co-operation by the Ministry of Education, polytechnics and other stakeholders and are based on the five theme entities: the development of teaching and teaching methods, the attractiveness of the education offered and students' progress in their studies, relevance to working life and research and development, regional impact and operations and capacity for renewal. Some performance-based funding has also been allocated to polytechnics on the basis of

evaluations carried out by the Finnish Higher Education Evaluation Council, which has reviewed centres of excellence in teaching and regional development impact. In 2003, 1.7 million euros were allocated on the basis of general performance criteria and 1.7 million euros to centres of excellence selected on the basis of the evaluations. (Ministry of Education 2004b, 16.)

2.2.3 Polytechnics as higher education institutions

The typical feature of higher education institutions in general is the division between the academic and administrative structures (Birnbaum 1991, 9–28; Sporn 1999a, 25–31). This means the activities of polytechnics and other higher education institutions are organised by the discipline or profession and by the institution which together determine academic organisation in specific ways (cf. Clark 1983, 28, 32).

The institutional level is the connective element and principal legal entity through which most of the functions of the polytechnics are performed. It is also the body through which the different and often loosely coupled fields of education and professions are authoritatively held together. (Becher & Kogan 1992, 67; Clark 1983, 28–19.) The internal institutional management of a Finnish polytechnic consists of a rector, vice-rector and other executive heads and a Polytechnic Board. In addition a polytechnic can have a management group to support the rector. The Polytechnics Act (351/2003) outlines the rector's responsibilities, the process for appointing the rector and the tasks and composition of the Polytechnic Board. The rector and the Polytechnic Board are responsible for the polytechnic's internal governance (Polytechnics Act 351/2003; see also Eurydice 2008, 33–35). The rector manages the polytechnic's activities as well as dealing with and solving issues that concern the polytechnic's internal governance (Polytechnics Act 351/2003). In private polytechnics (limited companies and foundations), the rector also acts as the chief executive officer.

The Polytechnic Board is composed of the representatives of polytechnic management, full-time teachers, other full-time staff and full-time students as well as representatives of business and working life. The number of members representing business and working life cannot exceed one-third. The rector acts as the chair of the board. The main task of the board is to develop the polytechnic's activities. It also makes proposals to the maintaining organisation for the polytechnic's action and economic plans, decides on the grounds for the distribution of the funds granted to the polytechnic, sets up other governing bodies and it approves the polytechnic's degree regulations and regulations concerning the polytechnic's internal governance. In addition, the board deals with and solves other issues stipulated in the legislation. These issues could be deciding on the polytechnic's central goals concerning business and working life and regional development, for example. (Polytechnics Act 351/2003.)

Teaching, research and service responsibilities are the main duties of polytechnics which are carried out mainly by basic units. These units are typically formed around a discipline, profession or field of education which are specialised forms of organisation that knit together specialists from similar fields, such as engineers to engineers and nurses to nurses. (cf. Clark 1983, 12, 28–29.) In Finnish polytechnics these units are typically called schools, such as the School of Engineering or faculties, such as the Faculty of Business and Culture. Polytechnics have also established separate service units to work with research and development, consultancy, evaluation or in-service training to respond to the needs of the environment and different stakeholder groups (cf. Becher & Kogan 1992, 87–89).

The educational task of polytechnics – enacted in the Government Decree on Polytechnics (352/2003) – includes eight fields of education in which polytechnics offer teaching. These are 1) humanities and education, 2) culture, 3) social sciences, business and administration, 4) natural resources and the environment, 5) technology, communication and transport, 6) natural sciences, 7) social services, health and sport as well as 8) tourism, catering and domestic services. Polytechnics provide teaching for polytechnic degrees and polytechnic Master's degrees. In addition they offer professional specialisation and other adult education, open polytechnic education as well as vocational teacher training.

The staff members occupying senior lecturer and lecturer posts are primarily responsible for the polytechnic's teaching activities. Teachers' qualification requirements were raised when polytechnics became as part of the higher education system. The Government Decree on Polytechnics (352/2003) specifies teachers' qualification requirements. According to it, senior lecturers should hold either a licentiate or doctoral degree. Lecturers are required to have master's degree. In addition, both senior lecturers and lecturers have to have three years' practical work experience relating to their field.

3
Innovation in the regional context

3.1 Concept and typologies of innovation

Researchers have divided innovation on the grounds of its novelty, its nature and its evolution. The traditional concept of innovation is that it represents some major reform or change. This refers to radical innovation or major technological breakthroughs, such as the railway, car or computer. However, it is evident that most innovation is incremental in nature, that is, it is made up of new combinations or step-by-step reforms to existing elements. (Lemola 2000, 153.) Innovation has also traditionally been defined from the technological perspective, based on the division of product and process innovation. Accordingly, innovation is understood as being the new or improved product or process that has economic value. In that case, product innovation refers to goods or services whereas process innovation refers to technological or organisational processes through which the product and services are produced. (Edquist 2001.); (see Figure 2).
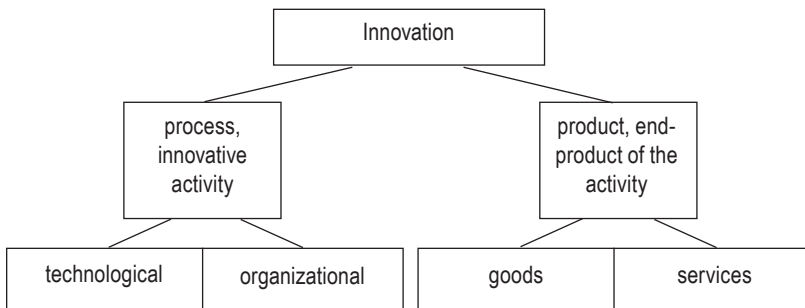
Source: adapted from Edquist 2001

FIGURE 2. Types of innovation

Thus, the traditional assumption emphasises the nature of innovation as the commercialised technological inventions that are new products or technical production methods (Hämäläinen & Heiskala 2004, 45; Kolehmainen 2004, 35). Accordingly, innovation is typically distinguished from invention by defining invention as the first occurrence of an idea for a new product or process or production of new technological knowledge, whereas innovation refers to the first attempt to carry this idea or knowledge out in practice which refers to taking innovation into commercial use (Fagerberg 2005, 4; Schienstock 1999, 14).

It can be seen that understanding innovation only in technological terms is a very narrow view. Schienstock (1999, 15) argues that Schumpeter, who was one of the creators of, and one of the most influential persons for contemporary innovation and entrepreneurship research, already defined innovation in much broader terms than pure technical innovation as "doing of new things or doing of things that are already done in a new way". The definition also included the new organisational forms, opening of new markets or new ways of marketing. (Audretsch 2002, 2; Schumpeter 1939, see Schienstock 1999, 15.) Schumpeter's aim was to explain the development of market economies through innovation and innovators. As an economist, he regarded enterprises and especially the competition between the inventor-enterprisers and their ability to utilise the continuous change of technology and markets as the key factors in economic development. However, Schumpeter was criticised for over-emphasising the role of radical innovation and individual innovators. It is claimed that most of the technical changes consist of small enhancements and modifications to innovations. In addition to innovators, the first users also have a significant role. (Lemola 2000, 149–175; Rosenberg 1976.)

The assumption that innovation relates not only to radical, technical changes but also to incremental and social or organisational reforms has gradually been emphasised (e.g. Kautonen & Sotarauta 1999, 80). The present conception emphasises the role of the different kinds of innovation in the structural change of society and the economy. It is argued that in addition to technical innovation, the significance of organisational and social innovation, such as new organisational solutions, institutional frameworks and operational models which solve problems better than in the past, has been increased. For example, new information systems can strengthen the effectiveness of an organisation but at the same time, this presupposes investment in new organisational models as well as the education and know-how of personnel. (Schienstock & Hämäläinen 2001, 11.) Accordingly, the conception of innovation has been widened. Innovation can be understood as a new (or considered as a new) model, practice or idea which changes existing practices and as a consequence of these changes, technological, economic or social performance and capacity grow (Hämäläinen & Heiskala 2004, 46). As one can see, the definition expands the conception of traditional technical innovation by emphasising that in addition to product or process, innovation can also be a new model or practice. The essential prerequisite of innovation is that it changes existing practices somehow.

The consequences of these changes can be economic and technical but also produce social benefits.

3.2 Evolution of innovation

3.2.1 From linear models to interactive innovation

There is no a single conception concerning the evolution of innovation. However, the assumption about the linear innovation process was dominant until the 1960s–1970s. The linear model emphasised radical innovation. Those are big changes such as technical breakthroughs. It was considered that innovation, especially technological innovation, develops as a consequence of linear and separate phases, either from basic research to commercialisation (the science push – model), or from the demands of the markets to basic research (the market demand – model). There is hardly any feedback from the different stages of the innovation process. (Edquist & Hommen 1999, 64.); (see Figure 3) From the viewpoint of higher education institutions, the linear innovation models presupposed only long-term contributions to the economy and little interaction between the higher education institutions and environment (Etzkowitz & Leydesdorff 1995). The central question in the 1960s–1970s was whether the science push – or market demand – model were better in explaining the evolution and success of innovation (Miettinen et al. 1999, 4).

The science push – model considers basic research as the most important factor in the innovation processes (Miettinen et al. 1999, 4–5). Its basic precondition is that the innovation process starts with basic research and develops straightforwardly to the marketing of the innovations. The assumptions of the market demand –model are quite the opposite. The model is based on the idea that innovation evolves as the consequence of the needs of potential customers. In those circumstances, markets and demand produce new ideas for research and development and the new

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Science push model

research → development → production → marketing

Demand pull model

markets → production → development → research
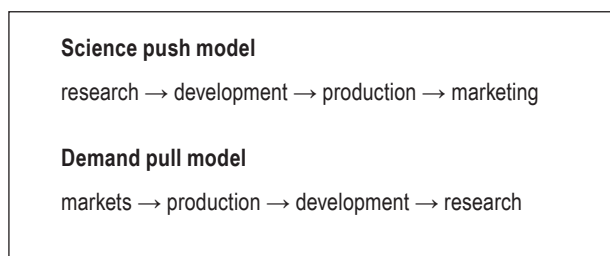
Source: Männistö 2002, 31; OECD 1996, 15; Kline & Rosenberg 1989, 286.

FIGURE 3. Linear innovation models

innovations evolve as the outcome of these processes. The science push –model was criticised for over-emphasising the significance of science and preferring scientific knowledge to applied knowledge. In principle, it can be assumed that an increase in scientific knowledge raises society's innovation potential, but its utilisation can not be guaranteed. (Männistö 2002, 28–29.) It is evident that the links between basic research and technological change are generally subtle and indirect and can occur over an extended period of time. However, the critical patents relating to the leading technological breakthroughs from 1950 to 1973 were reliant on basic university research. (Bok 1982, 138.) The conclusion of the debate was that basic research is an essential precondition for innovation but the evolution of the innovation is a much more complicated process (Kautonen & Tiainen 2000; Miettinen 1999, 5; Männistö 2002, 28–30). Nowadays linear innovation processes are considered to be especially valid only in some high tech sectors such as biotechnology (Goddard et al. 2003, 27).

In the 1970s–1980s, both linear models were abandoned mainly because of their empirical uselessness. In particular, critics were directed to the narrowness of the adopted innovation concept and straightforwardness of the process. It was claimed that innovations are not only exceptional and radical events that take place in specific circumstances. Instead, they can occur in all parts of the economy at any time. Thus, innovations can be and generally are incremental or novel combinations and step-by-step reforms to existing elements. The linear innovation models were also criticised because they assumed that there are clear sequences of stages that follow each other causally in innovation processes. Instead, innovation processes can rather be characterised as interactive, cumulative and socially embedded and shaped processes that follow a certain trajectory. (Schienstock 1999, 14–15.) These processes consist of complex interaction and feedback mechanisms and interactive relationships between science, technology, higher education, policy and demand. The innovation processes occur over time and are influenced by many factors such as national or regional culture, agreements, legislation and norms. Because of this complexity, organisations (companies) have to establish relationships with other organisations, such as other companies, higher education institutions, research institutes and ministries to gain, develop, and exchange knowledge, information, and other resources. Thus, one has to analyse innovation as an interactive process in which particular innovation activities can be both cause and effect or consequence and prerequisite. In this respect, it is not coincidental or simple reaction to the changes in the market demand. (Edquist 1997, 1–2; Kautonen & Tiainen 2000, 15; Schienstock 1999, 14, see also Cooke et al. 2000.)

In scientific discussion, the linear model of innovation was gradually replaced by the interactive approach in the late 1970s and 1980s. It widened the scope of the innovation processes because basic research was no longer seen as the most important and only source of innovation. Nor was the locus of innovation seen only within a single company, since the central finding of the innovation literature was that companies do not innovate in isolation, but through interaction and interdependence with other organisations. (Edquist 2005, 182; Fagerberg 2005, 20.) Thus, the focus

of attention was on understanding the effect of the innovation-creating process on complex interactions between the producers, the intermediaries and the users of knowledge. It especially concentrates on analysing how the interactions between different institutions and actors contribute to the emergence of new innovations. (Miettinen 2002, 12–14.); (see Figure 4)
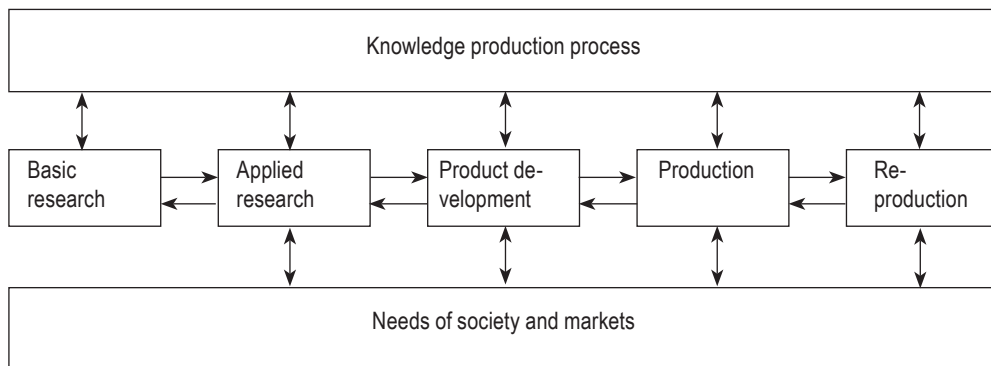
FIGURE 4. Interactive innovation processes

3.2.2 Innovation system

Origin and different forms of the innovation system concept

The growing understanding about the complexity and interactive nature of the innovation process changed the focus of interest of innovation studies from a single company to a network of different actors. The systemic nature of the innovation process emphasises that companies do not innovate in isolation but often in collaboration and with interdependence with other organisations, such as higher education institutions, research institutes and other companies. The behaviour of these organisations is also shaped by institutions such as laws, rules, norms, and routines. That is, sets of activities or actors those are interlinked. (Edquist 2005, 182; Fagerberg 2005, 13.) Therefore the innovation system approach is one way of conceptualising the interactive nature of innovation (Miettinen 2002, 13). The approach focuses particularly on analysing the structure and the dynamics of the innovation processes. Accordingly, the focus of the studies is primarily on the determinants of innovation, particularly those institutional configurations that lead to economic growth and social transformation. (Edquist 1997, 1–2; Edquist 2001, 2; Nieminen 2005, 22.)

The main approaches to delineate innovation systems are based on spatial, technological, industrial, or sectoral characters (Fagerberg 2005, 12). Accordingly, the boundaries of innovation systems have been analysed geographically, sectorally as

well as in terms of the activities undertaken. The spatial or geographical boundaries have most often been defined for national and regional innovation systems, sometimes also for sectoral ones. (Edquist 2005, 198–199.) The *national innovation system* encompasses elements and relationships either located within or rooted inside the borders of the nation state. The importance of the national level is emphasised because most public policies are still designed and implemented at the national level. (Edquist 2005, 199–200.) The concept of the national innovation system was first introduced in the late 1980s by the economists Christopher Freeman (1987), Bengt-Åke Lundvall (1992) and Richard Nelson (1993). Freeman (1987) was the first to use the innovation system concept explicitly in his study. He attempted to understand the differences in economic growth rates between the industrialised countries. As the counterbalance for this economic theory which tends to explain economic growth in terms of capital and labour accumulation, Lundvall and his group developed interactive learning theory (Lundvall 1992). They considered interactive learning and innovation to be the key pillars of economic growth (Miettinen 2002, 39–59). Lundvall divides the basic types of learning into learning and searching. Learning refers to communication within the organisation, quality and reward systems and co-operation relationships, whereas searching is related to the systematic search for new knowledge. Its most important sub-systems are organisations' research and development units, co-operation and interaction relationships between the organisations and funding bodies. (Lundvall 1992, 11.)

A couple of years later, the concept of 'innovation system' started to be analysed from the sectoral perspective – delimited to specific technological fields or product areas (Breschi & Malerba 1997; Edquist 2005, 200) and regional viewpoints (Asheim & Isaksen 2002; Braczyk et al. 1998; Cooke et al. 2000, 2004; Kautonen 2006; Kautonen, Kolehmainen & Koski 2002; Männistö 2002), which emphasise the geographical and spatial boundaries (see Chapter 3.2.3).

Even if there are differences between innovation systems, there is agreement that the basic elements of innovation systems include organisations, institutions and relationships that interact in order to produce and diffuse new and economically useful knowledge and know-how (Edquist 2005, 182; Kautonen 2006, 7; Lundvall 1992, 12). In narrow terms, those kinds of organisations and institutions generally incorporate the research and development functions of universities, other higher education institutions, public and private research institutes and corporations. The core of the innovation processes is thus the research and development system, its resources, competencies and organisation. (Asheim & Gertler 2005, 300; Asheim & Coenen 2005, 1179; Lundvall 1992, 12–14.) However, it is quite evident that the whole innovation system is much wider than the pure research system. If one considers the innovation system from the broader perspective, all parts and aspects of the economic structure and the institutional set-up – important institutional, organisational, social and political factors that influence the development, diffusion and use of innovation – should be included. (Edquist 1997, 17; Edquist 2001, 2; Lundvall 1992, 2, 12.)

According to innovation studies, the central organisations of the innovation system comprise companies, higher education institutions and research institutes. They are regarded as important engines of technological change. During recent decades, the role of the institutions has also become increasingly important in innovation theory and studies. Instead of looking at them as being only rigidities or obstacles to innovation, institutions are seen as the factors that can either hinder or support innovation activities (Edquist & Johnson 1997, 41, 47). According to Edquist and Johnson (1997, 46) institutions refer to the sets of common habits, routines, established practices, rules, or laws that regulate the relationships and interactions between individuals, groups and organisations. These can be regulations, rules and norms that influence the relationships between higher education institutions and industry. An example of that kind of regulation is the act that presupposes university personnel should undertake 'the third task' (that is, interacting with society) alongside teaching and research. (Edquist 2005, 188, 194.) That is, institutions can influence the rate and direction of innovation and shape the behaviour of the organisations and can therefore provide incentives for innovation, or place obstacles in its way (Edquist 2005, 182; Lundvall 1992, 14). It is said that institutions set the rules of the game (North 1990, 3).

Innovation and learning in the core of innovation system
In spite of the differences, all system of innovation approaches set the innovation and learning processes as the focus of the system. The emphasis on learning acknowledges that innovation is a matter of producing new knowledge or combining existing elements of knowledge in new ways. (Edquist 2005, 184–185.) It is often assumed that learning in the form of formal education and research and development is behind much of the innovation. However, the sources of innovation can be more diverse and the results of various types of learning process can be embedded in ordinary economic activities (Edquist 1997, 16). Edquist (2005, 191–195) argues that the innovation system approach focuses particularly on three kinds of learning: innovation, research and development as well as competence building. Innovation in the form of new products and processes mainly occur in companies. However, innovating companies often need to collaborate with public research organisations and universities. It is been suggested that the linkages between university / public research organisations and companies are especially important to the performance of the innovation system.

Research and development has traditionally been considered as the core of the innovation system and universities as the most important public organisations that undertake research and development. Nevertheless, in many countries the science system nowadays also includes public research institutes and other research and development organisations, such as professionally-oriented higher education institutions (Gibbons et al. 1994). Characteristic for the research and development activity of these organisations is that it leads to publicly available knowledge, such

as scholarly journals and other publications (Edquist 2005, 192–194; Kautonen 2006, 26). The challenge is that the ability of companies to utilise this knowledge vary significantly and is often dependent on the interfaces, such as research and development units within a company or an external organisation, such as a university or other research organisation to mediate information flows (Kautonen 2006, 26).

Research and innovation activities are also usually driven by a range of rationales and motivations. To put it simplistically, research aims to advance knowledge and the driving force of innovation is the quest for profits. It is also argued that the tacit components and specificity of knowledge are much smaller in scientific knowledge production compared with industrial research and development. Consequently, the problem definitions of science are to a lesser extent determined by the local context, but result from global discourse. University researchers are explicitly oriented towards public diffusion of knowledge on the widest geographical scale possible. Investors in industrial research and development have an incentive to appropriate results, whatever the mechanism used to achieve this. (Frenken & van Oort 2004, 42–43.) However, innovation does not depend solely on the results of research and development, but also requires other actions, such as technical experimentation, market investigations, and entrepreneurial initiative (Edquist 2005, 194; Kautonen 2006, 26). It is proposed that particularly polytechnics could act as the mediators of research results into practice because polytechnics' research and development orientation is more practical and concentrates on applied research and development work (e.g. Kainulainen 2004, 72–73; Marttila et al. 2004, 100).

The third form of learning – competence building – occurs in educational institutions and companies. Its role was much neglected in early studies of the innovation system but the appreciation of it has been increasingly strengthened in recent years, because the importance of having skilled personnel for most innovative activities is recognised (Edquist 2005, 194). One can see that it is essential to analyse the knowledge and learning aspects of systems of innovation, including the formal research and development system, the education and training system as well as processes of learning that are embedded in various ordinary economic activities (Edquist 1997, 16).

The understanding that organisations, especially companies, do not innovate in isolation but instead in more or less close interaction with other organisations has brought interdependence and non-linearity to the focus of innovation system analysis. Within the innovation system, the relationships between the different organisations as well as organisations and institutions are often based on reciprocal relationships and complicated feedback mechanisms involving science, technology, learning, production, public policy, and demand. Through innovation activities, companies and other organisations can establish relationships with other organisations. (Edquist 1997, 1, 20; Edquist et al. 2002, 565–566.) The interaction relationships between the organisations can be of the market or non-market kind (Edquist 2001, 6; Edquist 2005, 196). Market transactions are based on exchanges of clearly specified

benefits between buyers and sellers in which the prices and quantities are the main means of communication (Edquist & Johnson 1997, 49; Powell 1990, 300–301). However, it is argued that market transactions do not illustrate the interaction of the innovation process in the best way and neither do they produce many innovations. Innovation processes require exchanges of qualitative matters, such as knowledge, know-how and information through which technical possibilities and user needs are confronted. (Cooke et al. 1997, 478; Edquist, Eriksson & Sjögren 2002, 565; Edquist & Johnson 1997, 49.) Those kinds of exchange are not easily measured and they have to be based on reciprocal, long-term and stable arrangements between the possessor and the potential receiver. It is evident that the kind of relationship presupposes trust between the two parties (Edquist et al. 2002, 566). Trust cannot be bought; it has to be earned in repeated transactions (Morgan 1997, 493).

3.2.3 Regional innovation system

The concept of the regional innovation system has been deployed since 1992 when regional scientists began to put together business networking, technology transfer and vocational training which formed the key pillars of regional innovation systems (Cooke 1998, 2–3). Since then, the concept has been developed further (e.g. Asheim & Gertler 2005, 291–317; Asheim & Isaksen 2002, 77–86; Braczyk et al. 1998; Cooke et al. 1997, 1998, 2000, 2004; Doloreux 2002; Kautonen et al. 2002; Kautonen 2006; Schienstock et al. 2004). The concept and approach of the regional innovation system originates from and is much inspired by the discussions about the national innovation system. It also usually refers to related works. (Asheim & Gertler 2005, 299; Edquist 1997; Edquist et al. 2002, 564; Lundvall 1992.) The regional innovation system approach was developed when it became apparent that some of the systemic dimensions of the development of innovations were difficult to capture at the national level even if the precise distinction between the regional and national innovation system is often difficult to ascertain. (Doloreux 2002, 246; Edquist et al. 2002, 564.) There are also several different theories that have influenced theoretical development of the regional system of innovation approach. The major contributions have come from evolutionary economics (Nelson & Winter 1982), institutional economics (Nelson 1993), new regional economics (Storper 1993), economics of learning (Foray & Lundvall 1996) and economics of innovation (Dosi et al. 1998) as well as network theory (Håkansson 1987). However, despite the importance of these theoretical influences, none of these form an implicit normative rationale in studying regional innovation systems. (Doloreux 2002, 244; see also Edquist et al. 2002, 564.)

In principle, the regional innovation system consists of the same elements as the national innovation system. Contrary to national systems, regional innovation systems are focused on interactions between diverse actors within the limited geographic area. Defining the geographical boundaries of an innovation system

is not a straightforward question, however. (Edquist 2005, 199; Miettinen 2002, 14.) As Edquist (2005, 199) argues, the specification of the boundaries should not be a question of choosing or using administrative boundaries between regions in mechanical manner. Instead, it should also be a matter of choosing geographical areas in which the degree of coherence or inward orientation is high with regard to innovation processes. (Edquist 2005, 199.) Possessing significant supra-local governance capacity and cohesiveness differentiates a region from its state and other regions. Regional innovation systems also have a different role from national systems. Because of the limited resources and smaller scale, not all the same organisations, institutions and resources are available at the regional level as are available at the national level (Cooke et al. 2000, 1–3; Kautonen et al. 2002, 125; Miettinen 2002, 14.) However, innovation and technology policies and related resources are often co-ordinated at the national level. Thus, it is possible to argue that regional innovation systems are entities embedded in national innovation systems and strongly influenced by national level co-ordination (Harmaakorpi 2004, 65).

The importance of the regional dimension of the innovation system has been argued as follows: regions differ with respect to their industrial specialisation patterns and innovation performance. Knowledge spillovers – which are important for innovation processes – are also often spatially bounded (Tödling & Trippl 2005, 1205). In addition, it has been argued that tacit knowledge is an essential determinant of successful innovation in the regional level. The exchange of tacit knowledge requires intensive, trustworthy personal contacts, such as face-to-face interaction or mobility of personnel (Gertler 2003, 79; Kaufmann & Tödling 2001, 792) which is difficult to carry out over long distances. Instead, tacit knowledge is strongly bonded with the social and institutional context in which it is produced. The context-specific nature of knowledge makes it spatially bound, because two parties can only exchange knowledge if they share a common social context. In these circumstances, partners in co-operation already share some basic commonalities, such as the same language, shared conventions and norms that have been fostered by a shared institutional environment. It is also essential that they have personal knowledge of each other which is based on a past history of successful collaboration or informal interaction. The common regional culture shapes the way that organisations interact with one another in the regional level. (Asheim & Gertler 2005, 293, 300.) The spatial character of tacit knowledge is also related to the changing nature of the innovation process. This means that innovation processes are increasingly based on interactions and knowledge flows between different actors, such as companies, research organisations and public agencies. (Gertler 2003, 79; Asheim & Gertler 2005, 293.) It should be noted that geographic proximity is also important for the formation of higher education – industry alliances (Croissant & Smith-Doerr 2008, 697; Fairweather 1988, 42).

4
Entrepreneurship in the higher education context

4.1 Entrepreneurship in the higher education literature

Entrepreneurship as a characteristic of higher education institutions and individual scholars has received increasing attention in research about higher education and science since the late 1990s. In particular, the aim of researchers has been to understand and redefine the changing role and tasks of science and higher education institutions in knowledge society. (Kristensen 1999, 35–36; Miettinen & Tuunainen 2006, 16.) Accordingly, entrepreneurship is increasingly attached to the higher education institutions that have actively adopted the third mission of economic and social development along with their traditional teaching and research tasks (Etzkowitz et al. 2000, 313–330; Etzkowitz & Klofsten 2005; 246–247; Jacob, Lundqvist & Hellsmark 2003, 1555–1556; Miettinen et al. 2006, 16). Entrepreneurial behaviour has particularly been considered to be higher education institutions' and individual scholars' response to the challenges of the rapidly changing environment, particularly financial scarcity and political pressures (e.g. Clark 1998a, 2004; Gibbons et al. 1994; Marginson & Considine 2000; Nowotny et al. 2002; Slaughter & Leslie 1997).

Entrepreneurship has been analysed with regards to individual and institutional level phenomena in the context of changes in higher education institutions' management, governance and research and teaching activities (e.g. Clark 1998a; Fairweather 1988; Gibbons et al. 1994; Marginson & Considine 2000; Slaughter & Leslie 1997). From the individual viewpoint, entrepreneurship has been integrated into such activities as higher education institution teachers' and researchers' engagement in obtaining large externally-funded research and development projects, their consulting firms, or as something that students learn in higher education (Nieminen 2005, 22–23; Seashore & Louis 1998, 77–78; Williams 2003, 10).

The current conception of entrepreneurship, however, emphasises the idea that entrepreneurship is not only an individual and sudden phenomenon but is also

social and organised (Jacob et al. 2003, 1556). From the institutional viewpoint entrepreneurship refers to universities or polytechnics[1] as enterprising organisations (Williams 2003, 10). The question is thus primarily about the governance, management and leadership of these organisations. Governance is related to the mission and purpose of organisation, its systems of decision-making and resource allocation, the patterns of authority as well as institutional-level relationships to the inside and the outside world (Marginson & Considine 2000, 7). That is, it is related to structures and processes through which institutional participants interact with, and influence each other, and communicate with stakeholders from the external environment (Birnbaum 1991, 4).

Burton Clark's (1998) study *Creating Entrepreneurial Universities: Organizational Pathways of Transformation* (presented in more detail in chapter 4.2) can be considered to be pioneer research on the entrepreneurial university. Since then, the number of studies of the field has increased and the conceptualisations of the Enterprise University and the entrepreneurial university have been applied to studies relating to organisational change and academic work in universities. The study by Marginson and Considine (2000, 2–3) investigated recent and contemporary changes in governance and the institutional culture of universities in Australia. These were analysed from the viewpoint of executive leadership, decision-making systems, and research management. The researchers used 17 university case studies as their empirical framework. They emphasised that their conception of an entrepreneurial institution was broader than profit-seeking activity in which organisational culture is totally reduced to the business form. Instead, they spoke about the Enterprise University, referring to both the economic and academic dimensions of the institution. They argued that enterprise is as much about generating institutional prestige as about generating income. (Marginson & Considine 2000, 4–5, 53.)

Based on their study, Marginson and Considine illustrated the shapes the entrepreneurial changes have taken in leadership and management structures as well as decision-making systems in Australian universities. The researchers concluded that the main changes in institutional governance have been strengthened executive leadership and executive strategies, the rise of vice-chancellors' groups, commercial arms and informal methods of consultation and communication. These are in addition to enhanced flexibility and continuous re-engineering. At the same time, the old collegial structures have sidelined or co-opted and the centrality of the academic disciplines in research organisations has declined. (Marginson & Considine 2000, 234.)

According to Marginson and Considine (2000, 72, 93) the new forms of executive authority appeared to be more concentrated and strategic than before. Power is related to the creation and use of strategic choices. In particular, it places vice-chancellors at

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1 However, most of the higher education and science studies consider entrepreneurship from the universities' viewpoint. To date, little research has taken the special features of polytechnic sector into consideration.

the centre of decisions about the strategic directions of universities. To support vice-chancellors and to keep them informed, universities have developed semi-formal decision-making groups. These groups generally do not have formal status defined by statute nor do they have direct reporting responsibility to other university bodies, such as university councils. The vice-chancellors can decide on the composition of these groups. (Marginson & Considine 2000, 74, 87, 91, 93, 234.)

At the same time, the role of the university councils has changed. University councils have traditionally been composed of representatives of academic and general staff, students, parliamentarians, members of university convocations, executive management, and a few co-opted members from business, law, community and the arts. Since the 1990s, university councils have been under pressure to become more externally oriented. Several committees recommended that the councils should be smaller and tighter and that a greater proportion of members should be appointed from industry and commerce. The central task of all the councils is the responsibility for the appointment of vice-chancellors. In addition, the councils have particularly engaged with formulation of strategic direction, planning for capital expenditure as well as financial and quality-related audits. (Marginson & Considine 2000, 98–100, 106.)

Marginson and Considine (2000, 133–136) argued that research forms the main link between the academic and corporate programmes in the Enterprise University. The study indicated that the research management of universities is becoming more comprehensive and more indicator-driven in both new and in older universities. In that situation, the primary task of research managers is no longer to encourage research and scholarship as ends in themselves, but the most important issues are the higher education institution's research prestige and its contribution to the financial balance sheet. Institutional measures of performance, the creation of comprehensive research management and the sharpening of competition in research emphasised the values of research activity. The researchers argued that the means to research has become both the measure of its value, and the end to be sought. The criteria for the distribution of core funding for research is increasingly based on measured performance. The centralised funding distributed by the government through the so-called 'research quantum', competitive project funding and the programme for funding 'cooperative research centres' now constitutes a majority of all designated research activity. This has made individual projects into the dominant mode of research activity, rather than open-ended long-term research programmes. (Marginson & Considine 2000, 136–137, 140–141.)

According to Marginson and Considine (2000, 141), the culture of economic enterprise is one of the central elements of the Enterprise University. It is related to the creation of a performance economy in research and the installation of funding distributions that reward successful performers. The economic perspective also sees academic freedom as sliding towards market economic freedom, referring to having the freedom to sign contracts, sell discoveries and retain the income earned.

However, the result of that kind of liberation is rarely expressed in terms of a richer intellectual life. The researchers argued that in the Enterprise University, one of the primary techniques of management is competition. Instead, few incentives are provided to encourage collaboration with other researchers. Privileging competition as a tool for resource allocation emphasises the quantity of research and sustains the drive to greater measured performance at all levels. It also focuses on short-term returns and shorter project times rather than long-term development. (Marginson & Considine 2000, 142–144.)

The institutional research managers aim to integrate research into academic units. According to Marginson and Considine, the main elements in the universities' internal research administration are the research office, the research leader-manager, the central research committee, and the company that manages at least some of the commercial contracts. However, there are considerable differences between universities in the systems and techniques they have adopted for research management. These include the functions of manager-leaders, the role given to central research committees, the manner in which academic units are involved with the centre, in the funding system, and in the precise formulae used. (Marginson & Considine 2000, 151, 155, 158.)

Marginson and Considine (2000) note that structuring the relationship between centralisation and devolution/autonomy can be the most delicate aspect in reconfiguring the academic units of a performance economy. The academic units are at the locus of research performance due to devolution. They are encouraged to become more proactive in creating projects and developing clients. That is, they are expected to behave almost like entrepreneurial local firms. The deans act as the middle-level executives, rather than as discipline leaders in their own right. Unit managers often have more financial autonomy than under the collegial tradition but within tighter constraints. The centrally determined systems of priority setting, output measurement, funding and infrastructure support set constraints and delineate the boundaries of legitimate research activity. (Marginson & Considine 2000, 74, 87, 150, 152, 234.)

According to Marginson and Considine (2000, 240) all Australian universities display three of Clark's characteristics of an entrepreneurial university: strengthened steering core, expanded developmental periphery, and diversified funding base, which are the characteristics of an entrepreneurial university in Clark's study. Instead, they note that the stimulated academic heartland and integrated entrepreneurial culture are weak or non-existent in Australia. They argue that stimulating the academic heartland relates not only to generating more financial resources but it also requires that more respect be given to academic cultures. (Marginson & Considine 2000, 247.)

Slaughter and Leslie (1997) had a slightly different viewpoint of the entrepreneurial university. They examined the ongoing changes in global economics, national policy and the financing of higher education, and how these have influenced the nature of academic labour. They sought answers to the following research questions:

How do individual academics respond to the rise of academic capitalism? How do administrators and academics describe the advantages and disadvantages of academic capitalism? Their research was concerned primarily with the dependence of universities on external funding (Tuunainen 2005, 280). Accordingly, Slaughter and Leslie used resource dependence theory to explain changes in national systems and in the pattern of incentives that shape the behaviour of universities in the United States, Australia, Canada, and the United Kingdom. Because less money from government sources is available in many industrialised countries, higher education institutions have become dependent on other financial resources. Accordingly, they have to begin to compete or increase their competition for critical resources. (Slaughter & Leslie 1997, 209.) Slaughter and Leslie use the term 'academic capitalism' to describe the institutional and professorial market or the market-like efforts to secure external funds. The critical resources for which universities compete are often intended for research. Acquiring competitive research funding is important for a university's prestige. In common with Marginson and Considine, Slaughter and Leslie point out that universities are not entirely driven by profits, since academic prestige also remains important. It can be said that universities are both profit maximisers and prestige maximisers. (Slaughter & Leslie 1997, 139, 212, 218; see also Fairweather 1988, 23; see also Marginson & Considine 2000, 49–51.)

The study by Slaughter and Leslie (1997, 137) indicated that both academics and administrators considered prestige and relations with external bodies to be critical resources. It was considered that universities' commercial activities would enhance their relationships with external groups, such as business firms, the public and government agencies. (Slaughter & Leslie 1997, 122.)

Slaughter and Leslie (1997, 17) argued that research is the activity that differentiates between and within universities because most universities teach but fewer win competitive research funds from government or industry. The results of Slaughter and Leslie's study (1997, 21) indicated that merit is no longer defined primarily through publication: rather it is also based at least partly on success with market and market-like activities.

The differentiation within public research universities will also become much greater because the departments, centres, and disciplines are in different positions in relation to markets and academic capitalism. Units and fields that operate close to the market gain power and influence within the university. They are able to take advantage of competitive opportunities provided by changes in government policy as well as opportunities offered by business and industry. Units of that type can organise themselves into centres and become successful academic capitalists and they often do so and teach less, while the remaining units that are far from market will teach more. It is argued that the centres and institutes have become the organisational vehicles for academic capitalism in Australia. They act as the intermediate organisational forms that enable academics to relate directly to external markets. (Slaughter & Leslie 1997, 174, 218, 221, 243.)

The disciplines closest to markets are undergoing the greatest transformations. Disciplines such as business services, applied natural sciences, agricultural sciences, and engineering are likely to gain external funding. They often have substantial revenues from contracts and grants with businesses and governments. The disciplines that interact with the private sector receive the highest remuneration. National policies that fund techno-science fields are also likely to increase differentiation between fields and disciplines within research universities since the fields and disciplines which are best suited for academic capitalism are more likely to receive greater government funding. They are also better positioned to win business and industry funds. Techno-science fields also account for the great majority of units that engage in the commercialisation of knowledge. On the other hand, humanities and social sciences are unlikely to have received much external funding. Centres in these fields are most likely to work with the public and accordingly they may have difficulties finding clients who have resources to support their research and expertise. They often lack a clear market niche. The centres have difficulties in working with external agencies that are committed more to profit than social justice or environmental protection. (Slaughter & Leslie 1997, 163, 175–176, 212, 217–218.)

According to Slaughter and Leslie (1997, 207) academic capitalism in general and science and technology in particular are bringing the change in higher education to the point where the centre of the academy has shifted from a liberal arts core to an entrepreneurial university. It can be assumed that entrepreneurial activity on the periphery will begin to reshape the academic core definitively. (Slaughter & Leslie 1997, 210.)

Slaughter and Leslie (1997) as well as Marginson and Considine (2000) note that universities of different types in different countries take different development pathways towards entrepreneurialism (Tuunainen 2005, 284). The change of universities and university research has also been investigated from several viewpoints in the Finnish context (e.g. Hakala et al. 2003; Hakala 2009; Kutinlahti 2005; Lyytinen et al. 2010; Nieminen 2005; Tuunainen 2004; Ylijoki et al. 2011 in press). Ylijoki has applied the concept of academic capitalism in her studies of Finnish university research (Ylijoki 2003; Hakala et al. 2003). According to Ylijoki (2003, 326–332) engaging in academic capitalism is not a straightforward or one-dimensional phenomenon in Finnish universities. Instead, it can take a variety of forms in different disciplines and organisational settings. The scope of the funding basis varies between disciplines, for example. Ylijoki studied three cases – the Department of History, The SemiLab and The Work Research Centre. Each of these units represented a different discipline. The Department of History had a relatively weak entrepreneurial orientation because its research markets are limited primarily to academic markets, even if there are preliminary openings for other sources of income. In the Work Research Centre, market-orientation was manifested in a very different form. It had a somewhat wider scope of potential income: it operates in the public sector research market, competing for funding from various public bodies.

The Centre can be described as a loose community of individual entrepreneurs who have to gather their funding and to employ themselves. The SemiLab had the widest funding base. It competes in academic markets, the public sector market as well as the private sector market by gaining funding from companies and by founding spin-off companies of its own. (Ylijoki 2003, 326–327; see also Hakala et al. 2003, 97–139.)

Nyyssölä (2008) has studied corporate governance and entrepreneurship[2] in Finnish polytechnics. The aim of his study was to produce concepts by which corporate governance, entrepreneurship and effectiveness can be studied in the context of Finnish polytechnics. He also examined the extent to which the amount of corporate governance and entrepreneurship affect the objective-orientation and effectiveness of the universities of applied sciences. The empirical data were collected by a questionnaire that was directed to the owners of all polytechnics and staff of 15 polytechnics. The results indicated that the corporate governance was dependent on the level of psychological ownership more than legal ownership. The amount of corporate governance and ownership were also stronger in private-owned than in public-owned polytechnics. The stronger the level of ownership was and the more entrepreneurial the personnel were, the more successful was the polytechnic according to the evaluation by personnel.

It is argued that due to changes in society, there has also been a shift in regard to scientific knowledge production in the sense of what the goals of the research are, how it is organised, what the reward systems are and mechanisms to control quality (Gibbons et al. 1994, 3–16; Nieminen 2005, 16; Nowotny et al. 2002). Gibbons et al. (1994) describe that shift in their well-known study *The new production of knowledge* as the change from Mode 1 type research, which is basic, disciplinary-based knowledge production to more applied and problem-oriented Mode 2 type research which is also called entrepreneurial research. A characteristic of Mode 2 knowledge production is that it aims at being useful for someone, whether to industry, government or society. Social accountability permeates the whole knowledge production process from defining research priorities to interpretation and diffusion of research results. In practice, this is manifested as the increased dependence of higher education institutions on external funding sources and the interests of the external environment. At the same time, public research funding is increasingly integrated into fulfilling national policy priorities. Thus, the knowledge production process presupposes close interaction between many actors. It is argued that the process has also become more heterogeneous and diverse in regards to potential sites where knowledge can be created as well as the skills and experience people bring to it The criteria to assess the quality of the research also differ from Mode 1 disciplinary science. The quality of disciplinary science is traditionally determined through peer review judgements but it is argued that in Mode 2 science, assessing the quality

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2   Nyyssölä uses the term intrapreneurship which he has derived from Schumpeterian idea of entrepreneurship.

includes a diverse range of intellectual interests as well as other social, economic and political interests. (Gibbons et al. 1994, 3–16; Nowotny et al. 2002; Slaughter & Leslie 1997.)

The change of university research from basic, Mode 1 type science towards to Mode 2 type science has also been investigated in the Finnish context (e.g. Hakala, Kaukonen, Nieminen & Ylijoki 2003; Hakala 2009; Lyytinen, Marttila, Ylijoki & Kaukonen 2010; Nieminen 2005). Researchers have sought answers to questions of how the changes in science policy and funding have been manifested in university research in different disciplines and research environments (Hakala et al. 2003; Lyytinen et al. 2010). Did Finnish university research shift towards a context of application during the 1990s and how did the organisation of university research change during the 1990s (Nieminen 2005).

The studies by Nieminen (2005) and Hakala et al. (2003) indicated that there has been a shift from pure or curiosity-oriented research towards strategic or applied research in Finnish universities. The data used in these studies were collected by a broad postal survey directed to the heads of all departments and separate research units in Finnish universities as well as semi-structured interviews, which were directed at professors, research directors and experienced senior researchers in university departments and research units that co-operate with non-academic partners.

Nieminen (2005, 176, 181, 227) argues that any straightforward conclusion of a comprehensive shift towards a context of application is exaggerated or at least it is premature to speak about broader epistemic shift in the Finnish case. It seems that coexistent change as well as traditional academic values and practices characterise the current status of Finnish university research (Lyytinen et al. 2010, 46).

The studies show that applied and interdisciplinary research as well as targeted research have increased in Finnish universities (Hakala et al. 2003, 94; Lyytinen et al. 2010, 32–35). However, the shift has been quite small-scale so far (Nieminen 2005, 146–147, 151). On the other hand, there are differences between the disciplinary groups. The change from basic research to applied research is the most visible in the natural sciences, engineering and medicine fields, while most of the representatives of humanities considered that there had been no change at all. The change has been clearest among the disciplinary groups where the growth of external funding has been fastest, even if the increase of external funding was an important change in all research environments (Hakala et al. 2003, 139–140; Nieminen 2005, 213). It seems that the growth in external funding and working in wider research groups has also been increasing in the humanities (Lyytinen et al. 2010, 36, 47).

The units that operated mainly with external funding adapted their activities to external expectations by combining academic and non-academic elements in their work (Nieminen 2005, 233). Engineering departments seemed to be more application-oriented and influenced by external influences than departments in other disciplines. Researchers within the field of engineering have also collaborated with companies for a long time. That is to say, they have the strongest market orientation (Hakala

et al. 2003, 195; Lyytinen et al. 2010, 46; Nieminen 2005, 148, 167). The universities with large natural sciences, engineering and medical faculties were able to attract more external funding than other universities. This can be at least partly explained because of science and research funding policy, which emphasised the importance of developing research in these areas. (Nieminen 2005, 225.)

The research indicated that university researchers collaborate more actively with other university researchers than with non-university institutes or companies. However, the disciplinary groups again differ from each others: the social sciences and humanities collaborate mainly with Finnish and foreign universities while the collaboration of natural and medical scientists and engineers consists of a more varied range of partners from universities to research institutes and companies. (Nieminen 2005, 181, 229.)

Studies concerning research and development at Finnish polytechnics have also been undertaken (Hyrkkänen 2007; Kortelainen 2006; Lyytinen et al. 2003; Lyytinen et al. 2008; Marttila et al. 2007; Marttila et al. 2005; Marttila et al. 2004; Rissanen 2003; Suvinen et al. 2006; Tulkki & Lyytinen 2001). Professional-oriented higher education institutions were originally teaching only institutions. However, the role of research and development has recently arisen as an important task in addition to teaching (Kyvik & Skodvin 2003, 204). Applied research and development is also a new task for Finnish polytechnics. The studies show that the research and development undertaken by polytechnics and non-university sector higher education institutions is more practical and externally-oriented than the university research. (Hazelkorn 2005, 54; Kyvik & Skodvin 2003, 205; Lyytinen, Marttila & Kautonen 2008; Lyytinen & Marttila 2008; Marttila et al. 2007). In Finland, polytechnics' research activity is mainly applied research and process or product development, which are aimed at solving the practical problems of working life (Marttila et al. 2007, 55). Scientific goals, such as promoting individual scientific interests or developing discipline, are not being emphasised as much (Lyytinen et al. 2008, 60–61; Lyytinen & Marttila 2008, 38). Because polytechnics' research and development aims to respond primarily to the needs of business, industry, companies and the public sector, co-operation with external partners is important. The researches indicate that companies, particular local companies, are often the most essential collaboration partners for polytechnics. (Marttila et al. 2004; Lyytinen et al. 2008.) In fact, co-operation with other polytechnics and research institutes seems to be substantially less regular. As is also the case with universities, polytechnics' co-operation partners, the reasons for co-operation and the results of research and development differ between fields of education. The social and health care field co-operates mainly with representatives and organisations of the public sector, and they aim to respond to their needs, whereas the representatives of the technology and transportation field typically collaborate with the enterprise sector by responding to their needs. (Lyytinen et al. 2008, 26, 62; Lyytinen & Marttila 2008, 34.)

Hakala and Ylijoki (2001, 377) argue that even though it is possible that there is a good balance between academic and entrepreneurial orientations, attempts to combine them are often problematic. The central reason for tensions between these orientations is the different rationales and time-span. The academic orientation emphasises theoretical work and allows for risk-taking. The entrepreneurial orientation appreciates direct utility and commercial benefits in a shorter time-span. Entrepreneurial orientation also keeps some important results secret, whereas making results public is the essential norm in the academic orientation. (Hakala & Ylijoki 2001, 377.) The same kind of problems can also be observed in the polytechnic context. The polytechnic's nature is to be an educational institution. Combining that role with the roles of research, development and as a service provider is the major challenge for polytechnics if they want to become more entrepreneurial organisations. (Lyytinen et al. 2008, 64–66; Lyytinen & Marttila 2008, 31–39; Marttila et al. 2004, 77; Marttila et al. 2007, 58; Marttila et al. 2008, 423–425.) The operation of polytechnics and companies is fundamentally different. The time frames and manner of achieving technical solutions may hamper collaboration between the two. Reconciling polytechnics´ academic perspectives with the rapid turnaround more common in companies has also been identified as challenging. In addition, company partners do not always take into account polytechnics' goals as educational institutions. (Lyytinen et al. 2008, 50–51; Lyytinen & Marttila 2008, 36–37; Marttila et al. 2004, 78–79.) There are also structural barriers that hinder external collaboration. It has been observed that the administration and governance models of polytechnics are not flexible enough for external co-operation. In practice, this means that the planning and funding systems of polytechnics are designed to support teaching activity. Accordingly, there are difficulties in combining teachers' flexible working hours, curricula and teaching with fast project activities and the time-tables of the company sector. Also, the core funding of polytechnics is allocated on the basis of the number of students and the number of completed degrees. (Lyytinen et al. 2008, 44–46, 65; Lyytinen & Marttila 2008; Marttila et al. 2005; Marttila et al. 2007, 54; Marttila et al. 2008.)

4.2 The organisational dimensions of entrepreneurial higher education institutions

According to Clark (1998a, xvi) the higher education institution – environment relationship can be characterised by increasing asymmetry between environmental demands and an institution's capacity to respond. That is, higher education institutions need an increasingly enlarged capacity to respond flexibly and selectively to the changes in the external environment (comprised of government, business and

industry and civic life), as well as the changes taking place within knowledge and the professional domains of the higher education world itself.

Clark's (1998a) study focuses on analysing the organisational pathways followed by five European universities in order to become more entrepreneurial. His view of the entrepreneurial university is based on the structural arrangements of a higher education institution that improves the organisation's response capacity and enhances focused organisation through choices made by administration and faculty (see also Sporn 1999a, 60). Clark considers "entrepreneurial" as the character of the social system that refers to the entire university, its departments and other units. A characteristic of an entrepreneurial higher education institution is that it actively seeks to move away from close governmental regulation and seeks its own organisational identity and new solutions about how it carries out its activities. It takes chances in markets and takes risks when initiating new practices. (Clark 1998a, 4.) As the conclusion of the case studies, Clark (1998a) summarises five important interrelated dimensions on the way entrepreneurial capacities of higher education institutions can be developed and how these can reduce the imbalance between environmental demand and an institution's capacity to respond. These are strengthening the steering core, expanding the developmental periphery, diversifying the funding base, stimulating the academic heartland and creating an integrated entrepreneurial culture.

4.2.1 Reconciling academic and managerial values – strengthened steering core

It is argued that higher education institutions need to strengthen their managerial capacities to become quicker, more flexible and focused in their reactions to changing demands (Clark 1998a, 5–6). According to Clark 'strengthened steering core' refers to a higher education institution's efforts to strengthen and systematise its managerial capacities. The strengthened steering core can take different shapes from centralisation to decentralisation but it is essential that it includes both central managerial groups as well as academic departments to combine traditional academic and managerial values. (Clark 1998a, 5–6; Clark 2004, 175; Kuoppala et al. 2003, 42.)

The traditional form of authority in higher education institutions has been collective control by a body of peers (Clark 1983, 112). That is to say, the professionals of each disciplinary field organise themselves internally, decide their own issues and choose their representatives for the university's decision-making bodies (Räsänen 2005, 22). Instead, the newer managerial forms of governance emphasise bringing the management concepts of private business into the higher education sector by stressing performance measurement, customer orientation, growing power of the executives as well as decentralisation of budgets, management responsibilities, and teaching/research outputs to the faculty or department level. The managers are in charge of their units and their performance. (de Boer, Enders & Leisyte 2007, 27-46; Ryan &

Guthrie 2009, 323; Räsänen 2005, 22–23; Santiago, Carvalho, Amaral & Meek 2006, 218, 221; Reed 2002, 163–185.) Clark (1998a) argues that blending the perspectives of central managerial groups and academic departments works best when academics that are trusted by their peers serve on central groups and councils and take up responsibilities for the entire institution. Through these collegial groups, senior institutional management and academic departments can share responsibilities, smooth over the conflict between new managerial and traditional academic values, and provide a link between overall institutional interests and the separate interests of major internal units and groups. (Clark 1998a, 137–138.) If deans are included as part of one of the central groups, the steering core is less likely to become detached from the institution's core tasks: teaching and research and the academic interests of the institution (Shattock 2003, 79).

However, regardless of its shape, the strengthened steering core consists of managers and administrators who work to find resources for the institution as a whole. They work towards diversifying income sources and seeking out new infrastructure that reaches across the old boundaries of higher education institutions to link them with outside establishments, especially the business sector. (Clark 1998a, 137–138; Clark 1998b, 9.) The role of the managers of higher education institutions nowadays is to be actively involved in promoting and lobbying for the institutions in regional innovation and research policy forums. In addition to looking inwards, they also look and engage outwards with society (Shattock 1997, 33). They have to take more direct responsibility for setting strategic directions and for developing a range of assessment practices in order to respond to the accountability regimes (Clark 1998a, 138; Clark 1998b, 9; Scott 1996, 120–121).

Clark (1998a, 5) emphasises the active role and adaptation by design of administration that brings his analysis nearer to the strategic choice view. The strategic choice view emphasises three key issues: the role of agency and choice in organisational analysis, the nature of organisational environment as well as the relationship between organisational agents and environment (Child 1997, 43–76; Child 1972, 1–22). Strategic choice view has also been applied to higher education context (Sporn 1999; Cameron 1983, 359–380; Cameron 1984, 122–144).

The perspectives on organisation have traditionally been dichotomised between those which focus on agency (the "voluntaristic" approach) and those which emphasise determinism (Astley & Van de Ven 1983; Child 1997, 49). The voluntaristic approach sees individuals as autonomous, proactive and self-directing agents. Individuals form the basic unit of analysis and source of change in organisational life whereas the deterministic view emphasises that the behaviour of individuals is determined by and is a reaction to structural constraints that provide organisational life with an overall stability and control (Astley & Van de Ven 1983, 247). However, that kind of dichotomisation is criticised as being too simple because it implies that all constraints on agency are external (Whittington 1998, 521; Child 1997, 49). Whittington (1988) divides between environmental determinism and action determinism. Action

determinism refers to the possibility that actions are selected according to the in-built preferences and information processing systems of the actors (Child 1997, 49; Whittington 1988, 524). Child (1997, 58) argues that the concept of strategic choice was misleadingly interpreted as justifying a sharp distinction between organisational agency and organisational environment, meaning the absence of external determination in strategic choice. Organisational decision-makers can find themselves in a position of having to respond to feedback from the environment if their organisations are not to risk severe market and institutional penalties.

Strategic choice can be defined as the process whereby power-holders within the organisation decide upon courses of strategic action which can be directed towards different targets (Child 1997, 45). The view emphasises a strong managerialistic point of departure in dealing with organisation-environment relationship and the active role of the managers and leading groups who have the power to exert influence on the structures of their organisations through essential political process (Astley & Van de Ven 1983, 249; Child 1997, 43). The decision-makers have discretion to choose an organisation's strategy quite independently. Even if there are always a few external and internal constraints, the management still has certain discretion in strategy formulation and the actual choice reflects the preferences and perspectives of top managers. (Vesalainen 1995, 31.)

According to Child (1997, 53, 56), the nature of the environment is essential for strategic choice analysis. Strategic choice analysis recognises both proactive and reactive aspects of organisational decision-making with relation to environment. Proactivity refers to management that is trying to anticipate future conditions and adjust the organisation according to them. (Vesalainen 1995, 31.) Organisational agents are considered to have a kind of bounded autonomy. That means they can take external initiatives, such as the choice to enter and exit environments, they can control, manipulate and scan the environment and make adaptive internal arrangement but at the same time the environments within which they are operating can present both threats and opportunities for the actors. That is to say, the environment can enable or constrain their options for making choices and their scope for action because it imposes certain conditions for the organisations to perform well. (Child 1997, 53–54, 56; Cameron 1984, 127.) In the context of higher education institutions, the types of constraint that limit rectors' choice options include legislation, interests of different stakeholders, professional norms as well as the system of collective bargaining contract, for example (Ojala 2003, 167).

The strategic choice view has traditionally provided guidance to studies of how organisations relate to their task environments (Child 1972; Scott 2003, 197). In general, the task environment focuses on economic and technical variables, such as market demand and the rate of technological change (Child 1997, 54). By broad definition, it refers to all aspects of the organisation's environment that are potentially relevant to goal setting and goal attainment. However, typically it is used more narrowly to refer to the nature and sources of inputs, competitors, and markets

for outputs. The task environment conception emphasises that most organisations are created to achieve goals, to perform some type of work. It particularly stresses that no organisation is self-sufficient; but instead all must enter into exchanges with the environment (Scott 2003, 133). The current assumption emphasises, nevertheless, that the organisational actors do not necessarily deal with environment through the impersonal transactions of classical market analysis but instead they often engage in relationships with external parties that are sufficiently close and long-standing as to lend a mutually pervasive character to organisation and environment. It indicates that the environment has an institutional character too, and persons inside and outside the formal boundaries of an organisation may share institutionalised norms and relationships. That means the environment contains cultural and relational dimension in addition to the "task" and market variables. (Child 1997, 54–55, 57–58.) Accordingly, the social structuring of the environment, such as norms and values can both enable as well as constrain the strategic choices (Whittington 1998, see Child 1997, 56). The ways in which organisational actors understand the environment also affect the extent to which they enjoy autonomy of choice between alternatives (Child 1997, 53). It is argued that entrepreneurial higher education institutions enter into and try to anticipate the behaviour of the markets (Shattock 1997, 33). There is a need for management to cope with permeable boundaries within the organisation as well as external boundaries by emphasising strategic partnerships, sharing resources and looking for new problem contexts. That is to say, the external environment becomes essential (Gibbons et al. 1994, 155–161; Van Vught 1999, 351). External stakeholders also become increasingly involved in the internal processes of higher education institutions (Amaral & Magalhaes 2002, 9; Harrison & John 1996, 47). The essential question is whether and how higher education institutions develop policies, structures and rules that allow and encourage increased interaction with other actors (Gibbons et al. 1994, 163).

It is also argued that strategic choice analysis offers two particularly useful contributions to understanding the process of accommodation of external performance expectations. It recognises that people in organisations often belong or give access to intra- and extra-organisational social groups. Through these connections, the members of the organisation can influence the success criteria that external bodies apply to it. They can also be proactive in the formulation of the criteria imposed by the external bodies. (Child 1997, 68–69.)

It can be supposed that this is one of the most important challenges considering the present situation of the Finnish polytechnics. They have had to adapt both to rapid internal change as well as increased external expectations. The new tasks and increased regional responsibilities have challenged polytechnics to strengthen their institutional capacity as organisations.

4.2.2 Spanning the external boundaries of the organisation – expanded developmental periphery

It is argued that higher education institutions need to be more open and responsive to their environment to survive and these responses can have profound effects on their governance structures and processes (e.g. Birnbaum 1991). Calls for providing a broader range of services to society and responsiveness to regional communities have challenged higher education institutions to reorganise themselves in order to increase their engagement in the different development processes of their environment (Jacob & Hellström 2003, 48). That means higher education institutions increasingly interact with, and are influenced by, numerous and diverse external elements. They have to cope with changing governmental regulations and societal demands as well as competition for external financial resources. (Ashkenas et al. 2002, 2, 11; Daft 2007, 55; Jongbloed, Enders & Salerno 2008, 305.) When the complexity of the external environment increases, higher education institutions need to increase their own complexity (Daft 2007, 66, 74).

According to Clark (1998a, 6), exhibiting a growth of units that cross the old university boundaries to link up with external organisations and groups can be the response of an entrepreneurially-oriented higher education institution to cope with increasing environmental complexity and uncertainty. Clark calls this 'the expanded developmental periphery'. The boundary spanning refers to the set of activities involved with organisation-environment interaction. Accordingly, activities that link an organisation with its environment can be seen as boundary spanning behaviour (Jemison 1984, 133).

The boundary-spanning units and roles can have different functions. The main functions can be divided into information processing and external representation. That means boundary-spanning roles link and co-ordinate the organisation with key environmental elements, whether by buffering, moderating, or influencing the environment. The organisation also gets information from external sources through boundary roles. However, boundary roles and units facilitate not only collecting external information and sharing it with internal members, but they also promote transmitting internal information to external groups. (Aldrich & Herker 1977, 218; Birnbaum 1991, 166, 183; Daft 2007, 59–60; Lee, Ohta & Kakehi 2010, 192.) By offering information about the uncertain environment and resources from the environment, the boundary roles and units can become essential elements that improve an organisation's capacity to respond more flexibly and speedily to environmental demands and changes. (See also Daft 2007, 66, 74; Scott 2003, 299.) A boundary-spanning unit can take the initiative and move more flexibly than traditional departments since they are often largely dependent on external funds and their existence is less permanent than teaching units (Becher & Kogan 1992, 89). In innovation process, the role of boundary spanning is particularly to

promote information flows across boundaries of different groups, organisations and knowledge domains (Lee et al. 2010, 92).

The boundary-spanning units can take different shapes: they can be administrative units promoting contract research and contract education, or research centres that work as part of the higher education institution. Alternatively, they can operate more like mediating institutions, such as science parks, situating themselves between the higher education institution and the outside environment. (Clark 1998a, 138–139; Clark 1998b, 9.) Technology transfer offices, research centres, research parks and industry liaison offices belong to typical formal boundary spanning structures promoting university-industry collaboration (Lee et al. 2010, 192). The boundary-spanning units can be loosely or tightly coupled to the steering core and the heartland departments. Common to all of these is that they move higher education institutions toward a dual structure of basic units in which traditional departments are supplemented by the centres, units and programmes that are linked to external environment. Department-based specialist groups can be complemented by project groups that introduce external definitions of research problems, provide the training that is required, and promote environmental linkages in their practices. (Clark 1998a, 6, 138–139; Clark 1998b, 9.)

Establishing separate outreach units, research centres or managerial offices that are in charge of building and maintaining bridges to the environment is the traditional way of analysing the boundary roles of higher education institutions (Clark 1983, 1998; Scott 2003, 299). However, the traditional approach has been criticised because its central idea is to protect the technical core or academic heartland from external influences by constructing separate buffer units as the barriers between the organisation and environment (Daft 2007, 59; Harrison & St. John 1996, 47). It is argued that boundary-spanning activities that link organisations directly to other organisations without separate buffers are important for higher education institutions because they make it easier to create and enlarge common goals and to build interdependencies with the stakeholders in the complex and uncertain environment. (Amaral & Magalhaes 2002, 2, 11–12; Gibbons et al. 1994; Harrison & John 1996, 52; Manev & Stevenson 2001; Shattock 2003; Van Vught 1999.)

It can be assumed that managing and analysing the environment and different stakeholder relationships and prioritising stakeholders over the long run is a central strategic challenge of higher education institutions. Activities of these kinds allow higher education institutions to establish linkages to their external stakeholders in the pursuit of common goals instead of only adapting to the needs of the stakeholders. Examples of boundary-spanning activities that link organisations to other organisations are networks, joint ventures, strategic alliances, associations and consortia, for example. (Freeman & McVea 2001, 199; Scott 2003.)

Networks can be characterised as the constellations of businesses that are organised through the establishment of social contracts such as reciprocity, trust and horizontal patterns of exchange rather than legally binding contracts. That is to say,

the exchanges within the network are dependent on relationships, mutual interests, and reputation. It is argued that networks are particularly suitable for circumstances in which there is need for efficient and reliable information. In that situation, the most useful information is that which is obtained from someone with whom one has operated previously and found to be reliable. Thus, networks are especially useful for the exchange of commodities whose value is not easily measured such as know-how and skills, technological capability or spirit of innovation. (Barringer & Harrison 2000, 387; Jones, Hesterly & Borgatti 1997, 916; Powell 1990, 295–336.)

Joint ventures are entities that are created when two or more organisations pool a portion of their resources to create a separate jointly owned organisation. Joint ventures can be tools for higher education institutions to achieve a range of objectives as a result of increased competitive pressures (Barringer & Harrison 2000, 384). Higher education institutions can also establish and participate in strategic alliances with local actors aiming to utilise and transfer the knowledge, technologies, know-how and skills into local and regional communities. An alliance is distinct from networks and joint ventures. It tends to be informal and not involved in the creation of a new entity or central administrative authority. Rather it refers to partnerships between organisations that are not as complex and long-term in nature as networks and joint ventures. An alliance is an arrangement between two or more organisations that establish an exchange relationship but it is not involved with joint ownership. (Barringer & Harrison 2000, 391, see Dickson & Weaver 1997.) Strategic alliances can also help higher education institutions to combine scare resources and earn new resources. This links the developmental periphery and the diversification of external funding sources closely together (Kitagawa 2005, 66, 75, 83). By prioritising stakeholders, higher education institutions can create strategic alliances and enter into contracts with particular companies (Bok 1982, 157).

Associations are arrangements that allow collections of similar or diverse organisations to work in concert to pursue mutually desired objectives at the community or local levels. That is important because much of the work to influence the external environment is accomplished jointly with other organisations that have similar interests. Organisations join associations for gathering resources, securing information, exercising influence or obtaining legitimacy and acceptance. (Scott 2003, 209.) By pooling resources, organisations can pay people to carry out activities, such as lobbying legislators, influencing new regulations or developing public relation campaigns (Daft 2007, 72).

By working closely with stakeholders, higher education institutions will have more complete information about the direction the environment is moving in. Close relationships also support the creation of trust and respect between these two groups which are important in innovation processes and could possibly lead to an enduring relationship (Harrison & St. John 1996, 52; Powell 1990). Thus, networking and partnership models need to be suitably adapted to local specificities and institutional capabilities. The challenge of management is to find reasons for pursuing these

opportunities that serve the interests of the higher education institution and simultaneously benefit the community. (Bok 1982, 221, 236.) This kind of mediation mechanism can be especially significant, furthering the process of institutional learning and communication, creating networks of institutions and building social capital (Clark 1983, 235; Kitagawa 2005, 75; Putnam 1993).

4.2.3 Seeking external resources – diversifying the funding base

The core funding from the government is the most important source of funding of universities and polytechnics in many European countries (see e.g. Ferreira et al. 2008, 197–198; Huisman 2008, 155–156). However, its share is declining in almost every industrialised country. This is also a topical challenge for the Finnish polytechnics. According to Clark (1998, 6–7) higher education institutions can turn the pattern of declining resources to their advantage by trying to raise money from external, second and third stream funding sources. It is argued that the most successful universities are among those that have adapted best to the new environment and diversified their funding sources (Shattock 2003, 27).

The second major source of funding is typically research councils whose grants and contracts higher education institutions can compete for. The third-stream income source – that is particularly emphasised by Clark – refers to funding from companies, local government, the European Union and other international funding sources as well as revenue from campus services, student fees, and alumni fundraising. In many countries, the most important new or additional third stream funding comes in the form of tuition payments from students. Their significance as a revenue source has increased as its share of university's total revenues has grown (Slaughter & Leslie 1997, 237). Success in attracting diversified funding sources depends also on meeting the criteria related to social priorities, relevance and accountability of research (Gibbons et al. 1994, 145). In the Finnish context, the third stream funding is channelled mainly to research activities and to research and development and continuing education in polytechnics (Kuoppala 2005, 236–237; Ministry of Education 2004b, 16). It should be noted that the more research active universities often have a more diversified funding base than the less research active universities (Shattock 2003, 27). By diversifying its funding base through second and third stream funding sources, a higher education institution can strengthen its self-regulative capacity and thus have more flexibility to make changes and to respond to environmental needs (Clark 1998a, 6–7; Kuoppala 2005, 236–237). Discretionary funds can be used in the development of a higher education institution's activities and for the recruitment of experts that would not otherwise be available (see for example Slaughter & Leslie 1997, 2; Sporn 1999b, 28). They can also be an instrument for polytechnics to create a regional profile (Meklin et al. 2000, 9). Clark emphasises that it is important to integrate the process of income

diversification with entrepreneurialism which is primarily academically rather than financially led (Clark 1998; Shattock 2003, 50).

4.2.4 Increasing the interaction between core and environment – stimulated academic heartland

According to Clark (1983, 28–30, 234) higher education institutions are bottom-heavy and diffuse organisations in which the discipline or profession constitute the dominant force and the academic personnel's primary mode of working. The discipline and profession is the form of an organisation that is specialised according to certain knowledge domains. It connects one sociologist with other sociologists as well as engineers to other engineers within the higher education institution and between higher education systems nationally and internationally. The disciplinary-based departments form the academic heartland of the higher education institution in which the basic tasks – teaching and research – are undertaken. Whether these units accept change is critical for transforming them into more entrepreneurial entities. For change to take hold, it is essential to know how these heartland units orient themselves to the external environment by establishing new relationships, teaching and research programmes, or promoting third stream income. The forms of stimulation can take on a range of forms from melding the periphery into the core, establishing university-wide graduate schools or research fellowship programmes and restructuring the organisation. Clark's case universities also emphasised that the basic units should be given considerable leeway to develop their disciplinary possibilities, to create bridges to industry and to select projects according to their disciplinary interests. (Clark 1998a, 27, 52, 78, 109.)

It is argued that the heartland units are often the last places where changes take hold. In addition, enterprising activities also typically spread unevenly in the different heartland units. That means science and technology departments are typically the most involved in external relationships and therefore are the first to become entrepreneurial, whereas social sciences and humanities departments are less involved in relationships that link to external groups (Clark 1998a, 7, 141). In addition, the linkages to the environment are often speciality-based with each professional section possessing its own bridges to external groups (Clark 1983, 206).

One can suppose that the heartland or knowledge domain of polytechnics is built up differently than in the university sector and is a more complex issue. The tradition of the polytechnics is drawn particularly from the previous post-secondary level vocational educational institutions and teaching. As Kotila (2004, 13) argues, disciplinary-based expertise is only one of the traditions behind polytechnic teaching. It is said that polytechnic teaching is based on a mix of the disciplinary-based higher education tradition as well as the apprenticeship tradition and the professional training tradition. That is to say, polytechnics' heartlands are built up of a mixture

of these three traditions, which are strongly dependent on the field of education and also still reflect on the operation and pedagogical cultures from the previous educational institutions. (Kotila 2003, 189, 191, 199.) In addition, histories, traditions and the nature of knowledge production vary between the fields of education (cf. Hölttä 1995, 48).

It is argued that professional higher education institutions have a twofold orientation when they locate between the discipline-oriented universities and practice-oriented working life (Schön 1990, 306; see also Auvinen 2004, 226; Lyytinen & Marttila 2008, 38). In that situation the stimulation of the heartland is related both to the linkages to business and industry as well as academic community. That is also a topical challenge for Finnish polytechnics. It is argued that professional education can not be based only on mediating knowledge and skills inside a higher education institution. Instead, it is important to widen the learning and working options outside the organisation and to bring the environment inside the higher education institution and to its teachers and students. The central challenge for the basic units is to create open and networked learning environments. (e.g. Auvinen 2004, 21; Raivola et al. 2001; Salminen 2000, 47.)

4.2.5 From institutional idea to integrated entrepreneurial culture

The mission of a higher education institution indicates which profile the institution would like to realise, what its overall goal and reason for existence is (Daft 2007, 158; Spoor & den Hollander 1988, 59). It gives expression in terms of status, quality and prestige with respect to other institutions as well as educational vision, student profile to be attained, and orientation with regard to new tasks (Spoor & den Hollander 1988, 59). It is argued that even if organisations have different core missions, the logic from which the mission derives from is the same: a balancing of the needs of different stakeholders (Schein 2004, 89).

In order to achieve change in an organisation it is essential that the work culture of that organisation supports change (Clark 1998a). According to the Clark, the process can start from an institutional idea about change which later becomes an institution-wide culture. It is argued that the assumptions the members of an organisation share about their identity and ultimate mission or functions is one of the most central elements of any culture (Schein 2004, 92–93). The culture includes the ideas that certain things in groups are shared or held in common, and there is some level of structural stability in the group. Thus, the history of shared experience and some stability of membership in the group are essential preconditions of forming the organisational culture. The concept of culture also refers to an integration of elements – rituals, climate, values and behaviours – into a larger, coherent whole. (Schein 2004, 12–14, see also Clark 1983.) However, as Harman (2002, 110) argues it is not realistic or useful to interpret an integrated organisational culture in a

sense that all members should agree amicably on everything but instead that they can agree on a basic framework of values even if they can disagree some technical issues. Schein (2004, 17) defines the organisational culture as "a pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration." These have worked well enough to be considered valid and accordingly, to "be taught to new members as the correct way to perceive, think, and feel in relation to those problems."

Schein (2004, 85–88) emphasises that every organisation encounters the problems of how to deal with its external environment and how to manage its internal integration. The issues or problems of external adaptation specify the coping cycle that organisation have to maintain in relation to its changing environment. The essential elements of this cycle include the organisation's mission and strategy, goals, means, measurement and correction. According to Schein (2004, 89) every new organisation has to develop a shared concept of these survival problems. Organisations have also to be able to develop and maintain a set of internal relationships among its members. The processes that allow a group to integrate itself internally reflect the major internal issues which include creating a common language and conceptual categories, defining group boundaries, distributing power and status, developing norms of intimacy, friendship, defining and allocating rewards and punishments as well as explaining the unexplainable that any group have to deal with. (Schein 2004, 111–112.) These issues of external adaptation and internal integration are interdependent. The environment sets limits as to what the organisation can do. Within those limits, not all solutions will work equally well (Schein 2004, 134).

Clark (1998a, 7–8) argues that changes in an organisation's internal steering system, re-organisation of academic activities as well as boundary-spanning units are central tools by which transforming beliefs are made operative. Strong cultures are rooted in strong practices. The history of Finnish polytechnics as multidisciplinary higher education institutions is still young. Polytechnics are comprised of several former vocational education institutions. Each of these institutions had their own subcultures and own integrity including shared histories and traditions that differ from each other (cf. Schein 1992, 14, 255). Understanding the bases of these cultural differences is the first step for the senior institutional management of polytechnics who have the task of creating a coherent higher education community (Harman 2002, 111). It is argued that the existing cultural characteristics, such as values, beliefs and attitudes of staff are essential determinants if the newly merged higher education institution wants to fashion itself on an entrepreneurial model (Locke 2007, 93).

5
Research data and methodological choices

5.1   Multiple case study design

It can be argued that the case study is one form of qualitative research. Most if not all qualitative studies can be defined as case studies but case study can also include quantitative evidence. (Creswell 1998; Eskola & Suoranta 1998, 61–62; Merriam 1998; Yin 2003, 15.) When one is using a case study method, the research interest is usually in the interpretation of the meaning of text or action (Miles & Huberman 1994, 7). Robert Yin (2003) recommends case study research design for studies in which the researcher has only a little control over the phenomenon and the focus of the research is on some current phenomenon in its everyday life context. The case study design is also appropriate in those situations when the boundaries between the phenomenon and context are not clearly evident. This makes it possible to maintain an approach covering the holistic and significant features of the phenomenon. In addition the case study strategy is a most appropriate design for answering "how" and "why" questions.

   The central principles of case study research are its context-orientation, exploitation of multifaceted sources of research data and the development of theoretical propositions to guide data collection and analysis (Creswell 1998, 36; Gray 2004, 124; Yin 2003, 13). According to Creswell (1998, 61) the context of the case means situating it within its physical, social, historical, cultural and / or economic settings (see also Häkli 1999). If the case is a higher education institution the essential and unique context features are, for example, the institution's geographic location, its unique historical developments, the academic staff's strengths and weaknesses and even the play of particular personalities (Clark 1998b, 8; Jongbloed et al. 2008, 308). It is argued that the case study approach is especially useful when the researcher is trying to uncover a relationship between the phenomenon and the context in which it is occurring (Gray 2004, 124).

Case studies also often include multiple sources of information which can be observations, interviews, audio-visual materials as well as documents (Creswell 1998, 61). In the context of using multifaceted research data, researchers often speak about triangulation, which means exploitation of different data, theories and methods in the same research. It can also mean that different researchers are studying the same object. Thus, it is possible to speak about data, researcher, theory and method triangulation. (Eskola & Suoranta 1998, 69–74; Yin 2003.)

Yin (2003, 21) summarises the components of case studies by outlining five especially important elements. These are 1) the study's questions, 2) its propositions (if any), 3) its unit(s) of analysis, 4) the logic of linking the data to the propositions and 5) the criteria for interpreting findings. This study used the multiple case study method. A description of how the components of case studies and the principles of context-orientation, exploitation of multifaceted sources of research data and the development of prior theoretical propositions were applied in this study is described below.

Research questions

The research task of this study was to examine how the Finnish polytechnics have built their capacity for regional engagement. Capacity building was analysed within the framework of organisational change dimensions of the entrepreneurial university (Clark 1998a). The research task can be divided into two research questions:

1. How have the polytechnics strengthened their institutional capacity for regional engagement?
2. What kind of linkages have polytechnics established with the other actors of the environment?

The questions were analysed particularly from the viewpoint of the senior institutional management of the polytechnics and the officers from regional authorities who are in charge of regional development at the strategic level. The question was thus primarily about the conceptions and opinions of these institutional level actors.

Cases

The unit of analysis is related to the question of what the case is. The research design can consist of both single- and multiple-cases (Yin 2003, 22, 46). This study applied multiple-case study design in which the cases were polytechnics. The research focused on studying four particular cases – Jyväskylä Polytechnic, Tampere Polytechnic, Satakunta Polytechnic and Seinäjoki Polytechnic. All the case polytechnics were medium-sized, multidisciplinary and regional higher education institutions. In addition, they have all been operating as polytechnics for about the same length of time (see Table 1). It can also be claimed that the success of Jyväskylä Polytechnic (2006), Satakunta Polytechnic (2001) and Seinäjoki Polytechnic (2003) in the external evaluation of the centre of excellence for regional development impact carried out by

the Finnish Higher Education Evaluation Council is evidence of their willingness and activity to become regionally responsive higher education institutions (Huttula 2001; Impiö et al. 2003; Käyhkö et al. 2006).

In this study, the cases – polytechnics – were situated in the particular context of their local and regional environments. The polytechnics were located in four different regional innovation environments: Central Finland, Satakunta, South Ostrobothnia and the Pirkanmaa/Tampere region. The multiple-case study design make it possible to compare the cases with each other and to identify their similarities and differences that provide more general information about the phenomenon than focusing only on single case (cf. Peltola 2007, 112).

TABLE 1. Basic information about the case polytechnics

	Seinäjoki Polytechnic	Satakunta Polytechnic	Jyväskylä Polytechnic	Tampere Polytechnic*
History	Permanent operating licence 1.8.1996	Permanent operating licence 1.8.1997	Permanent operating licence 1.8.1997	Permanent operating licence 1.8.1996
Number of students	~ 4500	~ 5900	~ 6500	~ 5200
Number of full-time teachers	~ 200	~ 275	~ 290	~240
Structure	Dispersed (units in six localities in province)	Dispersed (units in five localities in province)	Dispersed (units in three localities in province)	Concentrated (units in two localities, most of the units in the city of Tampere)
Licence holder	Seinäjoki Federation of Municipalities in Education	The City of Pori	Jyväskylä Polytechnic Ltd.	The City of Tampere
Academic profile	Multidisciplinary	Multidisciplinary, technical-commercial	Multidisciplinary, especially the service sector	Multidisciplinary, technical-commercial

*   Tampere Polytechnic merged with Pirkanmaa Polytechnic on 1.1.2010. The new polytechnic is known as Tampere Polytechnic. The data for this study were collected before the merger process. Thus, this study considers Tampere Polytechnic in its original shape.

According to Yin (2003, 47), in multiple-case studies each case has to be selected so that it either predicts similar results or predicts contrasting results for predictable reasons. My argument for choosing these cases was that although they were all medium-sized, multidisciplinary and regional higher education institutions, they were located in different regional innovation environments which meant that they

provided different perspectives of the problem (Creswell 1998, 62) and they therefore predicted contrasting results from this viewpoint. It is argued that the different environmental conditions and different relationships with external actors may require diverse organisational structural accommodation in order to achieve a high level performance (Child 1972, 3). Accordingly, it can be assumed that polytechnics need different strategies and tools to respond to the changing environment in different regions (Etzkowitz & Klofsten 2005, 243; Isaksen & Remoe 2001, 300) and the choices of these strategies vary according to what the central decision-makers of polytechnics and regional authorities find to be important. The decision-makers can take external initiatives and make internal adaptive arrangements. However, at the same time the environment within which they are operating can constrain or enable their choices and scope of action (Child 1997, 53).

This study focused on investigating polytechnics in two types of regional innovation environments: institutionally thick regions (regions with polytechnics, universities and research institutes, which are Tampere/Pirkanmaa and Jyväskylä/ Central Finland, and institutionally thin regions (with a polytechnic and university consortium but without their own university), which are Satakunta and South Ostrobothnia (see Table 2). The research shows that the strong institutional presence and the high levels of interaction and commitment demonstrated by companies, higher education institutions, research institutes and technology transfer agencies in the local areas are the central factors that promote the success of the regions and their innovation capacity (Amin & Thrift 1994, 14–15; Cooke et al. 2004, 11; Kolehmainen 2004, 41; Kosonen 2004, 124). Respectively, the lack of relevant actors and lack of innovation collaboration between them are considered to be barriers to innovation activity. Institutionally "thin" regions lack universities, research and development institutes, technology centres or other important local organisations (Isaksen 2003, 70–71). The starting point of forming this research design was based on a previous research project which preliminary explored polytechnics' new research and development task and role in regional innovation environments (Tulkki & Lyytinen 2001).

TABLE 2. Characteristics of the regional innovation environments of the case polytechnics

	South Ostrobothnia (Seinäjoki)	Satakunta (Pori)	Central Finland (Jyväskylä)	Pirkanmaa (Tampere)
Industrial fields	Primary production, SMEs (woodworking, metal, textile, food industry)	Manufacturing (forest, metal, shipbuilding industry)	Services, industry (mechanical, equipment, metal and base metal industry)	Multifaceted (ICT, pulp, paper, mechanical engineering)
Research	Focus on applied research and development work	Focus on applied research and development work	Basic and applied research, development work	Basic and applied research, development work
Education	Seinäjoki Polytechnic and Seinäjoki University Consortium (consists of units of five universities)	Satakunta Polytechnic, Pori University Consortium (consists of units of four universities)	Jyväskylä Polytechnic and Jyväskylä University	Tampere Polytechnic, Pirkanmaa Polytechnic, Tampere University, Tampere University of Technology

However, it is essential to remember that even if the best knowledge about local issues is usually held by regional level actors, the ability to develop regional models is often highly dependent on national regulations, constraints and incentives, particularly in centralised countries such as Finland (see Harmaakorpi 2004, 65; Isaksen and Remoe 2001, 300). In Finland, the regulative environments of polytechnics are set by actors at two levels – the state and the local maintaining organisations (Kohtamäki 2009, 57).

Logic of linking data to a conceptual framework

This study applied Burton Clark's (1998a) organisational change elements of entrepreneurial universities as the framework for analysing the senior institutional management views of how Finnish polytechnics build their institutional capacity for regional engagement. The starting point of the study was thus to analyse how the polytechnics have strengthened their internal management and governance (strengthened steering core), established linkages and boundary spanning activities to other regional actors (expanded their developmental periphery), sought external funding sources (diversified their funding), stimulated their academic activities (stimulated their academic heartlands) as well as developed their work culture for regional engagement. Regional engagement refers here to the activities and linkages through which polytechnic can demonstrate its relevance to the regional environment (cf. Jongbloed et al. 2008, 313). Polytechnics' responses have been analysed in the context of their particular regional innovation environments. The data are linked to the framework as follows:

The *strengthened steering core* refers to systematising and organising the internal steering and management capacity of higher education institutions in a way which combines managerial and academic values. The changes in environment, particularly the political pressures and legislative demands have challenged Finnish polytechnics to strengthen their steering capacity. This study analysed how the polytechnics have strengthened their management capacity and what kind of choices the senior institutional management have done to respond the changes.

The *expanded developmental periphery* refers to outreach units, programmes and other boundary spanning roles and activities that link polytechnics with the external actors and groups (Clark 1998a, 6). This study analysed the kind of linkages polytechnics have established with the other regional actors and organisations (in the context of regional innovation activities), and why. The expanded developmental periphery has not been limited to meaning only polytechnics' outreach units and programmes but instead it was examined in the wider perspective including more varied modes of linkages between polytechnic and external environment.

The *stimulation of the academic heartland* refers to the disciplinary departments that reach out to the external environment with new relationships, new programmes, and promoting third-stream income (Clark 1998a, 7). This study considered stimulation of the academic heartland from the viewpoint of the schools and different fields of education of case polytechnics. These schools have traditionally been organised by the fields of education and have focused on teaching activities. The study analysed the stimulation of the academic heartland in terms of how the schools of different fields of education have reached the external environment by seeking new forms of co-operation relationships and diversifying their funding sources. The external relationships was emphasised instead of units' internal renewal. Polytechnics use a range of terms to describe their basic units. Seinäjoki and Jyväskylä Polytechnics call their basic units schools. At Satakunta Polytechnic the basic units are wider entities which are called faculties. I have used the term 'school' for the basic units at Seinäjoki, Jyväskylä and Tampere Polytechnics and the term 'faculty' for the three basic units at Satakunta Polytechnic.

To fashion a change-oriented character, higher education institutions generally need substantial financial resources. *Diversifying the funding base* becomes essential since the core funding of higher education institutions is diminishing in most countries. According to Clark (1998a, 6) higher education institutions can turn the decreasing core funding to their advantage by raising money from external funding sources. Finnish polytechnics provide external funding particularly to their research and development activities and in-service training. This study analysed how the polytechnics have diversified their funding base, particularly whether contract research and development and contract education have acted as the tools for diversifying polytechnics' funding sources.

Clark emphasises the co-existence of all the above-mentioned organisational elements. As the integrative concept, he uses the integrated entrepreneurial culture

which connects the elements together. This study examined how the case polytechnics have built and are building an integrated and more outward-oriented work culture.

Data collection and analysis methods

This study used both interviews and documents as its sources of research data. The main data consisted of thematic interviews, stakeholder analysis and documentary materials. The documentary materials were used to provide supporting material for interviews.

Case study seeks what is common and what is particular about the cases. Multiple-case studies typically consist of two stages: within-case analysis and cross-case analysis. The aim of the within case-analysis is that each case is first treated as a comprehensive case in itself. This requires a quite detailed description of each case and themes within it. These data help researchers to learn about the contextual variables of the case. The cross-case analysis can begin when each case has been completed. It is the thematic analysis across the cases that seek to build abstractions across cases. (Creswell 1998, 63; Stake 1998, 90; Merriam 1998, 194–195.)

The first stage of this research project was mapping the polytechnics and their regional contexts. It was based on the analysis of documentary materials, particularly the goals of the regional centre of expertise programmes, the regional strategies of the higher education institutions and regional authorities as well as stakeholder analyses.

Stakeholder analyses. Stakeholder analyses were the starting point of the within-case analyses. The aim of the stakeholder analyses was to outline key organisations and activities of regional innovation system and particularly the interactive relations and activities that link polytechnics to other actors and organisations of the regional innovation system. The goal was thus to draw a picture of the special characteristics of the regional innovation environment in each region and the regional frames of activities of each case polytechnic.

Stakeholder analysis is a method through which it is possible to define the influences of some reform to its stakeholder (Aarrevaara & Vallittu 2001). It is typically carried out as part of the policy, plan or organisational development effort. Stakeholder analysis is thus suitable for analysing complicated administrative processes in which it is important that a range of individuals, groups and organisations participate in solving the problem. Thus, the total responsibility belongs to nobody alone. Instead, several persons have a stake in some way or another (Bryson 2004, 23–24, 27, 46). The changing and networked environment has also challenged polytechnics to analyse their external stakeholders, regional environment and the changes there more carefully and accordingly to develop strategies and establish linkages to other actors (see Salminen 2000, 47).

The central strategic question is who should be involved in stakeholder analysis and when. In general, those participants who have information that cannot be obtained otherwise should be involved. (Bryson 2004, 27.) The participants in the stakeholder

analysis undertaken for this study were persons who have formal responsibility for participating in regional development, based on law or a contract. Accordingly, an invitation to participate in the stakeholder analysis was sent to six persons per case (Appendix 1). In each region, the invitation was sent to the polytechnic's rector, the director of business development of the city, the managing director of the technology centre, the regional development director of the Regional Council, the head of the Technology unit of Employment and Economic Development centre as well as the research liaison officer or equivalent from the university or university consortium. The presence of the polytechnic's rector and the head of technology centre / centre of expertise programme were confirmed beforehand in each region. A total of three to six persons participated in the stakeholder analyses, which were carried out between August 2003 and January 2004.

With the help of structured discussions with stakeholders' representatives, the views of the different participants could be collected in systematic way. The variety of the opinions was thought to be important (Aarrevaara & Seppälä 2001). During group discussions it was possible to complement and correct issues as well as provide new opinions. Hence, it offered more diverse information than can be obtained by merely interviewing individuals. The constraint of stakeholder analysis was that participants could control others' opinions. One can suppose that it is easier to bring out successful experiences and examples than weaknesses and problems. It seems that the common interest of the stakeholders was to provide a positive picture of the region. The disadvantages and problems were probably not dealt with as openly which influences also on the reliability of the research results.

After the meeting, the group discussions were transcribed as a memo. Each participant was presented with the draft of these memos and each was given an opportunity to provide feedback if they believed that something essential was missing or interpreted inaccurately. However, this opportunity was little used and the corrections were mainly stylistic. I took the feedback into consideration while writing the summaries of the case reports and case analyses. The summaries of the case reports were sent to the participants (Lyytinen 2003a, 2003b, 2004a, 2004b). The group discussions were also transcribed. Each of them produced between 26 and 32 pages of typewritten text. The term "regional actor" refers to the participant of the stakeholder analysis. The participants were coded SA1–SA15.

Thematic interviews. The second step of the study was to conduct thematic interviews in the case polytechnics. The interviewees were the representatives of senior institutional management who are in charge of strategic development of organisation as well as regional engagement activities in the case polytechnics at both organisational and unit levels. Collecting the data in two phases (stakeholder analysis in 2003 and interviews in 2005) made it possible to broaden the information that was collected during the first phase.

The stakeholder analyses were explorative by their nature. Thus, the aim of the thematic interviews was to complete the information that had been received from the stakeholder analyses, particularly from the viewpoint of the case polytechnics. The interviews provided further information about the interactive relationships between polytechnic and other actors and added to the knowledge about the choices available to the polytechnics' senior institutional management, the challenges posed by different regional innovation environments as well as the internal management and governance of the case polytechnics.

Before starting the interviews, I had discussions with four persons in polytechnics during 2003 and 2004. They were directors of strategic development or quality managers (coded as I11–I13). The discussions acted as pilot studies, the aim of which was to elucidate the core questions in terms of regional engagement in polytechnics' senior institutional management.

Interviewee requests were sent to each by e-mail. The requests included the introduction of the research topic and the implementation plan for the research including the request for an interview. All persons agreed to be interviewed. The interviews in the case polytechnics were carried out as semi-structured thematic interviews. In line with this method, certain major themes were discussed with all interviewees (Hirsjärvi & Hurme 2000, 48; Merton et al. 1990). The interview themes of the study were based on Clark's (1998a) organisational dimensions of the entrepreneurial university: management and decision-making of the regional engagement activities (strengthened steering core); the polytechnic's boundary spanning strategies and models (expanded developmental periphery); the forms of stimulating the academic activities in different fields of education (stimulated academic heartland); and diversifying the funding sources (diversified funding base). The interview also dealt with the challenges set by the environment to each case polytechnic's scope of action. The study comprised 10 thematic interviews (coded as I1–I10) carried out in the case polytechnics during 2005. Each interview took about 90 minutes and was tape-recorded. The tape-recorded interviews were subsequently transcribed. The transcribed interviews were read through several times. The important issues were underlined and notes were made of each case. The contents of the interviews were analysed and grouped by themes that encompassed different organisational dimensions. The within case analyses and cross case analysis are based on content analysis of both stakeholder analyses and interviews. The interview quotes illustrate the within and cross case analyses. The original Finnish interview quotes are presented in Appendix 3.

Documentary materials. The documentary materials from the years 2003 to 2005 were used as the support material for the interviews and stakeholder analysis. The main documents were the polytechnics' internal regulations (standing order, administrative regulations) and polytechnics' strategies that framed their regional task, particularly regional strategies of higher education institutions, polytechnics'

research and development strategies and polytechnics' proposals as the regional centre of expertise. In addition, statistical information from the AMKOTA database and Statistics Finland was used as well as annual reports, brochures and news taken from polytechnics' web-pages. The complete list of case-specific documents is presented in the list of references.

5.2   Limitations of the research

Evaluating reliability in qualitative research is not straightforward. The validity and reliability of research results are criticised as being less suitable in qualitative research than they are in quantitative research (Tuomi & Sarajärvi 2003). However, qualitative researchers have developed methods to analyse internal and external validity as well as the reliability of the research (Merriam 1998, 198–214; Yin 2003, 33–39).

Internal validity is related to the question of how research findings match reality and how congruent with reality these findings are. One of the basic assumptions of qualitative research is that there is not a single, fixed and objective phenomenon under the research. Instead, reality is considered to be multidimensional and changing. The essential question is how people understand the world (Merriam 1998, 201–205). The focus of my research was on polytechnics' capacity building for regional engagement from the viewpoint of their senior institutional management and the heads of the regional authorities and the technology centres. It means that the views of the directors / management and the top-down approach was emphasised all along. By comparison, the views of academic staff remained narrower and their emphasis was on the field of technology. This choice of viewpoint was also influenced by the description and analysis of the academic heartland, which was approached at a quite descriptive and broad level. To gain a more extensive picture from the stimulated academic heartland and integrated entrepreneurial culture, wider-ranging interviews with academic staff would have been needed.

However, there are certain strategies a researcher can adopt to enhance the internal validity of their research. Multiple methods of data collection and analysis can act as the tools to strengthen reliability and internal validity. The documentary and statistical materials were used as material to complement information obtained via interviews and stakeholder analyses. Memos and tentative interpretations of the stakeholder analyses were sent to the participants and they were asked to comment on whether the interpretations were correct. In addition, one aim of the interviews was to extend certain questions that were dealt with in stakeholder analyses. That means I used triangulation and member checks to enhance the internal validity of the study (cf. Merriam 1998, 201–205). In addition to my PhD work, I have worked as researcher in other research projects that relate to Finnish polytechnics (Lyytinen et al. 2003; Lyytinen et al. 2008; Marttila et al. 2007; Raivola et al. 2001; Tulkki &

Lyytinen 2001) and acted as a research consultant on projects for other researchers (Ahmaniemi & Setälä 2003; Marttila et al. 2004; Marttila et al. 2005; Suvinen et al. 2006). Experiences from these projects have also increased my knowledge of polytechnics and their operation.

Reliability refers to the extent to which the research findings can be replicated. It is somehow a problematic concept in the social sciences because human behaviour is never static (Merriam 1998, 205). During recent years, the development of the polytechnics has been rapid. The organisation, management and administration of the case polytechnics have been developing and have changed since the time the data were collected (in the years 2003 to 2005). For example, Jyväskylä and Seinäjoki Polytechnics have merged their schools into larger and more multidisciplinary entities. Tampere Polytechnic has merged with Pirkanmaa Polytechnic and Satakunta and Seinäjoki Polytechnics have closed down their separate outreach units that specialised in contract research and development and consultancy. All of these reforms have influenced and changed polytechnics' organisation, which challenge the opportunities to observe repeatability. However, Merriam (1998, 206–207, see also Lincoln and Guba 1985) argues that it is essential that research results are consistent with the data collected and that they are dependable. That means the researcher explains the assumptions and theory behind her study, her position regarding the group being studied, the basis for selecting the informants and their description as well as the social context in which the data were collected.

External validity is about the extent to which the findings of one study can be applied to other situations or how generalisable the results are (Merriam 1998, 207). It is argued that in the context of qualitative research it is more appropriate to speak about transferability. Transferability can be related to the theoretical concepts or observations of the research. That is, whether the concepts are applicable to other situations and whether the research results can be transferred to other contexts and under which conditions (e.g. Eskola & Suoranta 1998, 68). In the context of this study, it can be said that legislation and national higher education policy create frames for polytechnics' regional engagement. However, the local responses and operations models are created through interactions with the actors at the regional level based on the needs of the particular region. These models are thus not transferable to other regions without qualifications. The transferability is naturally more appropriate to similar regions. The transferability of Clark's concept of organisational change elements of the entrepreneurial university to the context of Finnish polytechnics' regional engagement is analysed in Chapter 8.

6
Results of case analyses: changing polytechnic organisations and practices

This chapter presents within-case analyses for each case. The case analyses describe how each polytechnic has responded and built its capacity for regional engagement. Looking at the organisational change elements of entrepreneurial universities (Clark 1998a), the analysis is based on an examination of how the polytechnics have strengthened their management and decision-making, what kind of linkages polytechnics have established with the other regional actors and organisations, how the schools reach the external environment, and how the polytechnics have diversified their funding base. Polytechnics' organisational responses are analysed in relation to their regional environments. The codes I1–I10 refer to interviewees 1–10 and the codes SA1–SA15 to the participants in the stakeholder analyses.

6.1 Seinäjoki Polytechnic – facilitator of the regional innovation system

6.1.1 South Ostrobothnia as the regional innovation environment

South Ostrobothnia is a province in the western part of Finland with about 194 000 inhabitants. The industries of the region have traditionally been heavily based on primary production. At the beginning of the 1990s, about one-fifth of the jobs were within agriculture and forestry. Since then, the significance of these industries has clearly diminished. However, they still provide about 11 per cent of places of work, which is a significantly larger share than in other parts of the country. Another influential industry is manufacturing. Manufacturing provides 28 per cent of the work places within the region. In particular, there is manufacturing of metal products and furniture as well as the production of timber, wood products, engines and equipment,

textiles and clothes as well as the food industry. The largest employers are Atria Oy, which develops, manufactures and markets fresh food and Valio Oy which is a milk processor. Another special characteristic of this region's industries is the multitude of places of business, especially small enterprises and agricultural companies. The companies have formed agglomerations particularly in the woodwork industry, the metal industry and the textile industry. The share of services is lower in South Ostrobothnia than the national average. (Etelä-Pohjanmaan liitto 2003, 43; Etelä-Pohjanmaan liitto 2006, 24; Statistics Finland 2006a.)

The presence of higher education institutions and research institutes as well as knowledge-intensive companies – which provide the basis for the regional innovation environment – was low in the South Ostrobothnia region until the beginning of the 1990s. Even if the University Association of South Ostrobothnia was established in 1960, university education was offered only by the summer university, and the office of The Institute for Extension Studies at the University of Tampere (TYT) started its operations in Seinäjoki in 1981. Before this, the region didn't have its own higher education institutions or research institutes providing higher education degrees and supporting research activities. Neither there were knowledge-intensive companies that carry out research and development. The proportion of inhabitants with a higher education degree as well as research and development investments was lower in South Ostrobothnia than in the other parts of the country, on average. The problem was that there were too few competent individuals able to compete for national and international research funding and who were respected actors in wider circles. The innovation system and the research and development climate were distinctively regional and introverted. (Helander et al. 2009, 67; Sotarauta & Kosonen 2004, 10.)

The reform of regional governance, the establishment of the centre of expertise programmes as well as Seinäjoki Polytechnic and large-scale operations of the university units strengthened the institutional basis of the South Ostrobothnian innovation environment. The development of university co-operation started in Seinäjoki at the beginning of 1990s. The first contract of intent was signed in 1994 as part of the formulation of the centre of expertise programme. The aim was to strengthen research work on entrepreneurship in South Ostrobothnia. The co-operation deepened following the formulation of the research programme in 1998 (Helander et al. 2009, 67) and the South Ostrobothnian university network – EPANET was established at the end of the 1990s. Accordingly, the basis of the region's research and innovation activities started to be built around the EPANET, which is a co-operation network of five universities, the Polytechnic and regional actors. It is based on the co-operation of twelve research professorships in five multidisciplinary fields of research: IT applications, economics and business administration as well as research and development and marketing the food industry, regions and welfare. These fields could be seen as being weak but had started to grow branches in the regional innovation system. The aim has thus been to strengthen applied research and product development within these fields. The expectation that experts that had

received researcher education (i.e., a doctoral degree) can contribute to regional development by generating competitive research funding in the region resulting in research activities connected with international networks. (SA14; Helander et al. 2009, 67; Tutkimus- ja innovaatio-ohjelma 2000–2006, 12–14.) It was not until the beginning of 2000 that the infrastructure and organisational base of an innovation system was developed. The establishment of the EPANET network has been seen as an appropriate response to the need to strengthen the region's research capacity. (SA14; Sotarauta & Kosonen 2004, 7–10.)

6.1.2 Seinäjoki Polytechnic's responses

Institutional idea
Seinäjoki Polytechnic was among the first polytechnics to be awarded an experimental operating licence in April 1991. It was granted a permanent operating licence five years later in August 1996. The Polytechnic was composed of ten previous post-secondary level vocational educational institutions and higher vocational level educational institutions which were located in six municipalities – Seinäjoki, Ilmajoki, Kauhajoki, Kauhava, Jurva and Ähtäri – in different parts of South Ostrobothnia. (Finnish Higher Education Evaluation Council 1998; National Board of Education 2003.) After several stages of development, Seinäjoki Polytechnic ended up choosing the Seinäjoki Joint Municipal Authority for Education as its licence holder and maintaining organisation. This Authority is owned by 14 South Ostrobothnian municipalities. (Riukulehto 2007, 72–76.)

Seinäjoki Polytechnic's profile is as a regional higher education institution. The vision of Polytechnic emphasises the co-operative role of the polytechnic: it aims at being an independent and networked higher education institution that wants to be a co-operative partner emphasising excellent professional expertise and entrepreneurship in its activities. In addition, the strategic goal of the Polytechnic is to be a supportive higher education community that develops wellbeing and has an active role as an opinion leader, innovator and organisation that promotes internationalization. (Seinäjoen ammattikorkeakoulun missio ja visio.)

Management and decision-making
The reform of the Polytechnics Act in 2003 increased the Polytechnic's regional responsibilities and strengthened the authority of the Polytechnic's rector and the polytechnic board. Some of the tasks and issues that had previously been under the authority of the Board of the Joint Municipal Authority were transferred to the rector and the board (I5; Varmola 2004, 239). According to interviewee I5, the rector's position is strong and the new demands have even strengthened his position as the chair of the whole entity. The rector acts as the chair of the Joint Municipal Authority for Education, which consists of both polytechnic and secondary level

education. This point was emphasised. Either the rector or the financial director act as the official charged with formally presenting proposals to the Board of the Joint Municipal Authority for Education. Through this connection, the rector participates in, and can influence the criteria applied by the Joint Municipal Authority to the Polytechnic, as well as strategic choices and definitions of regional policy. (I5.) The rector informs the chairs of the Board and Council of the Joint Municipal Authority about the Polytechnic's central solutions and lines of policy. The important common issues of the rector's strategic management and the Board of the Joint Municipal Authority are decisions concerning new degree programmes, recruitment of key personnel as well as real estate. However, the rector can exert a strong influence on the recruitment of key personnel. The Board of the Joint Municipal Authority follows the Polytechnics' finances carefully but the Polytechnic has a lot of freedom to decide and make choices about how to carry out its activities. The board has only rarely interfered in teaching activities or other operational matters. One reason for adopting this approach is because the Polytechnic has operating units in several municipalities and the units are autonomous. (Puoskari 2004, 55, 65.)

The Polytechnic has strengthened its management capacity by dividing its academic activities into two result areas: the teaching result area and the research and development result area. According to interviewee I5, this meant that the traditional teaching activities (polytechnic degrees, polytechnic master's degrees, some professional specialisation studies) financed by first stream unit price funding were separated from research and development and paid service activities that are financed mainly by external second and third stream funding sources. Teaching result area is the responsibility of a vice-rector and a research director was appointed to be part of the central administration and in charge of the research and development result area. Accordingly, he is responsible for activities that are mainly dependent on external funding sources and co-operation relationships (cf. Clark 1998a, 142). The activities financed by external funding sources[1] comprise about 15–24 per cent of the Polytechnic's budget while the teaching activities still form the main part of Polytechnic's activities, about 73–84 per cent of the Polytechnic's budget (Table 3; cf. Clark 1998a; National Board of Education 2008a). The vice-rector and research director are centralised in charge of strategy and quality work of their results areas.

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1 The Polytechnic's external funding sources consist of revenue sources from paid service activities, other separate funding, funding from licence holder and other funding.

TABLE 3. Revenue sources: Seinäjoki Polytechnic

Year	Unit price funding	Separate funding of state	Paid service activities (incl. external R&D funding)	Other separate funding	Funding from licence holder	Other funding	Total (1000 euros)
2002	74 %	3 %	17 %	1 %	4 %	0 %	100 % (24 093)
2004	73 %	2 %	17 %	1 %	6 %	0 %	100 % (28 710)
2006	76 %	2 %	18 %	3 %	1 %	0 %	100 % (31 202)
2008	84 %	1 %	9 %	2 %	4 %	0 %	100 % (33 472)

Source: National Board of Education 2008a

In spite of strengthening the management capacity of senior institutional management it can be said that the decision-making of Seinäjoki Polytechnic is rather decentralised. The schools have the historical tradition of being autonomous units which can make decisions about their own issues. (I5; Puoskari 2004, 65; Seinäjoen ammattikorkeakoulu 2005, 5.) According to interviewee I5, this also reflects the South Ostrobothnian culture. The heads of schools act as the managers of the basic units, which are the responsibility centres and are in charge of their own budget and results. They are the highest decision-makers at the unit level and are in charge of agreements and contracts of the school. The interviewee I5 argued that the regional responsibilities have even increased schools' options for profiling and selecting their strengths and fields of expertise. At the same time, the Polytechnic's strategy process has become firmer and the core competencies of schools have started to be analysed more systematically than in earlier times.

Seinäjoki Polytechnic uses collegial groups to share responsibilities between the institutional management and academic staff to develop common strategies and practices to whole organisation. The Polytechnic Board and the Heads of Schools Meeting – established just when the interview data for this study were collected – represent the formal decision-making bodies. To strengthen its management capacity for research, development and other external engagement activities, a Research and Development Management Group was established – which was later renamed to the R&D Expert Group. Through this semi-formal expert group the research director and the representatives of each school – either the head of school or the senior lecturer – exchange information, develop activities and create a common strategy for the entire Polytechnic. (I5)

Boundary spanning activities
Seinäjoki Polytechnic's linkages with other regional organisations have taken several forms: outreach research and development units and other boundary spanning

structures between the higher education institution and the environment. In addition, the Polytechnic's staff members co-operate with other regional actors in steering and working groups of regional development programmes and networks. Interviewees I5 and SA14 particularly emphasised that the Polytechnic offers services in geographically dispersed areas in different parts of the province. Due to the region's low research resources, the Polytechnic has aimed at influencing in the environment by affiliating with the EPANET network and investing in technology and development centres.

TABLE 4. Linkages to the regional innovation environment: Seinäjoki Polytechnic

– The Polytechnic acts as the activator and strategic investor (e.g. research professorships and a higher education library).
– The Polytechnic is the central actor in the Centre of Expertise in Social Work
– Focus on entrepreneurship and the strong fields of the region's business and industry.
– Strengthening the prerequisites of research and development
– Personnel as the expertise resource of the region (emphasis on researcher education);
  • Research expertise is strong especially in the social and health care sector and business administration (high expertise in national level in the polytechnic field);
  • Research and development unit of the technology sector is the strategic partner of the technology unit of the Employment and Economic Development Centre.

Source: Lyytinen 2004b, Stakeholder map (see Table 5)

The Polytechnic has two outreach research and development units – the Social and Health Care Research and Development Centre[2] and SC-Research – that concentrate on applied research and development projects as well as offering education and consultancy services to regional industry and public organisations. SC-Research focused particularly on companies' innovation services. The units can act flexibly carrying out research and development work and services with personnel who have received researcher training. The units mediate between the environment and heartland by offering practical training and thesis places for students. However, at the same time they are criticised for being too loosely coupled to heartland units (I5; I7; see also Marttila et al. 2005, 32–33). According to interviewee I6, the separate units also have pressures on them to be economically effective units: they should achieve at least a "plus minus zero" situation even if they do not generate income.

In addition to adapting its internal organisation by establishing research and development outreach units, the Polytechnic has also influenced the regional environment by developing and investing in innovation infrastructure. It has particularly involved a range of boundary spanning structures, including a Science Park and development centres, as part of its developmental periphery. Through the

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2 The Polytechnic broke up the separate research and development units in 2007. Research and development and teaching activities in social and health care were merged under the School of Health Care and Social Work in 1.8.2007. (Seinäjoen ammattikorkeakoulu 2007.)

development fund Polytechnic has also financed seven EPANET professorships in the research fields that are important for the purposes of the Polytechnic's teaching activities (SA14; Riukulehto 2007, 132, 138). This has been important in South Ostrobothnia, where the institutions and organisations of the regional innovation environment have been strengthened only since the 1990s. Regional actors' evaluation was that the Polytechnic has had an influential role in reforming and building up the regional innovation system. The Polytechnic was seen as the "strategic investor who is often the first one to rent or finance the construction of new facilities" (SA11; SA14; see also Riukulehto 2007, 139).

> The Polytechnic has a major role to play in renewing and constructing the [regional innovation] system because there needs to be an organisation that has competencies for being active and that has some of its own resources. (SA11) (1)

> We have sometimes been the first investors. In fact, this has been the case with Mediwest and Nikkarikeskus in Jurva. After long discussions, we first decided to rent facilities. When we rent, then the others come along. This is one role which is not spoken about very often. (SA14) (2)

Examples of the boundary spanning structures have included the FRAMI – Seinäjoki Centre for Technology and Innovation, the Mediwest Health Technology Centre and Nikkarikeskus Development Centre. Seinäjoki Polytechnic is the shareholder of Seinäjoki Science Park Ltd. By locating its own units adjacent to these technology and innovation centres, the Polytechnic has fused the external environment and the academic activities closer together: the Polytechnic's School of Information and Communication Technology, part of the School of Culture and Design as well as the research and development services of the School of Engineering are located in FRAMI. The aim is thus to stimulate the academic activities by increasing interaction between the fields of education as well as between the Polytechnic and EPANET professors. In the same way, the research and development facilities of social and health care are in the Mediwest Health Technology Centre and the research and laboratory facilities of the School of Culture and Design are in Nikkarikeskus. Nikkarikeskus is an organisation for marketing and promoting the expertise of South Ostrobothnian furniture manufacturing that operates in Jurva (SA14; I5). The Polytechnic has regional representatives in connection with two regional development companies. The representatives gather information about sub-regions as well as transmitting information about the Polytechnic to the sub-regions (I5).

Seinäjoki Polytechnic and its staff members have also exerted influence on the environment jointly with other actors by engaging in steering and working groups of regional development programmes as well as affiliating with the EPANET network. The interviewee 5 illustrated the situation as follows: "When our strategies are formulated, we look at the policy definitions [in the Regional Plan, the Regional

Strategic Programme and suchlike] or when the Implementation Plan of the Regional Strategic Programme is being written, the Polytechnic's staff members act as the experts or commentators." (SA14; Riukulehto 2007, 132, 138; Seinäjoen ammattikorkeakoulu 2005a.) By pooling interests and resources in the EPANET network, the Polytechnic and other organisations aim to attract competitive research funding and human resources to the region in order to strengthen region's competitiveness in national and international research markets.

To link up with the regional social service providers the Polytechnic has also participated in the Centre of Expertise of Social Work. The Polytechnic was a proactive actor in getting the centre of expertise established in South Ostrobothnia. The Centre is the regional network of expertise and social service providers. The research and development centre for social welfare and health operates as the node actor of the centre is in charge of leading it. (I6; SA14; Seinäjoen ammattikorkeakoulu 2005a, 6.)

According to interviewees SA11 and I5, the network forms of organising, such as the EPANET network, the Higher Education Association and Centres of Expertise Programmes have promoted local initiatives, trust, commitment of the actors, and common values. This has been particularly important in the situation in which the financing of Polytechnic, EPANET and the Centre of Expertise Programme have been dispersed to several public and private local actors (companies, the City of Seinäjoki and other municipalities, regional authorities, developer organisations, higher education institutions and research institutes). Interviewee I5 also argued that the size of the province is such that the central actors know each others and are in contact with each others.

Teaching, research and development activities
The schools of the Seinäjoki Polytechnic are situated in six geographically dispersed localities: Seinäjoki, Ilmajoki, Jurva, Kauhajoki, Kauhava and Ähtäri. The multidisciplinary Polytechnic offers teaching in seven fields of education and 21 degree programmes which are organised in eight units (I5; Seinäjoen ammattikorkeakoulu 2005a, 2).

In the polytechnic context, stimulating the academic heartland refers both to establishing linkages to the academic community as well as to companies and business life. It seems that at Seinäjoki Polytechnic, the essential means of stimulating the activities of the academic heartland are to increase contacts and relationships with units of Seinäjoki University Consortium. The maintaining organisation has enabled the involvement of the Polytechnic's schools and personnel in external engagement and research activities through the decisions, recommendations and financial support of the Board of the Joint Municipal Authority. The good financial standing of the Joint Municipal Authority and the commitment and financial support of the owner municipalities has made it possible to generate surpluses for the Joint Municipal Authority for Education to add to the development fund. It is

intended that the fund be used to improve the possibility of providing resources for teaching, research and development activities, international activities, development of working life relationships as well as supporting Polytechnic staff members' postgraduate studies and publication activities. (I5; Riukulehto 2007, 132.) The fund has helped the Polytechnic to build reserves and to create a flexible environment for its activities. Through the development fund, the Polytechnic has allocated resources to fund staff members' study leave for undertaking postgraduate study and research work as well as developing research activities in the applied fields at the regional level by participating in EPANET projects as a partner in co-operation and financing the activities. The idea is that the principal lecturers can engage in EPANET research groups and collaborate in common projects (SA14; I5; Riukulehto 2007, 132, 138).

> We have aspired to manage so that senior lecturers would have connections to EPANET professors. We have invited the professors to meetings of senior lecturers to introduce themselves and to let our personnel get a picture of who there are. We try to tempt, use carrots in order to generate common projects and to create tighter interaction. (I5) (3)

The experiences of the staff of collaboration with the units and individuals of Seinäjoki University Consortium were diverse: according to interviewee I7, "the scale of co-operation varies from discussions and working in advisory groups to a two-year joint venture". However, there were also units that have regular research collaboration with university units.

The forms and the intensity with which the fields of education have stimulated their activities vary depending on the field of education, particularly its traditions as well as the size and management of the school (I5; see also Marttila et al. 2005, 8). The small schools often lack of resources: the larger units have more senior lecturers, and they can move between teaching and research and development activities more flexibly. According to interviewee I5, the traditions of the schools depend strongly on the structure of the teaching staff as well as their orientation to the different tasks. It seems that adoption of new work culture and practices, such as new project-based educational methods, is often easier for younger teachers.

The linkages to the environment are often speciality-based with each professional section possessing bridges of its own to external groups (Clark 1983, 206). Each of the Polytechnic's schools has connections of its own: Stakes[3] is an important co-operation partner for the field of social care; Tampere University of Technology for the field of technology; and MTT Agrifood Research Finland for the field of agriculture. In addition, staff members have a lot of personal contacts with staff from universities

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3   The National Research and Development Centre for Welfare and Health (STAKES) and the National Public Health Institute (KTL) merged into The National Institute of Health and Welfare, which started its operations in January 2009.

and companies, which have been built up primarily through their previous work history as well as through their postgraduate studies in universities (I5).

The enterprising activities are also spread unevenly in the different schools (Clark 1998a, 141). The School of Agriculture and Forestry has been actively involved in external relationships. It has been the co-ordinator of development projects that have supported local companies in internationalisation. The role of the School of Agriculture and Forestry has been especially important in the situation in which the region, with its long agricultural tradition, has tried to adapt itself to the challenges set by the European Union and its regional policy. The school has carried out EU projects and has conducted in-service training according to the requirements of the European Union. (I5; SA14; Riukulehto 2007, 81.) The School of Health Care and Social Work has also been involved in long-term development of its expertise and collaboration with external partners. In addition, there is an in-service education unit within the school, which is in charge of regional education (I5; I7).

> With EU membership, project possibilities opened up particularly in the field of agriculture. They do not primarily undertake research. Instead, they speak about projects and applied research. The School of Agriculture and Forestry is one which was able to utilise those possibilities and the available funding. It also requires expertise. That kind of long-term approach can also be seen in the field of social and health care… They have a view and they have developed their expertise in the long term and have started to seek out partnerships. (I5) (4)

The share of EU funding has been approximately one-third of Polytechnic's research and development expenditure. As interviewee I5 argues, the challenge is how the Polytechnic is able to take advantage of other national funding sources when the share of EU funding diminishes.

Building up engineering education has been the biggest structural change for Seinäjoki Polytechnic, according to interviewee SA14. The School of Engineering has a long tradition of co-operation with industry. The technical institutes were the first to respond to external needs. The activities started in the late 1980s aimed to create tight linkages with the region's business life and to find new modes of interaction through which expertise and the school's laboratories could be better exploited (I7; Seinäjoen ammattikorkeakoulu 2004, 34). The degree programmes of the School of Engineering – the degree programmes in automotive technology, mechanical and industrial engineering, bio and food technology, wood technology and construction engineering – correspond to the industries in the region. The degree programme in mechanical and industrial engineering is the most recent and was established through industry initiative. The other degree programmes are older. The origin of the degree programme in wood technology stems from the beginning of the 1990s and combines the needs of the companies and the unit's large investments in laboratories. The School of Engineering co-operates regularly with those companies that are willing

and capable of development. The environment constrained the activities, since most of the companies are small and medium-sized but according to the interviewee, they are favourably disposed towards development.

> We have that good situation that we have companies. Even if they are small and medium-sized (and most of them are small) it is possible to find favourable attitudes towards development but we have to market and contact them regularly. In one sense, it would be much easier if there were a couple of big companies which would continuously have new projects. (I7) (5)

It can be said that the expanded developmental periphery partly overlaps with the stimulated academic heartland of the School of Engineering. In addition to the main unit on the main campus, the School of Engineering has located its degree programme of bio and food technology adjacent to the Centre of Expertise for Food Development and the School of Information and Communication Technology and research and development services adjacent to the Seinäjoki Centre for Technology and Innovation.

TABLE 5. Stakeholder map: actors and activities of the South Ostrobothnian regional innovation system

Actor/ stakeholder	Activity
South Ostrobothnian University Network Epanet University Consortium of Seinäjoki	Higher education network as the realiser of the research programme: programme contract, raising respect for higher education. Horizontal co-operation, research, and high-level education and development projects (e.g. professorships). Building infrastructure (e.g. the ADP network, network teaching centre in the future)
Seinäjoki Polytechnic	Focus on entrepreneurship and the strong fields of the region's business and industry. Strengthening the prerequisites of research and development – Personnel as the expertise resource of the region (emphasis on researcher education); – Research expertise is strong especially in the social and health care sector and business administration (high expertise in national level in the polytechnic field); – Research and development unit of the technology sector is the strategic partner of the technology unit of the Employment and Economic Development Centre. The Polytechnic acts as the activator in its region and strategic investor (e.g. research professorships and a higher education library).
Health Care District/ Mediwest Health Technology Centre	Top expertise, act as the model of expertise to others, research activity. Participates in Technology Park and finances professorships.
Centre of Expertise in the Food Industry / Foodwest	Regional and national work in order to transfer technology into practice: Seinäjoki Polytechnic acts as the co-ordinator of the knowledge environment. Knowledge in its own field. Activating, networks, operation culture.
Key companies	Companies which have connections to research and development activities and international networks. Strong fields of industry in the region: metal, wood, and ICT in the field of trade.
South Ostrobothnian Employment and Economic Development Centre	Finance (competent finance and active investments). Expertise in the field of technology, views about technology development, technology network.
Technology unit/ Tekes network	Finance and organisation. Human resources. Innovation environment.
City of Seinäjoki Business unit (Seinäjoki, Nurmo, Ylistaro) District organisations	Development projects with regard to entrepreneurship, finance, Knowledge about the needs of the companies. Finance and resources, human resources. Agglomerations, Activities without formal organisations.
Regional Council of South Ostrobothnia	Finance e.g. in EPANET. Internationalisation. Building co-operation networks. Collecting development goals, lobbyist of the region.

Other actors	Other activities
Forestry Centre and Provincial Centre	Counselling and projects (near to companies).
Chamber of Commerce, entrepreneur organisations	Counselling, formation of intent, internal network, development work.
Seinäjoki Technology Centre/ Centre of Expertise in Intelligence Technology	Co-ordinator of the regional centre programme, charge of facility services (Frami).
Regional Centre Programmes (ePohjanmaa, Integroituva Suupohja)	Early projects (little administration). Offer resources and make it enable to use resources flexibly according to local goals.
Centre of Expertise in Social Care (Seinäjoki, Vaasa, Kokkola)	Seinäjoki Polytechnic is the central actor; providing new social services in a new way as part of the national network. Tasks: research, product development, education, consultancy.
Adult education centres and specialised institutions (e.g. Teak, Education in Kuortane Sports Institute, JAKK)*	Training of specialist expertise, adult education, projects.
Finnvera*	Financing and counselling. Expertise in business activity. Expertise relating to certain field.

Source: Lyytinen 2004b

6.2 Satakunta Polytechnic – regional technology developer

6.2.1 Satakunta as the regional innovation environment

Satakunta is a province of about 230 000 inhabitants in south-western Finland. The central region of the province is the Pori urban region in which about 60 per cent of the population lives (Satamittari 2005). Satakunta is famous for its long industrial tradition. A special feature of the industries of the Pori urban region and Satakunta province is its long history of manufacturing. The industrial fields of the province are heavily based on the metal and forestry industries. There is also an agglomeration of expertise in the magnetic industry and an automation industry agglomeration in Ulvila. Manufacturing is the largest field of industry in the province in terms of both employment and gross national product. The share of industrial jobs has diminished since the 1970s but the field still employs about one-fifth of the labour force. The biggest companies are in the fields of copper processing, heavy engineering, mechanical wood processing, electrical engineering, energy production and chemical industries. During recent years, there have also been promising developments in some new technology industries. Services, in particular in telecommunications, computing and other services for businesses have grown fast in terms of employment. (Kosonen

2003, 11; Satamittari 2000–2004.) In addition to the diminishing number of jobs in general, the number of individual entrepreneurs in the province has been decreasing. The tradition of entrepreneurship is quite limited in the region as a whole. (Porin korkeakoululaitoksen yhteistyöstrategia 2002, 3.)

In terms of innovation activities, the important companies are particularly those that invest in research and development or are active in developing themselves and exploiting research and development-based knowledge. In Satakunta, those companies are shipyards such as Outokumpu Oyj, Metso Oyj, Oras Oy, Aker Mäntyluoto, and Swisslog Oy. There are also active tele-operators in the growing new technology fields. The central innovation political need is to create new businesses, particularly small companies, in the new technology fields such as automation, information technology and electronics. There are also many expectations related to the service sector and to the possibility of it creating interfaces with technology via wellness technology and services to old people. At the moment, the service industries employ about one-third of the labour force. (SA7; SA8; Satakunnan korkeakoululaitos 2008.)

The innovation environment of Satakunta started to build up from the late 1990s following the deep economic recession. The establishment of the Centre of Expertise Programmes in Materials Technology and in Distance Technology and the definition of provincial cutting-edge projects were the first steps in the construction of the institutional base and common institutions to follow a more determined vision and way of action in Satakunta. The strategic aim of the field of materials technology is to strengthen research that supports industry. (SA8.) The expertise of distance technologies is based on the expertise drawn from network technologies research and education expertise from Tampere University of Technology, and Pori and Satakunta Polytechnics (Satakunnan osaamiskeskus, osaamiskeskusohjelma 1999–2006).

For a long time, Satakunta was a province in which the proportion of people with higher education qualifications was low (Satakuntaliitto 2003, 11). Even at the beginning of the 1990s, fewer than ten per cent of the population had a higher education degree (Statistics Finland 2006b). The establishment and development of the Satakunta Polytechnic in 1997 and the provision of university-level education since 1983 – when Tampere University of Technology started small-scale research and education activities in Pori – rapidly changed the educational structure of Satakunta. The supply of education continued to expand at the beginning of the 2000s when Turku School of Economics established the Department of Cultural Production and Landscape Studies in Pori and started to offer degree education. The School of Art and Design and the University of Tampere also started their operations in Pori in 2004. That multidisciplinary academic community has been called the University Consortium of Pori since the beginning of 2004 (Helander et al. 2009, 55). As a consequence of increasing the supply of higher education, the level of education of the population has been rising little by little. At the moment, about a quarter of the province's population have a higher education degree (Statistics Finland 2006b).

6.2.2 Satakunta Polytechnic's responses

Institutional idea

Satakunta Polytechnic started its operations as a temporary Polytechnic in August 1992 (the experimental operating licence was granted in April 1991). At the beginning, the Polytechnic was composed of six previously separate post-secondary level educational institutions and one higher-level vocational educational institution. These were located in four municipalities in Satakunta. Later on, the Polytechnic applied for a change to its temporary operating licence and four new institutions (Pori Social Work Institution, Harjavalta Social Work and Health Care Institution, Kankaanpää Art School and Rauma Educational Institution) were merged into the Polytechnic in August 1996. The Polytechnic in its entirety – consisting of 13 municipal educational institutions – started its operation as the permanent polytechnic in August 1997. Since then the Polytechnic has been composed of three faculties and has been offering teaching in five fields of education: technology, communication and transport, business and administration, social services and health as well as culture. It has units in five municipalities: Pori, Rauma, Harjavalta, Huittinen and Kankaanpää. (Jaatinen 1999, 60–62; Kohtamäki & Meklin 2001, 10–11; National Board of Education 2003.)

Since its early days, the institutional idea behind Satakunta Polytechnic has rested on the principles of multidisciplinarity, regionalism and the regional service task (Jaatinen 1999, 60). The Polytechnic has specified its institutional idea in its standing order: "Satakunta Polytechnic is a networked learning and development centre that aims to increase the development of Satakunta as a competitive and international region. In addition, it offers teaching aimed at educating students to become experts in meeting their future responsibilities as well as enabling their professional development" (Satakunnan ammattikorkeakoulun johtosääntö 2003).

Management and decision-making

Satakunta Polytechnic is a municipal polytechnic. Even if the Polytechnic has units in five municipalities its licence holder is the City of Pori (Jaatinen 1999, 61–62; Satakunnan ammattikorkeakoulun johtosääntö 2003). That means Satakunta Polytechnic is one of the administrative departments of the City of Pori. However, there is a contract between the five municipalities – Pori, Rauma, Huittinen, Harjavalta and Kankaanpää – that agree on the flows of funding, the localities in which education is to be provided and the balanced development of education in the various municipalities. (Jaatinen 1999, 62; Kohtamäki & Meklin 2001, 10, 42; Satakunnan ammattikorkeakoulu 2009.) A critical question is the extent to which the Polytechnic should serve the whole province and the extent to which it should concentrate on serving specifically the City of Pori. According to interviewee I9, the Polytechnic wants to see itself as the higher education institution that serves the

whole province. Reconciling the interests of the owner municipality and the goals of wider regional development has sometimes proved to be challenging, however.

The Polytechnic Board was established and the board of the maintaining organisation became a committee as a consequence of the Polytechnics Act (351/2003) being reformed (Satakunnan ammattikorkeakoulun toimintasääntö 2005; I9). The establishment of the Polytechnic Board improved the Polytechnic's options for deciding about its internal issues. Among its other tasks, the Polytechnic board decides on the grounds for allocating the allowances granted to the Polytechnic. It also decides on the essential goals relating to business and working life and regional development. According to interviewee I8, the central challenge is to find the appropriate way to allocate funds: Should successful units be rewarded or should underachieving units be supported. Revenue from teaching forms the biggest share of the Polytechnic's budget whereas the share of research and regional development activities is more minor. (see Table 6; Satakunnan ammattikorkeakoulun sisäisen hallinnon sääntö 2004; I8).

TABLE 6. Revenue sources: Satakunta Polytechnic

Year	Unit price funding	Separate funding of state	Paid service activities (incl. external R&D funding)	Other separate funding	Funding from licence holder	Other funding	Total (1000 euros)
2002	82 %	4 %	12 %	1 %	1 %	0 %	100 % (31 869)
2004	82 %	3 %	13 %	1 %	1 %	0 %	100 % (33 440)
2006	89 %	2 %	8 %	1 %	0 %	0 %	100 % (34 103)
2008	91 %	2 %	7 %	1 %	0 %	0 %	100 % (37 566)

Source: National Board of Education 2008a

The Polytechnic's rector is in charge of the institutional management with the management group which is the central strategic and governance body that supports the rector on issues associated with the Polytechnic's management. The management group consists of representatives of senior institutional management (the rector, development director and financial director) and the representatives of faculties (deans and the director of continuing education centre) (Malinen et al. 2009, 14; Satakunnan ammattikorkeakoulun toimintasääntö 2005). Through this group the senior institutional management and members of the faculties exchange information, co-ordinate activities, and share the responsibilities for the institution as a whole. Among its other responsibilities, the management group exchanges information and deals with all the externally funded projects. It decides whether the projects

are compatible with the Polytechnic's profile and goals. According to interviewee I9, the group gives the Polytechnic greater collective ability to buffer itself against environmental pressures and demands that do not match the Polytechnic's goals. The Polytechnic also has a central research council, with representatives of senior institutional management (such as the rector, the head of O'Sata and the head of the centre for continuing education) as well as the members of each faculty.

> It [the research council] is collegial and maintains a democratic approach ensuring that others' issues are approved and that people are committed to these issues. (I8) (6)

Great store was placed on the role of these kinds of collegial group by interviewees I8 and I9. In particular, they emphasised the role of the Polytechnic board and the management group, as well as the research council[4] as being important from the viewpoint of external engagement.

A development trend at Satakunta Polytechnic has been to decentralise decision-making to the faculty level, which means that there is a preference for decisions concerning academic issues to be made within academic units. The educational units have traditionally been strong at the Polytechnic but with strategic guidance, the position of the faculties has been further strengthened. That means the Faculties of Business and Culture, Social Sciences and Health Care, and Technology and Maritime Management are accountable basic units. As the heads of these basic units, deans have become responsible for budgets and academic activities in their fields. They are direct subordinates of the Polytechnic's rector (Malinen et al. 2009, 14–15). According to interviewee I9, at the same time, the strategy controls the activities of the faculties more than in earlier times. The faculties have profiled and chosen their focus areas. The idea is that the search for collaboration partners and external funding sources is concentrated in these areas.

The new external demands have also challenged Polytechnic to strengthen the tasks specialisation of management. New middle-manager positions – research directors – have been established and appointed in the Faculties of Technology and Maritime Management and Social Sciences and Health Care[5]. They are responsible for, among their other duties, managing and developing their faculties' research and development activity, developing and maintaining networks, arranging external funding. They are also in charge of the budget and the adequacy of the allowances directed to research directors as well as the exploitation of the results of the research and development. (Satakunnan ammattikorkeakoulun toimintasääntö 2005; SA9; I8; I9; cf. Clark 1998a.)

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4   The current name of the research council is the evaluation and development council of research.

5   The research director position was established later also in the Faculty of Business and Culture.

Boundary spanning activities

The founding idea of Satakunta Polytechnic is to serve the region. According to interviewee I8, the Polytechnic was willing to take an active role as the regional developer in the situation when it was the first and only higher education institution in Satakunta province and provincial companies needed research and product development expertise. In order to respond to local needs, the Polytechnic established the O'Sata Research and Development in 1997. O'Sata[6] was the outreach unit that sold contract research and development services to the business sector. It acted as the intermediary in transferring the Polytechnic's knowledge and expertise to the regional business life. (I8, SA9)

> Then we have the O'Sata Research and Development, which in a way sells research and development services and acts as the information transfer link to companies and business life. (SA9) (7)

The goal of O'Sata was also to increase unity and integrated administrative culture within the new, multidisciplinary polytechnic by creating a common channel of academic service as well as bringing operation principles to the whole organisation. That means the unit also strengthened the Polytechnic's management capacity in the first phase. This was particularly important in the starting situation when each educational unit had its own culture and traditions as an individual educational institution. Accordingly, the units might send applications to regional resource providers without informing the Polytechnic's central administration. Consequently, the funding applications could have overlapped and funding decisions might be in conflict with the Polytechnic's common strategic and operation principles (SA9). In an operations sense, the unit was in charge of the centralised management of contracts and money transactions. The interviewees experience was that the O'Sata promoted the unity of the Polytechnic and operations according to the Polytechnic's common focus areas.

> The founding idea of the Polytechnic was that it should serve the region. Based on this idea we aimed to develop organisational structures from the beginning. We had 13 educational institutions that were now merged together. We built the common development and service centre to serve the whole organisation, which is now O'Sata. We specifically created a situation in which we could co-ordinate our own expertise. (SA9) (8)

In addition to separate research and development units, the interviewees' and regional actors' evaluation was that the important linkages of Satakunta Polytechnic

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6   The O'Sata unit ceased to operate in 2005 and the research and development activities were decentralised to the three faculties of the polytechnic (Satakunnan ammattikorkeakoulu 2005).

to external regional actors mainly take the shape of an O'Sata Enterprise Accelerator, a research and development environments and an expert exchange. Polytechnic's role was considered to be important on the one hand as the producer of human capital and on the other hand as the actor that transfers research knowledge to organisations that can put the knowledge to use. (SA7, SA8, SA9, see Table 7 and Table 8.)

TABLE 7. Linkages to the regional innovation environment: Satakunta Polytechnic

Satakunta Polytechnic's knowledge transfer mechanisms

– O'Sata Research and Development as the mediator and co-ordinator of knowledge
– O'Sata Enterprise Accelerator as the generator of new companies
– Research and development environments (common intelligent laboratory and company's product development environment)
– Expert exchange

Source: Lyytinen 2003b, Stakeholder map (Table 8)

Satakunta province has a long tradition of manufacturing. However, according to interviewees I8 and I9, the challenge of the environment is the heterogeneity of the company sector as well as thinness of the development intensity of companies. In particular, there are few growth companies and medium-sized companies. To promote entrepreneurship within the region, Satakunta Polytechnic has adopted an Enterprise Accelerator as part of O'Sata. The Accelerator is a pedagogical solution that aims to bridge higher education and business life by stimulating working-life oriented teaching, research and development. It is part of the Polytechnic's teaching and is integrated tightly into its faculties through degree education. That is to say, students participate in co-operation projects with companies. According to interviewee SA9, business ideas often emerge through these projects. After that, students start to process these ideas with the Polytechnic's mentors. The Accelerator aims to educate students to become entrepreneurs and to produce expertise that is needed in business life. At the same time, the goal is also to generate new knowledge-intensive entrepreneurship within the region as well as to strengthen the Polytechnic's company networks. In practice, this means that the enterprisers can participate in the Polytechnic's large projects or act as the part-time teachers at the Polytechnic. The first enterprises started their operations in 1997–1998. A total of 107 students had chosen a career as an entrepreneur by the year 2004. However, it has been criticised on the grounds that the Enterprise Accelerator does not have a systematic way of action through which the companies' options for success could be evaluated. (Malinen et al. 2009, 35; Satakunnan ammattikorkeakoulu 2004, 1; Satakunnan ammattikorkeakoulu 2006; I9; SA8.)

Satakunta also has an agglomeration of expertise in automation, particularly in the Ulvila district (Ahmaniemi et al. 2001, 47). To allocate resources for expertise on

automation and to create enduring relationships with its existing company partners, the Polytechnic has developed an Institute of Automation as part of the O'Sata. It has been noted that familiarising the companies with the expertise of the Institute of Automation and creating contacts and collaboration has been challenging (Marttila et al. 2004, 92). The Institute of Automation receives funding from several third stream funding sources, such as the municipalities and via the centre of expertise programme and the European Union (SA7; SA8; SA9, see also Tulkki & Lyytinen 2001, 62–63).

The Polytechnic has had a central role in establishing Satafood. Satafood operates like a mediating institution between the Polytechnic and outside organisations. The Faculty of Business and Culture has located its unit in Huittinen adjacent to Satafood. The managing director of Satafood was recruited from the Polytechnic. Exchanging experts between the Polytechnic and outside organisations forms an important linkage with external organisations.

> Here are Satafood and the Polytechnic's units. In principle, they operate in shared facilities. The managing director of Satafood is from the Polytechnic. The Polytechnic has had a significant role in giving birth to Satafood. (SA9) (9)

The Satakunta Polytechnic has also established linkages and co-operation with other regional actors through the different steering and working groups of the central regional development programmes. According to one interviewee (SA9), members of the Polytechnic's staff participate in developing technology strategies, a provincial programme and other strategy-related works and in that way they are central participants in guiding the development. It was noted that the Polytechnic is also the founding member of the centre of expertise programme in distance technology (SA8). Together with the other actors it is in charge of directing and executing the programme in the steering group (cf. Clark 1998, 92).

Teaching, research and development activities

The academic heartland of Satakunta Polytechnic has been constructed to represent the fields of technology and maritime management, business, tourism and culture as well as social services and health care which are organised as three faculties. Under these faculties, the Polytechnic offers teaching in 22 degree programmes through three faculties and ten units (Satakunnan ammattikorkeakoulu 2005, 7–8, 10).

The cultures and practices of the fields of education vary in terms of how they orient to, and are involved in, relationships that link them with external groups and funding sources. They are also in different phases of development. According to interviewee I9 the traditions of technology and maritime management and business administration are quite close to each other. Both of these fields aim to develop their expertise in logistics, which is important from the viewpoint of the development of the Satakunta region (I9; SA9).

The field of technology has the longest tradition for stimulating its activities both by contracting and working on joint projects with individual business and industry customers as well as academic co-operation with the equivalent unit at the Tampere University of Technology. According to interviewee I8, the co-operation with industry started with small steps. Business life had certain development needs, which related to equipment technology. In those circumstances, the Polytechnic made choices that related to maintenance and the diagnostics of modern maintenance. The measuring services proved to be too simple for highly educated personnel and the aim was to activate the longer-term development of companies and company groups. The choice was to develop technical-natural scientific expertise of automation and signal processing. The interviewee's I8 experience was that it was essential that the regional business life and aware companies were ready for co-operation because polytechnic needed co-operation partners. The first cluster of automation companies was established at the turn of the 1990s (SA9; I8; I9).

The field of technology has also stimulated its academic heartland with extensive co-operation with the unit at the Tampere University of Technology. The personal-level contacts were born through the Master of Science in Technology programme. Staff worked in shared facilities and saw each other every day. The linkages between the Polytechnic and the university were also born through teacher exchange: the same persons taught in both Polytechnic and in Master of Science in Technology programmes at the university unit through which they came to know one another. According to interviewee I9, staff members still have common projects and laboratories. However, the expansion of the university consortium and its move to Puuvilla facilities has diminished the extent of co-operation. The natural form of co-operation is also the Polytechnic's senior lecturers' postgraduate studies in the University Consortium. The Faculty of Technology and Maritime Management also has staff members who has worked for a long time in research institutes before coming to the Polytechnic. (I8; I9; SA9.)

Studies have shown that it is more difficult for the social services and health care sector to fashion links to industry and other external actors compared with the field of technology (cf. Clark 1998a, 78; Slaughter & Leslie 1997; Lyytinen et al. 2008, 62–63). The challenge of the sector has traditionally been in seeking external clients who are able to pay for their services even though the funding possibilities have improved during recent years. This means that the heartland of the social service and health care sector is more dependent on first stream core funding, teaching and students than the field of technology, for example. Accordingly, the collaboration with external partners has been connected primarily to the provision of practical training places and collaboration via such relationships as well as with different communities. The main partner in co-operation is the health care district through which the unit has also generated third stream funding (I9; SA9).

The Polytechnic does not have looser or tighter agreements to stimulate multidisciplinary collaboration. Instead, the initiative for co-operation is bounded

to individual persons. There are persons within the fields of technology and health care who are willing to co-operate and have co-operated for years. There is expertise within the field of social and health care in the field of gerontology. In order to respond to the needs of older people, the Polytechnic has launched a master's degree programme in wellness technology, which combines the expertise of technology with social and health care (I9; SA9). The regional actors had expectations that combinations of fields of education can give birth to the new experiments of wellness technology (SA8).

TABLE 8. Stakeholder map: actors and activities of Satakunta regional innovation system

Actor/stakeholder	Activity
Satakunta Polytechnic	Teaching, research and development, regional development – emphasis on working-life-based activities and applied research projects
	Research and development activities are in a development phase; most evidenced in the technology sector; business and administration is growing.
	The important knowledge transfer mechanisms are O'Sata Research and Development as the co-ordinator and mediator of knowledge, O'Sata Enterprise Accelerator as the generator of new companies, common intelligent laboratory and product development environment of company, expert exchange.
University Consortium of Pori	Teaching, research and regional development – emphasis on scientific research and doctoral education.
	Strong knowledge base at the present moment especially in technology and business administration.
Satafood	Research and development activities, product development, manufacturing process, particularly functional products.
Key companies: Shipyards, Äker Mäntyluoto, Outokumpu, Metso, Oras, Swisslog Tele-operators in growing fields Outokumpu Research Oy	Some companies have their own research and development activities, others are users of the knowledge. Creation of new entrepreneurship in the region.
PrizzTech Oy	Administering the regional development programmes (the centre of expertise programme and the regional centre programme). Supply and co-ordination of services that subsidise innovation environment, project management.
Satakunta Regional Council	Co-ordination of strategy work, financing and resourcing development.
Employment and Economic Development Centre of Satakunta (esp. services of Tekes)	Financing, participating in regional development, creating an innovation environment.
Finnvera	Financing, participating in discussions regarding creation of the innovation environment.

Source: Lyytinen 2003b

6.3 Jyväskylä Polytechnic – diversified regional developer

6.3.1 Jyväskylä urban region as the regional innovation environment

Central Finland is a region in the middle of Finland with about 268 000 inhabitants. Its central urban region is Jyväskylä in which about 60 per cent of the population lives and where most of the economic activity occurs. The special feature of the industries of the province is the strong service orientation. Public or private services, particularly health and social care, business services and the education sector provide about 75 per cent of the jobs in the region. This is a higher proportion than for Finland as a whole. (Keski-Suomen liitto 2005, 8–9.) The Jyväskylä region is also an industrial centre. Industry employs about one-fifth of the labour force. The main industrial fields are the mechanical industry and equipment engineering, the metal industry, the graphics industry as well as papermaking and the mechanical woodworking industry. Since the 1990s, information and communication technologies have also become cornerstones of the local economy. (Jykes 2006; Linnamaa 2002, 39.) Concerning research, development and innovation activities, the important actors are the companies in the main industrial branches that invest in research and development and have wide subcontracting chains, such as Metso Oyj, Nokia Oyj, Valtra Oy and TietoEnator Oyj and Keskimaa as the employer. Primary production employs only about five per cent of the work force in the region. (Keski-Suomen Liitto 2005, 9; SA5; SA6.)

The Jyväskylä region has a long tradition as an education city associated with its cultural and sports facilities (Linnamaa 2002, 235–236). There are two higher education institutions: the University of Jyväskylä, and Jyväskylä Polytechnic as well as the Technical Research Centre of Finland and several vocational educational institutions. Accordingly, the level of education of inhabitants is high. Almost a quarter of the inhabitants have a higher education degree (Statistics Finland 2006b). The investments in research and development activities have increased remarkably in Central Finland since the middle of the 1990s. A characteristic of the research and development activities is that they are focused strongly on the Jyväskylä urban region and a significant amount of the research and development expenditure is covered by public funding (Keski-Suomen liitto 2005, 10–11). On the other hand, the central challenge of that kind of development is the polarisation of the region. There are wide peripheral areas outside the Jyväskylä urban region. Consequently, a strategic challenge is how to reflect the impacts of the activities on to the whole province (SA4; SA6). A special feature of regional development in the Jyväskylä region is the numerousness of the regional development strategies (see also Mukkala et al. 2006).

6.3.2 Jyväskylä Polytechnic's responses

Institutional idea

Jyväskylä Polytechnic started its operation as a temporary polytechnic in August 1992 (experimental operating licence was granted in April 1991) with four educational institutions which represented the service sector and were located in the City of Jyväskylä. Polytechnic was granted a permanent operating licence six years later in August 1997. From the beginning of the experiment, the aim was that the Polytechnic would expand and would also have units in other parts of the province. The original foundation was considered to be too narrow and too small to meet provincial needs and to withstand national competition for a permanent operating licence. (Jääskeläinen et al. 2007, 32; Suosara 2007, 126; National Board of Education 2003, 146.) The Polytechnic expanded in several stages by the extension of its operating licence. In 1999, the Polytechnic established the Institute of Natural Resources in Saarijärvi, to carry out teaching, research, and service activities in the field of natural resources as well as to represent the Polytechnic in the northern part of Central Finland. In the second phase, the Institute of Business Administration and Technology in Jämsänkoski was also merged with the Polytechnic. The Polytechnic also extended its units and fields of education within the City of Jyväskylä: the Conservatory of Central Finland and the laboratory field from the Jyväskylä Technical Vocational Institution were merged into the Polytechnic. The Polytechnic reached its current composition in 2000. (Suosara 2007, 126–143.)

The provincial viewpoint has been written into the Polytechnic's mission and vision. The mission of Jyväskylä Polytechnic is "to increase the well-being of Central Finland by promoting expertise, networking and internationalisation of working life by ensuring the future-orientation and quality of its education, research and development and regional development activities as well as improving the education possibilities of the population continuously". Its vision was that by 2008, it should be a higher education community that is recognised as a specialised supporter of working life and be an organisation that creates new expertise, well-being and competitiveness in its region (Jyväskylän ammattikorkeakoulu 2004, 13). According to the proposal for the centre of excellence in regional development, the regional-based vision and mission form the base and give direction to all strategies of Jyväskylä Polytechnic. (Jyväskylän ammattikorkeakoulu 2005, 1.)

Management and decision-making

Contrary to the other case polytechnics, Jyväskylä Polytechnic is a private polytechnic. Its licence holder is Jyväskylä Polytechnic Ltd. The ownership of the limited company is divided between the City of Jyväskylä (55 per cent), Jyväskylä Joint Municipal Authority for Education (35 per cent), Äänekoski Joint Municipal Authority for Vocational Education (5 per cent) and Jämsä Joint Municipal Authority for Vocational Education (5 per cent) (Jyväskylän ammattikorkeakoulu 2005, 23).

The Board of the Limited Company is the decision-making body of the maintaining organisation. It is in charge of the most important strategic guidelines. These include making proposals concerning the Polytechnic's operating licence and locations, considering significant changes in the volume of education, developing construction projects, making decisions concerning the Polytechnic's strategic development and operational and financial plans, as well as establishing and selecting the heads of the Polytechnic and schools (I11; Jyväskylän ammattikorkeakoulun johtosääntö 2003; Panhelainen 2007, 149).

Representatives of business life have been co-opted onto the Board of the Limited Company in which they have had an important role from the beginning (Panhelainen 2007, 155). According to interviewee I11, the members of the board have brought stimulus from the external environment into the Polytechnic's decision-making. Examples of these kinds of stimulus have been the establishment of ICT Dynamo and degree programmes in information technology when parts of the Nokia organisation settled in the City of Jyväskylä. As an administration model, the limited company was seen as a body that enabled the Polytechnic to react quickly to issues and direct activities. Even if the Board of the Limited Company approves the Polytechnic's strategy, the practice of the Jyväskylä Polytechnic has been that the board does not have decision-making authority relating to the contents of the strategy that belongs to the Polytechnic's internal issues.

Due to the form of the ownership, the Polytechnic's rector is in a strong position: he is the rector of the Polytechnic as well as the chief executive officer of the limited company and the official charged with formally presenting proposals to the Board of the Limited Company. This makes combining operational and financial responsibilities possible (Jääskö & Panhelainen 2007, 282). As the chief executive officer, he is the central decision-maker on the principal issues concerning personnel policy: he establishes new positions other than those for vacancies on the Board of the Limited Company; he signs the contracts of employment; and he makes decisions about the salaries to be paid to new staff. (Jyväskylän ammattikorkeakoulun johtosääntö 2003.) Among his other duties, the rector also monitors the organisation-environment interface, is a member of many extra-organisational regional strategy groups and determines appropriate strategies, jointly with other actors (cf. Gumport 2005, 122; Jyväskylän ammattikorkeakoulu 2005, 6).

According to interviewee I3, the management style of Jyväskylä Polytechnic is based essentially on line authority between the rector, the heads of schools and the research and development managers and education managers of schools. In conjunction with the central administration, the rector manages and controls the schools primarily through goals, strategies and resources. The rector is supported by the strategy group which consists of the heads of school, the development director and the financial director. (Hämäläinen et al. 2006, 17.) The development director and financial director are part of the rector's staff.

The heads of schools are in charge of the activities of the schools. The schools are the responsibility centres and the heads are accountable for their results. That includes the administration of the school, the education process that consists of education leading to a degree, and research and development processes including paid service activities, in-service training and research and development activities. The heads are also responsible for degree programmes and internal development of education to respond to regional and national needs. The heads report and relate directly to the rector through the performance negotiation mechanism. The rector and the heads of the schools negotiate the targets and the results of each school annually. Regional engagement is part of the research and development and education processes under evaluation. However, according to interviewee I3 the challenge is how to evaluate and measure regional development activities that only rarely have immediate results (I3; I10; Jyväskylän ammattikorkeakoulu 2005, 6). The importance of strategies and strategic priorities in delineating research and development activities is emphasised at Jyväskylä Polytechnic (Lyytinen & Marttila 2009a, 31).

The schools' options for managing their external engagement activities have been strengthened by establishing research and development manager posts in each school. The research and development managers act as the co-ordinators of research, development and regional development work and are responsible for each school's project portfolio, and stakeholder and customer contacts (Jyväskylän ammattikorkeakoulu 2004). On average, the revenue through paid service activities forms a larger share of all revenues at Jyväskylä Polytechnic than at the other case polytechnics. However, the proportion of paid service activities declined by six per cent between 2006 to 2008 (see Table 9).

TABLE 9. Revenue sources: Jyväskylä Polytechnic

Year	Unit price funding	Separate funding of state	Paid service activities (incl. external R&D funding)	Other separate funding	Funding from licence holder	Other funding	Total (1000 euros)
2002	75 %	4 %	20 %	1 %	0 %	0 %	100 % (37 717)
2004	76 %	1 %	22 %	1 %	0 %	0 %	100 % (40 492)
2006	76 %	3 %	20 %	1 %	0 %	0 %	100 % (49 478)
2008	82 %	2 %	14 %	2 %	0 %	0 %	100 % (50 832)

Source: National Board of Education 2008a.

Boundary spanning activities

The expanded developmental periphery and academic heartland are fused elements at Jyväskylä Polytechnic since its contract research and development and contract education activities are carried out in interaction with the degree programmes and schools without separate organisations (Halttunen 2006, 29; Tulkki & Lyytinen 2001, 50). That means the Polytechnic's aim is to expose the schools nearer to the external environment instead of establishing separate outreach units.

According to two interviewees I3 and SA6, the environment set challenges for the Polytechnic's scope of action due to the co-existence of other higher education institutions and universities (cf. also Lyytinen & Marttila 2009a, 36–37; Marttila et al. 2004, 107–108) as well as due to the polarisation of the region. That means Jyväskylä Polytechnic is one of several competitors making approaches to the same clients and co-operation partners (cf. Thompson 2003, 27). The Polytechnic also aims to find an environmental domain where there is less competition, and to link up with new company groups and other stakeholders in different geographical areas (cf. Child 1997, 53; Daft 2007, 71). On the other hand, the Polytechnic has to enter into the same business areas with the other actors since the Polytechnic cannot exert a strong influence on regional development alone. Instead, it has to interact and collaborate with other organisations. The regional actors SA4 and SA6 emphasised that it would be important for the Polytechnic and other actors, particularly the university, to find common interests and pool their resources in the strategies.

> Because the Jyväskylä region has many actors who undertake development work for companies, we [the Polytechnic] are relatively small or let's say one actor among many. But when we go to the peripheral regions, our role there is much more important. The other developers have a lesser role than we have. (SA6) (10)

> In that sense, the Polytechnic's regional strategy is insignificant even if it is not congruent with the strategies of other actors. Therefore, it can not be independent. The Polytechnic can not lead regional development alone but it can be in on it. (SA6) (11)

The polarisation of the region is the challenge in Central Finland: the Jyväskylä region is growing and is economically strong but outside the region, there are large peripheral areas in which development work is needed. The company structure of these regions is diverse and the municipal and public sector organisations are in a weak position. Neither does the Polytechnic offer services in these regions.

The regional actors' evaluation was that the linkages of the Polytechnic to the regional environment and organisations mainly take the diverse forms of relationships and co-operation with companies and public organisations through projects, centres of expertise programmes and entrepreneurship education (SA4, SA5, SA6; see Table 10 and Table 11).

- Development of working life with help of projects (e.g. natural resources, technology, social and health care).
- Applied research: IT Institute and Jyväskylä Science Park*, co-operation with University of Jyväskylä.
- Partnerships in projects via networks.
- Participation in network Centre of Expertise in Food Industry in the Central Finland and Centre of Expertise for Tourism in Wellbeing Tourism
- Entrepreneurship: particularly service-entrepreneurship and technology entrepreneurship in the fields of technology and transport.
- Expertise in marketing in the field of business administration (Tiimiakatemia).
- Virtual teaching particularly in rural regions.

Source: Lyytinen 2004a, Stakeholder map (Table 11)
* The present name Jyväskylä Innovation Oy

The Polytechnic has the tradition of collaborating particularly with growth centre companies as well as small agricultural companies. The co-operation is often related to development of the different areas of the companies' business operations. The Polytechnic has institutionalised co-operation relationships with certain companies such as Valtra and its subcontractors (I3; SA6; Jyväskylän ammattikorkeakoulu 2005, 8). The field of technology has had long-term co-operation with Valmet and particularly Metso and the paper industry. According to interviewee I3, there is a risk that the co-operation is too dependent on one or two companies. The challenge for the Polytechnic is to enter into contracts with new company groups that do not have enough information about the Polytechnic. Neither does the Polytechnic have sufficient information about regional needs, particularly the needs of the companies in peripheral regions. Consequently, there is a need to distribute information about the Polytechnic's activities in the region. The challenge is that particularly the small and medium-sized companies do not always recognise the significance of the new knowledge.

> We have one very important issue that we have to achieve. We have to make ourselves more visible to the business world. Their experience has been that we [the Polytechnic] are a mammoth that they have difficulty in catching. We have difficulties in getting contacts in those companies that do not already know us. Organising this issue is not yet settled. (SA6) (12)

To reduce uncertainty, the Polytechnic has pooled resources with the University of Jyväskylä, the Vocational Institute, VTT Technical Research Centre of Finland, and the Technology Centre. Together they have established a provincial learning place network to share information, especially about the needs of the small and medium-sized companies in regional business life and to increase interaction between

education institutions and the environment by using regional development companies as mediating institutions. The network started its operations as a temporary project group but the aim is eventually to institutionalise these activities for the core activity of schools. (SA4; SA6; I3; I4.)

Wellness technology is one of the central industrial branches in Jyväskylä. The Polytechnic has joined in the regional centre programme and its Wellness Dream Lab (WDL) programme by administering the programme. The programme operates within the School of Technology. The programme aims to launch new business in wellness technology (I10; SA5; SA6; Jyväskylän kaupunki 2004). The WDL team operates with separate personnel in the Viveca building. It brings information to the Polytechnic's heartland about the needs of the business world for teaching, and research and development and by developing teaching and curriculum. The Polytechnic offers a degree programme in wellness technology. (Jyväskylän kaupunki 2004; Marttila et al. 2007, 33.)

According to interviewee SA6, Jyväskylä Polytechnic also builds networks in order to create new partnerships. The School of Tourism, Catering and Domestic Services has participated in national network centres of expertise: the Centres of Expertise in the Food Industry and Tourism. These centres aim to link education, research, development and business. They mediate and transfer the knowledge of education and research institutions to the development of the economic life of these fields. The Polytechnic is in charge of co-ordinating the Centre of Expertise in the Food Industry in Central Finland. Its responsibility in the Centre of Expertise for Tourism is Wellbeing Tourism (SA6). However, the food industry is quite a small branch of business based on its company structure. According to interviewee (I3), the Polytechnic has not utilised all the available tourism resources.

The Polytechnic's School of Business Administration is involved in the Tiimiakatemia entrepreneurship programme. The programme specialises in entrepreneurship education. Its curriculum focuses on entrepreneurship and marketing at the Jyväskylä unit and project management and expertise as well as work community skills at its Jämsänkoski location. At Jämsänkoski location, Tiimiakatemia has particylarly specialised in regional development work and projects concerning tourism and entrepreneurship. Tiimiakatemia gets closer to the academic heartland through the degree education it offers in business economics. (Tiimiakatemian opinto-opas 2004–2005, 146; I3, SA6.)

Teaching, research and development activities

The Jyväskylä Polytechnic offers teaching in seven fields of education and 27 degree programmes. These activities operate in eight schools in three localities. The Polytechnic has specialised particularly in service sector education (Jyväskylän ammattikorkeakoulu 2005).

Looking for outreach and external funding is done differently in different schools and fields of education (see also Tulkki & Lyytinen 2001, 50). There are schools

which have persistently and purposefully developed their external relationships and activities, but there are also units which have had difficulties in adapting changes. According to interviewee I3, the essential question is how the culture – which has its origins in practices and traditions of educational institutions – accepts change. Some educational institutions have had deep shared understanding that teacher's task is only to teach. The central challenge of the Polytechnic's governance and management is how to create incentives to support its personnel's participation in diversified external engagement activities alongside teaching.

Jyväskylä Polytechnic has service units under some schools. For example, there is an in-service unit under the School of Business Administration. The general aim of the Polytechnic however, is to stimulate the involvement of the schools by establishing multidisciplinary expertise networks which are operating networks that aim at stimulating co-operation between the fields of education and schools and with the representatives of business and industry. However, as interviewee I3 argued in line authority the schools act as the responsibility centres that decide which networks they belong to and the extent to which personnel participate in teaching and research and development activities.

The School of Technology has a long tradition in entrepreneurial activities: co-operation with companies and industry. It has specialised particularly in applied research and the development of companies' processes, such as developing networks, logistics and quality services for small and medium-sized companies. The School has carried out quality development projects for Valtra's subcontractors, for example. The ICT Institute has undertaken applied research with the Centre of Expertise. (SA5; SA6; Jyväskylän yliopisto ja Jyväskylän ammattikorkeakoulu 2002, 18–21.) The regional actors (SA5) mentioned that the field of technology also has co-operated in applied research projects with the University of Jyväskylä. In addition, long-standing individual relationships with external partners are often important for furnishing concerted action and common interests. According to interviewees I3 and I10, the exchange of persons between the University of Jyväskylä and the Polytechnic has facilitated the emergence of networks.

The School of Social and Health Care was mentioned as being a unit which has been involved in co-operative ventures particularly with public organisations. Central Finland Health Care District is the central customer for development projects within the field of social and health care. The School has found its role in developing service systems and service concepts for different population groups, organisations and service providers. Because the social and health care markets are more focused on public sector co-operation and development projects, the school is less involved in relationships that generate external funding. At the same time, the School of Social and Health Care is more dependent on core funding and student enrolments. The challenge for the field is to find external financiers. However, it seems that the funding possibilities of the field are getting better. (I3; I6; SA4; SA6; Jyväskylän yliopisto ja Jyväskylän ammattikorkeakoulu 2003–2006; Jyväskylän ammattikorkeakoulu 2003.)

The Institute of Natural Resources was the Polytechnic's first regional unit outside the City of Jyväskylä. The Institute offers the agricultural industry degree programme with a small intake of new students, but according to interviewee I3 the Institute has profiled particularly on regional development work, especially on developing the bio-energy sector and small and medium-sized companies within the sector (see also Jyväskylän ammattikorkeakoulu 2005, 8; Suosara 2007, 132). It is one of the Polytechnic's most active units in that sense. The Institute has purposefully developed and involved itself in external relationships. It has wide company networks and international projects. The Institute has stimulated its academic heartland by a flexible integration of research and development and teaching activities. It has succeeded in diversifying its funding base. About 58 per cent of the unit's income comes from first stream budget funding and 40 per cent from third stream sources through research and development contracts. (I3; SA6; Jyväskylän ammattikorkeakoulu 2006.)

TABLE 11. Stakeholder map: actors and activities of the Jyväskylä regional innovation system

Actor/Stakeholder	Activity
University of Jyväskylä	Teaching and research: basic research as well as applied research in co-operation with companies.
VTT Technical Research Centre of Finland	Applied research and co-operation with companies.
Jyväskylä Polytechnic	Entrepreneurship: particularly service-entrepreneurship and technology entrepreneurship in the fields of technology and transport. Expertise in marketing in the field of business administration (Tiimiakatemia). Participation in Network Centres of Expertise in the field of Tourism and Food Industry. Applied research: IT Institute and Jyväskylä Science Park, co-operation with University of Jyväskylä. Development of working life with help of projects (e.g. natural resources, technology, social and health care). Partnerships in projects via networks. Virtual teaching particularly in rural regions.
Secondary level vocational education	Development work directed towards companies in their own knowledge field; expertise in regards to working life; contacts. Teaching is important at all levels of education.
Key companies: Metso, Valtra, Nokia, TietoEnator, Keskimaa	Product development and subcontracting networks (Metso, Valtra and Nokia are the most important co-operation partners of Jyväskylä Polytechnic; the subcontracting networks of companies are particular important for polytechnic). Supply of jobs (Keskimaa).

Jyväskylä Science Park and the Centre of Expertise Programme	Generating business, developing companies (high tech), development programmes with regard to internationalisation, incubators, operational environment, promoting co-operation between companies and higher education institutions with the help of centre of expertise programme.
Investors and mentors	Finance, networks and business expertise – role is still modest but will be emphasised in the future. Technology entrepreneurship is the future challenge for Jyväskylä Polytechnic also.
Consultants, patent and marketing experts Regional Council of Central Finland	Welfare technology, small companies. Professional business management – stakeholders expect solutions from education institutions. Development of new ideas (e.g. students graduated from Tiimiakatemia).
Jyväskylä Regional Development Company, Jykes and other development companies	Strategies & finance, development work based on industries. Planning of land use and municipal development. Supporting development of companies.
Employment and Economic Development Centre of Central Finland	Finance, "own projects".
State Provincial Office of Western Finland	Finance.
Centre of Expertise in Social Care / Health Care District	Co-ordination of regional projects. Research concerning social care: solving problems coming from the field. Subscriber and financier of Jyväskylä Polytechnic's development projects.

Source: Lyytinen 2004a

6.4 Tampere Polytechnic – regionally recognised education provider

6.4.1 Pirkanmaa as the regional innovation environment

Pirkanmaa is a province with about 470 000 people in the western part of Finland. Its central region is the Tampere region in which about 68 per cent of the province's population live and where the growth of the region is largely concentrated. (Kautonen et al. 2004, 172; Pirkanmaan liitto 2006, 5.) Tampere is Finland's second major economic centre after Helsinki and its surroundings. The Tampere region has traditionally been an industrial town. Nowadays it is an example of a region which has renewed itself from the former industrial city into a visible node of global knowledge production. (Kautonen et al. 2004, 170–172.) However, the industrial sector is still bigger on average in Tampere and Pirkanmaa than in the other parts of the country (Schienstock et al. 2004, 129; Statistics Finland 2008).

The principle industrial fields are the metal industry, the chemical and mechanical forest industries as well as the food industry. These fields employ about 58 per cent of the workforce in industry and generate about 55 per cent of total revenue. More recently, automation, electronics, information and communications technologies, knowledge-intensive business services and health technology have been the growing industrial fields. Characteristic of enterprises in the region is the large number of small companies as well as companies affiliated with larger companies. During recent years, new companies have been established, particularly in business services, construction and social and health care services. (Pirkanmaan liitto 2006, 6.) The development of strategic clusters in mechanical engineering and automation, information and communication technology, media services, health technology, health care technology as well as knowledge-intensive business services is supported through the centre of expertise programmes. Special programmes such as eTampere (2001–2005) and BioneXT have also improved expertise in information technology and biotechnology (Tampereen kaupungin elinkeinostrategia 2005, 10–11).

Pirkanmaa is a region where research and development expenditure is high: 942 million euros in 2006. Over 80 per cent of this expenditure was channelled through companies (Ministry of Education 2008a; Statistics Finland 2007). Both knowledge-intensive business enterprises and large companies are important from the viewpoint of research and development activities (see Table 13). Higher education institutions' share of research and development expenditure was about 14 per cent (134 million euros) (Ministry of Education 2008a). Together with the large research and development-oriented companies, the University of Tampere, Tampere University of Technology, Tampere Polytechnic and Pirkanmaa Polytechnic form the backbone of the regional innovation system (Schienstock et al. 2004, 140). In addition, the Technical Research Centre of Finland has a sub-unit in Tampere. The level of education is high among the inhabitants of Pirkanmaa: about 25 per cent of the inhabitants have completed a higher education degree (Statistics Finland 2006b).

6.4.2 Tampere Polytechnic's[7] responses

Institutional idea

Tampere Polytechnic is a techno-economically oriented multidisciplinary higher education institution that serves business life. The Polytechnic has been built on the techno-economic fields of education around the former Technical Institute, Forest Institute, and Art and Communication Institute. It has traditionally been famous for its expertise in machine automation, electro technology and media. The Polytechnic started its operations in August 1992 (its experimental operating licence was granted

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7   Tampere Polytechnic merged with Pirkanmaa Polytechnic on 1.1.2010. The new polytechnic is known as Tampere Polytechnic. This study concerns the Tampere Polytechnic in its original form, because the research data were collected between 2003 and 2005, before the merger.

in April 1991) and the permanent operating licence was granted to the Polytechnic four years later in August 1996. (National Board of Education 2003, 139; SA2.)

The vision of the Polytechnic is to be a nationally and internationally esteemed higher education institution which has a significant role to play in the development of the Tampere region. The Polytechnic's strategic aims are to be renowned for its high-level education, to be an important provider of research and development services, to be a significant regional and international opinion leader and to be an attractive learning and working environment. (Tampereen ammattikorkeakoulun strategia 2003–2012.)

Management and decision-making

Tampere Polytechnic is one of the administrative units of the City of Tampere. From the beginning of 2005 the representative of the maintaining organisation has been the Committee for Education, Competence and Economic Services of the City of Tampere (Pirttilä et al. 2009, 14). The Polytechnic has two central locations in Tampere. It has organised itself according to the internal 'pay for service' administration model based on the one used by the City of Tampere.

The rector is in charge of the Polytechnic's management together with the central management group which consists of the rector as the chair, the vice-rector and the directors of the internal task areas as well as the financial manager as an expert member (Tampereen ammattikorkeakoulun toimintasääntö 2005). The Polytechnic has strengthened its management capacity by dividing its core processes so they correspond with all its tasks: education leading up to a degree, in-service training and company service, research and development as well as teacher training. Each of these processes forms an internal task area, which acts as the responsibility centre with its own directors. The post of research director was established in the central administration to be responsible for the research and development task area. Similarly, the service and in-service training director is in charge of in-service training and the company service task area. (I1; I2; Tampereen ammattikorkeakoulun toimintasääntö 2005.) The directors are in charge of managing and developing their task areas, financial planning and follow up as well as attending to operationally and economically appropriate co-operation within the Polytechnic organisation, with the City of Tampere and its organisation as well as business life and society. They have the power to employ fixed-term personnel, decide on product and service pricing as well as projects, procurement and outsourcing services to a certain cost (Pirttilä et al. 2009, 16; Tampereen ammattikorkeakoulun toimintasääntö 2005).

The task area of know-how and resources consists of eight centres of expertise which correspond to the fields of education Polytechnic offers: Art and Media, Business Administration and Entrepreneurship, Mechanical Engineering and Forest Technology, Construction Technology, Electrical Engineering and Telecommunications, Information Technology and Communications, Material and

Measuring Technology as well as Languages and International Activities[8]. Each of the centres of expertise has a manger that is in charge of the management of the centre. (I1; Pirttilä et al. 2009, 14–16, Tampereen ammattikorkeakoulun toimintasääntö 2005.)

Boundary spanning activities

As in the Jyväskylä region, establishing boundary spanning activities is also a challenging task in the Tampere region, due to the co-existence of other higher education institutions and research institutes (cf. Marttila et al. 2004, 107–108). The environment influences on the Polytechnic's of possibilities to create relationships with the other actors in its environment because there are many other similar actors offering research and development services, competing for the same clients and exerting an influence on regional development within the region. As argued by interviewee I1, the competition situation in Tampere is different from that in many other regions.

> This regional development task is quite interesting here in Tampere because there are three higher education institutions and VTT and also companies which have a favourable attitude towards research and development. There are many research and development actors and centres of expertise. There all have an interest in regional development and it is difficult to think that it is particularly our [the Polytechnic's] task. (I2) (13)

The Polytechnic offers in-service training to wide ranging company groups. Such services aim at responding directly to environmental needs. According to interviewee I2 the Polytechnic has made the choice to develop knowledge-intensive boundary relationships, particularly within the fields in which it is developing its academic capacity and seeking partners for co-operation. The Polytechnic also aims to create long-term relationships particularly with small and medium-sized companies. Finding company partners in collaboration is not difficult in Tampere as such but the situation becomes challenging if one wants to sell services in market price.

Interviewee I1 argues that external engagement and outreach activities can be a challenging task in a municipal polytechnic, if the polytechnic can not operate flexibly and speedily enough. The local authority can limit the Polytechnic's options for investing in new infrastructure or using auxiliary firm-names, for example. The slow processes of the Polytechnic's finances also set constraints on its flexible operation.

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8   Tampere Polytechnic was just changing over from old organisation model to new centres of expertise model when the interview data of this study was collected.

Teaching, research and development activities

Tampere Polytechnic has profiled itself as the polytechnic of the City of Tampere. Its units are in two central locations in Tampere. It has traditionally been famous for its expertise in machine automation, electro technology and media. The Polytechnic offers teaching in fields such as technology, business administration, natural resources and culture in degree programmes which reflect the industrial fields of the region (National Board of Education 2003, 139; SA2).

Tampere Polytechnic has a long tradition as an education provider. That means the schools have been formed around the teaching activities in particular. According to interviewee SA2, reforming the activities and establishing external co-operation relationships with the business community started through students' thesis projects, particularly in engineering education. The interviewee I2 argued that the particular aim of the Polytechnic still is to stimulate its academic heartland by integrating activities to students' curricula in the forms of thesis, project work and compulsory practical training. Nowadays, all the schools have relationships with companies, but the enterprising activities are not spread evenly between the heartland units. The relationships and co-operation with the universities was also considered as important as getting into large EU projects.

Tampere Polytechnic is particularly famous for its School of Art and Media, both in terms of teaching and research and development. There are active staff members who have been educated to the doctoral level. The school is involved in relationships with external groups at the national and international levels specialising especially in content production and different media. It has been involved in a regional eLearning cluster, bringing its expertise on content production to the cluster. The school has also actively sought international relationships and diversified funding sources particularly through a range of EU programmes and other funding instruments. (I1; I2; see also Tulkki & Lyytinen 2001, 57.)

The field of technology, particularly the School of Construction Technology and the Textile Technology have been actively involved in co-operation with external partners. The Textile Technology has generated revenue by selling services to groups of small and medium-sized companies that purchased the services through their own funding and through public funding from Tekes. The School of Construction Technology has many projects that are applied research or development. The school has also developed its measuring services into a 'product' and accordingly diversified its funding base by selling services to its customers. However, it was argued that as a whole, the Polytechnic should have many more productised services than it has. (I1.)

Having funding from many sources does not automatically strengthen the polytechnic's self-regulative capacity. Instead interviewee I1 argued that the funding from the EU and Tekes enable it to obtain funding to cover labour costs, and funding from the European Social Fund can be used for acquiring software, but they seldom generate income. The share of second and the third stream funding sources through paid service activities have comprised between 14 and 27 per cent of the Polytechnic's

total funding during the 2000s. On average, the share of separate funding from its maintaining organisation is also higher at Tampere Polytechnic than is the other case polytechnics. (see Table 12, National Board of Education 2008a.)

TABLE 12. Revenue sources: Tampere Polytechnic

Year	Unit price funding	Separate funding of state	Paid service activities (incl. external R&D funding)	Other separate funding	Funding from licence holder	Other funding	Total (1000 euros)
2002	72 %	3 %	10 %	0 %	15 %	0 %	100 % (32 826)
2004	81 %	4 %	14 %	1 %	0 %	0 %	100 % (30 021)
2006	81 %	4 %	13 %	2 %	0 %	0 %	100 % (34 761)
2008	78 %	3 %	7 %	2 %	10 %	0 %	100 % (41 741)

Source: National Board of Education 2008a

TABLE 13. Stakeholder map: actors and activities of the Tampere regional innovation system

Actor/stakeholder	Activity
Tampere polytechnic	New clients to the innovation system, Supporting of education of well-trained personnel by interacting with the environment.
Pirkanmaa polytechnic	Focus on health care, hotel and catering.
Häme polytechnic	Supporting the centre of expertise programme (Automaint).
University of Tampere	Knowledge base.
Technical University of Tampere	Knowledge base.
Technical Research Centre of Finland	Professional and trustworthy. Organises its activities nation-wide. Regional presence central in projects. Participates in programmes.
Companies	International companies, investments in research and development, KIBS.
TEKES	Finance. Strategic expertise.
Technology centre	Broker, networking and activating.
Employment and Economic Development Centre	Finance. Enterprise unit is also an actor.
City of Tampere	Strategy, launching of co-operation, new business, financing of the centre of expertise programme.
Other municipalities	District role.
Regional council of Pirkanmaa	Regional developer municipal. Finance "vaikuttavuus".
Programmes	Implementation of strategies, funding agency

Source: Lyytinen 2003a

7
Results of cross-case analyses: towards new ways of action – polytechnics' operations models in different regions

This chapter analyses across the cases to show how the case polytechnics have built their capacity for regional engagement. The analysis and comparison have been done on five dimensions: how the case polytechnics have strengthened their management capacity; the kind of linkages they have established with other regional actors and why; how they have diversified their funding bases; and how the schools and different fields of education have adjusted their practices in order to stimulate regional engagement as well as how they have built and are building an integrated and more outward-oriented work culture.

7.1 Strengthening internal management capacity for regional engagement

Polytechnics and other professional higher education institutions have traditionally been more externally oriented and centrally administered than universities (OECD 2002, 27). It is said that they are more favourable to the socio-economic context, their attitude is more business-oriented, and they have more formal contacts with external stakeholders than universities (e.g. Kyvik & Skodvin 2003, 203; Wit & Verhofen 2000, 435).

Studies and evaluations have suggested that autonomy is the central prerequisite for higher education institutions to become entrepreneurial and to create a distinctive institutional profile (Davies et al. 2009, 106; van Vught 2008). It is argued that entrepreneurial higher education institutions actively search for their special organisational identities. They risk being different and accept changes in markets (Clark 1998a, xiv). The central prerequisite for that kind of activity is

the higher education institution's ability to set its own strategic direction. That requires a considerable degree of independence from government and industry while maintaining a high degree of involvement with other societal actors from the independent standpoint. (Clark 1998a; Etzkowitz & Klofsten 2005, 246.)

The wide degree of independence and power enables the higher education institution to have the capacity to make choices to direct its activities (Gornitzka 1999; Hrebiniak & Joyce 1985; Orelma 1992, 130–131; Vuorinen 1990, 113). However, the ability to set a strategic direction is only the first step towards an entrepreneurial university. It is argued that autonomous institutions become entrepreneurial when they decide they have to explore and experiment with changes and react with external and internal demands and commit themselves to these changes. (Clark 1998, 5; Etzkowitz & Klofsten 2005, 246.) The options for Finnish polytechnics to make strategic choices are limited because educational institutions operate as part of the public administration (Ojala 2003, 167). Accordingly, polytechnics are legally and financially closely linked to both local and state authorities (Kohtamäki 2009, 25, 57).

The external relationships and regional responsibilities have also challenged case polytechnics to develop more entrepreneurial ways of action. The polytechnics have strengthened their managerial capacities. The strengthened role of the polytechnic's rector as the chief of the whole organisation was emphasised particularly by interviewees from Seinäjoki and Jyväskylä Polytechnics. Interviewees I3 and I5 considered the rector to be the key person particularly in the situations in which he also acts as the chief executive officer of the board of the limited company or as the chair of the joint municipal authority which is responsible for polytechnic- and secondary-level education (see also Puoskari 2004, 19). It was emphasised that having a limited company as the administration model makes it possible to react quickly and to prepare corresponding definitions of policy.

The managerial powers of the institutional management have been strengthened in case polytechnics also by other means. Three of the case polytechnics – Jyväskylä, Seinäjoki and Tampere – have separated teaching and research activities into their own result areas or processes. Each result area or process has its own director who has centralised responsibility of strategic management and planning of the result area. Most of the case polytechnics (Seinäjoki, Satakunta and Tampere) have established new research director positions in institutional management to be in charge of the strategic management and oversight of research, development and service activities including regional engagement. In Jyväskylä Polytechnic these activities are in the charge of a development director.

Step by step, the case polytechnics have also devolved decision-making and responsibilities to the schools or faculties, which act as the responsibility centres. The schools' management systems have been improved and the task specialisation of the managers has been strengthened. The heads of schools or deans of the faculties act as the middle-level executives. Their responsibilities increasingly include administrative and financial tasks. Under their authority, new middle-manager positions have been

established at Satakunta and Jyväskylä Polytechnics to be in charge of management and co-ordination of research and development and regional development work, stakeholder relationships and the school's project portfolio as well as seeking external funding sources. The interviewees also emphasised that the faculties and schools have made strategic choices about priorities and the fields of expertise in which they want to develop their capacity. In addition, most of the interviewees highlighted the fact that the senior institutional management and the heads of the schools are developing performance indicators to measure schools' regional engagement activities. It seems that even if the schools have got more autonomy to act, these strategic priorities delineate their activities, search for co-operation partners and external funding sources more than in earlier times. Within these strategic frames, the schools are encouraged to become proactive in creating projects and seeking co-operation partners. (cf. also de Boer et al. 2007, 39; Larsen et al. 2009; Marginson & Considine 2000, 136; Marttila et al. 2005, 20.)

Even if the managerial capacities of polytechnics have been strengthened, the collegial means of governance seems also to be significant. Sharing responsibilities and exchanging information and experiences in collegial groups has been pointed out as being important in the case polytechnics particularly in the situation in which polytechnics have developed common strategies and practices to entire institution. The most essential of the polytechnics' internal formal decision-making bodies is the polytechnic board. It brings the representatives of central management, the schools and the representatives of business and working life together to decide on issues common to the entire polytechnic. The board is in charge of the internal administration of the polytechnic together with the rector. At Satakunta and Tampere Polytechnics, the board also decides on the essential goals of business and working life and regional development (Satakunnan ammattikorkekoulun sisäisen hallinnon sääntö 2004; Tampereen ammattikorkeakoulun sisäisen hallinnon sääntö 2004).[1] Most case polytechnics also have central management or strategy group – consisting of representatives of senior institutional management and the representatives of schools – that support the rector in issues associated with the polytechnic's management.

The increased regional responsibilities and need for external collaboration have particularly required the case polytechnics to develop common administrative practices and directions. In that situation, the central management group and research and development group were mentioned as being important collegial bodies in the case polytechnics. The research and development group is a kind of semi-formal expert body which consists of the representatives of the senior institutional management and schools in order to blend interests and experiences as well as to deal with common issues relating to strategies and development of external engagement

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1   The experiences of the decision-making by polytechnic boards, established after the reform of the Polytechnics Act in 2003, were still relatively insignificant when the interview data used in this study were collected. However, the interviewees expected that the polytechnic board would become the body in which the issues would be dealt with from the viewpoint of the entire organisation.

activities (See also Lyytinen et al. 2008, 54 and Marttila et al. 2005, 26–28). The role of collegial bodies was emphasised particularly at Seinäjoki Polytechnic (cf. Papp et al. 2006, 42) but they were also considered to be important at Satakunta and Jyväskylä Polytechnics. It is argued that the lack of collegial interaction and common planning sessions between central management and the heads of schools can hinder clarifying and confirming the common goals (Toikka 2002, 206–207).

However, there were differences between the case polytechnics, such as how much co-ordination and control there was, and how centralised versus decentralised the decision-making was. The schools at Seinäjoki Polytechnic have historically been able to operate autonomously and decide on their own issues. The entrepreneurial spirit was mentioned as being the central part of the regional character which is reflected also in the activities of the Polytechnic's staff. However, it seems that even if the decentralised decision-making and autonomy of the schools characterises Seinäjoki Polytechnic, its method of administration is collegial rather than managerial. Instead, it seems that the capacity for control at Jyväskylä Polytechnic is more concentrated and rests more on managerial principles, line authority and performance management. The institutional management controls and co-ordinates the schools by management by objectives, strategies and financing. The heads of schools report and relate directly to the rector through the performance negotiation mechanism. The schools' success in regional engagement is evaluated annually as part of the performance negotiations.

7.2   Establishing linkages to the environment's other actors

This section presents analysis across the cases to show the kinds of linkage the case polytechnics have established to other actors in their environments, and why. The focus of analysis is on those aspects of the environment to which the case institutions and their schools are sensitive and have to respond. The cases are located in their specific regional environments. (cf. Barringer & Harrison 2000, 384; Birnbaum 1991, 43; Child 1972, 1997, 53; Daft 2007, 50; Fennell & Alexander 1987.)

The forms and strategies of boundary spanning the case polytechnics have used varied from separate units, research and development environments and enterprise accelerator to co-operation in regional boards, working groups and networks (see Table 14). The role of the separate boundary-spanning units was emphasised by two of the case polytechnics, Seinäjoki and Satakunta, which have made internal adaptations by establishing outreach research and development units of this type (See Table 14). The O'Sata unit at Satakunta Polytechnic has been the administrative office that concentrated on selling services and mediating knowledge between the polytechnic and the environment. It was also in charge of project administration and financial transactions through which it developed the polytechnic's capacity in

project administration and built an integrated work culture and operations model for the whole organisation. Alternatively, the units have specialised in offering research and development services to companies and public organisations, such as the Social and Health Care Research and Development Centre, SOTE and SC-Research units at Seinäjoki Polytechnic. The argument for research and development centres of that type was that they can act flexibly, responding to the needs of the environment with separate staff that do not also have teaching duties. At the same time, they protect the academic core from environmental uncertainties. They bring the problem-orientation of the external world to the schools by offering practical training or thesis writing places for students (I6; cf. Clark 1998a, 6; Marttila et al. 2005, 32). The Finnish polytechnics responded to the needs of the environment by establishing separate research and development units, particularly in the first phase (Marttila et al. 2005, 32). However, it seems that the strategy of all the case polytechnics is to give up their separate units and encourage the schools and staff to create direct linkages to the environment's other actors, because even if units of that kind have been coupled tightly to the external environment their linkages to schools often remained quite loose. (I5 and I6; cf. Becher & Kogan 1992, 89; Clark 1998a, 6; Daft 2007, 59; Hölttä 1995, 53; Marttila et al. 2005.)

To facilitate collaboration with companies and business life the case polytechnics have also established or joined in various boundary-spanning structures, such as an enterprise accelerator, entrepreneurship education units and co-operative research and development environments. An Enterprise Accelerator was seen as the response for promoting entrepreneurship and establishing new knowledge-intensive enterprises in Satakunta, which lacks medium-sized companies that are willing to develop. Tiimiakatemia in Jyväskylä Polytechnic was considered to be important in educating entrepreneurs and consultants in the service sector.

TABLE 14. Linkages to organisations and actors in the regional innovation environment: Seinäjoki, Satakunta, Jyväskylä, and Tampere Polytechnics

Seinäjoki Polytechnic	Satakunta Polytechnic	Jyväskylä Polytechnic	Tampere Polytechnic
Polytechnic is a proactive actor and offers financial resources for regional development (research professors and higher education library)	O'Sata Research and Development O'Sata Enterprise Accelerator	Development of working life with help of projects (e.g. natural resources, technology, social and health care).	New clients to system, supporting education of qualified personnel by being in contact with environment
Polytechnic is the central actor in Centre of Expertise in Social work	Research and development environments (common intelligent laboratory and company's product development environment)	Applied research: IT Institute and Jyväskylä Science Park, co-operation with University of Jyväskylä.	Offering labour force, new business, knowledge base
Focus on entrepreneurship and the strong fields of the region's business and industry.	Expert exchange	Partnerships in projects via networks.	
Strengthening the prerequisites of research and development Personnel as the expertise resource of the region (emphasis on researcher education);		Participation in network Centre of Expertise in Food Industry in Central Finland and Centre of Expertise for Tourism in Wellbeing Tourism	
Research expertise is strong especially in the social and health care sector and business administration (high expertise in national level in the polytechnic field);		Entrepreneurship: particularly service-entrepreneurship and technology entrepreneurship in the fields of technology and transport.	
Research and development unit of the technology sector is the strategic partner of the technology unit of the Employment and Economic Development Centre.		Know-how in marketing in the field of business administration (Tiimiakatemia). Virtual teaching particularly in rural regions.	

Sources: Lyytinen 2003a, 2003b, 2004a and 2004b (Stakeholder maps)

In addition to facilitating academic co-operation the case polytechnics have also joined in linkages with other regional actors by co-operating with them on boards, and working groups, and in networks, which were often related to the formulation of regional programmes or strategies, such as higher education institutions' regional strategy, technology strategy or different sub-regional strategies. Through their connections and memberships of these bodies, the actors of the case polytechnics

have shared and exchanged information about the needs of the polytechnic and environment, sought to achieve consensus with other actors as well as joined in the formulation of the common strategic criteria. This form of active participation in regional boards and working groups characterises Seinäjoki and Satakunta Polytechnics in particular. By formulating strategically important research and regional development programmes in conjunction with each other, the actors assume collective responsibility for funding and executing the programmes (cf. Clark 1998a, 92).

The interviewees emphasised that working groups and networks of those types have also played a significant role in collecting actors together and strengthening their mutual familiarity and commitment (see also Impiö 2003, 24). The importance of trustful relationships was emphasised in the creation of long-term co-operation with the environment's other actors. That kind of relationship was seen as being particularly important in establishing contacts with the representatives of universities.

> First and foremost, during the process we prepared this strategy [regional strategy of the higher education institutions], personal contacts were born and persons learnt to know each other in which case dealings became much easier even in those fields of education that had not yet that kind of tradition. It does not left on that one document but the advisory board will gather a couple of times in year to prepare projects. (SA9) (14)

> These types of organisations [centres of expertise and programmes] are very important because, in my opinion, they often knit together a quite dispersed spectrum of organisations which exist in many provinces. If there is lack of these kinds of network forms of organisations, co-operation is quite scant and formal in a way that the issues are not necessarily dealt with very deeply, I think. (SA11) (15)

It also seems that many environmental characteristics can influence a polytechnic's choices on boundary-spanning activities. The constraints can be related to production of polytechnic's teaching and services as well as rules and requirements that polytechnics' social, legal, and political context set to them (cf. Fennel & Alexander 1987, 456–457.) According to interviewees (I3, I7, and I9), heterogeneity of industries within the region, such as regional polarisation development, lack of companies' development intensiveness or the dominance of small companies, have set constraints for polytechnics to perform well. The heterogeneity of the company sector and the paucity of the development intensity of companies were constrained Satakunta Polytechnic's options for finding company partners in co-operation. In South Ostrobothnia, similar challenges have come from the dominance of small companies even if they are willing to develop. According to interviewee I7 it requires the polytechnic to markets its activities and takes contacts to companies often.

The polarisation of the development of Central Finland has also influenced Jyväskylä Polytechnic's boundary spanning choices: economic activity is concentrated in the central city where a large number of higher education and research institutions exist, all competing for the same customers and resource providers (cf. also Lyytinen & Marttila 2009a, 36–37). Instead, in the peripheral regions of Central Finland there is less competition and need for development work. However, the companies in peripheral regions do not have enough information about the Polytechnic's services and neither does the Polytechnic have sufficient information about the companies' needs. The small companies also often lack of resources and do not recognise the importance of new knowledge. The strategy of Jyväskylä Polytechnic seems to be to search for new company relationships as well as to establish boundary spanning activities to gain information also for the companies from more peripheral regions where there is less competition. Tampere, however, is an example of region where companies and industrial fields were not experienced as challenging.

The environment can contain varying numbers of customers and partners in co-operation. The organisation can be alone in serving them or it can be one of many competitors approaching the same customers and co-operation partners. (Thompson 2003, 27.) It seems that the position of particularly Satakunta and Seinäjoki Polytechnics is strong in their regions, in which the polytechnics have been the first higher education institutions and where University Consortiums have recently been established. Satakunta and Seinäjoki Polytechnics have made the most explicit choice of being provincial polytechnics by offering teaching and services as well as seeking co-operation partners in various districts of the province. Satakunta and Seinäjoki Polytechnics have also had influence and options for taking external initiatives, defining and influencing the contents of the regional strategies and developing diversified relationships to the environment. The communication between the members of the polytechnic and groups from the environment in joint working groups has been an essential channel for polytechnics to influence their socio-political environment (cf. Finet 1993).

> … when the regional strategies are written down we want to be participating from the preparation phase. We do not necessary want to build ourselves in. Maybe it is also one idea but we want to be rather proactive than reactive so that we not only react what someone says. (I9) (16)

> Polytechnic is a strategic definer of policy because this is a significant actor in this region. There is a lot of know-how and economically strong units. We are not content only with following, in my opinion, what is happening and offering our know-how… instead we define policies in this Polytechnic, in the Board of the Joint Municipal Authority and in whole federation of municipalities. (I5) (17)

However, the interviewees in Jyväskylä and Tampere I2 and SA6 experienced that the large number of similar actors – higher education institutions and research institutes – had influenced the polytechnics' options for creating relationships with their environment (cf. also Impiö et al. 2003, 21; Marttila et al. 2004, 107–108). In particular, Tampere Polytechnic does not profile as a regional higher education institution in the same sense than Satakunta and Seinäjoki Polytechnics do. According to the interviewees, there has been competition between the higher education institutions and establishing co-operation has been dependent a lot on the attitude of the local university. However, the interviewees' experience was also that linkages and co-operation between polytechnics and universities are increasing and taking more formal shapes (see also Lyytinen & Marttila 2008, 34, 36; Suvinen et al. 2006).

> It is maybe that the polytechnic's role is now accepted. [Before] there was no information on how polytechnics operate. In a way the prejudices of university have been disappeared. Now we have started on a more equal footing in which the polytechnic is recognised as an important innovation actor. We are certainly able to agree on areas in which the polytechnic is the key actor and the areas in which university is, and then the areas in which we will co-operate and how. We are able to gel the distribution of work. (I3) (18)

> If this willingness to co-operate increases, for my part, it will create a lot of new possibilities for us to co-operate in teaching and research and to start connecting functions although the organisations will not be changed as such. I think it mostly depends on whether we are able to permeate the attitude of co-operation to these directions. (I2) (19)

In summary, the case polytechnics interact with and are influenced by several external elements. The results indicated that polytechnics' boundary roles and activities have taken various forms and they have several purposes. Polytechnics have established separate units that act as the intermediators of knowledge and services, established enterprise accelerators and enterprise education to promote entrepreneurship as well as established or joint partners in co-operative research environments with companies. In addition, through the participation on different regional boards and working groups, and in networks, the case polytechnics have exchanged information both by transmitting information about the polytechnic to external groups as well as by collecting information about the environment which can be used in the development of the polytechnic's activities. However, it seems that obtaining or securing financial resources has not been the primary reason for the case polytechnics to establish linkages. Differences between the case polytechnics were observed in terms of how actively they have also been able to exert an influence on the environment through their boundary roles.

7.3   Stimulation of the practices in schools

This section presents analysis across the cases that show how the case polytechnics' schools and fields of education have stimulated their academic activities and practices for regional engagement. The schools have traditionally been organised according to fields of education and they have focused on teaching activities. Because polytechnics have a twofold orientation when they locate between the discipline-oriented universities and practice-oriented working life, stimulating the academic heartland requires both developing practices and co-operation with working life as well as strengthening the co-operation with universities (cf. Polytechnics Act 351/2003; Schön 1990, 306; Lyytinen & Marttila 2008, 38).

It is argued that higher education institutions are bottom-heavy organisations in which discipline rather than the institution is the dominant force of working and change (Clark 1983, 30, 234). However, it is also noted that polytechnics are more centrally administered and entrepreneurially oriented than universities from their basic nature (Larsen, Maassen & Stensaker 2009). The top down control of senior institutional management has been important particularly in the first phase when the aim was been to create common frames for the activities of the whole organisation. The decision-making and managerial capacities of the schools have gradually been strengthened.

However, since higher education institutions cover divergent fields of education and disciplines, enterprising activities – new forms of co-operation relationships and diversified income – are typically spread unevenly in the academic heartlands (cf. Clark 1998a, 141; Lyytinen et al. 2008, 62). In addition, the academic staff and schools orient differently to the external environment and reach outside to their respective professions and other members of their fields (Clark 1983, 235; Lyytinen et al. 2010; Ylijoki et al. in press). The disciplines and fields of education are also orientated differently to the external environment at the case polytechnics. Interviewees I3, I5, and I9 argued that this is primarily because the cultures and traditions as well as the attitudes and activities of staff in different fields of education and from different schools vary and they are at different phases in adopting entrepreneurial activities (cf. Marttila et al. 2005, 8). The bigger schools also often have more resources and accordingly more flexibility to allocate these resources to these activities than smaller schools. However, it also seems that the traditional academic values are not characteristic for polytechnics in the same way than they are for universities. Instead the interviewees emphasised that the existence of polytechnics is essentially based on the idea of serving the environment.

As shown in other studies, at most of the case polytechnics, the field of technology has been the first adopter of entrepreneurial activities and already had a long tradition of collaboration and contracting with customers (cf. Clark 1998a, 141). The history of company collaboration in the field of technology stems from the middle of the 1990s or even earlier years (Marttila et al. 2004, 68). The schools of technology have been

involved primarily in the practice of applied research that serves companies' needs. This was indicated also in the expectations of the regional actors. In many regions, the interviewees considered that the field of technology has shown the longest history of contracting with individual customers and strongest evidence of undertaking applied research and was therefore seen as the central actor in regional innovation system.

> We are still driving research and development activities in but we have had evidence for years that the field of technology has been first and foremost. (SA9) (20)

> Our field of technology is a very strong actor, undertaking quite large and tough projects. (SA6) (21)

The applied and practical nature of the field of technology was highlighted in various ways during the interviews. It was emphasised that polytechnics have to be useful for the actors in the environment. According to interviewee I4 "… in our case it should promote the development of companies' business activity in some way." The interviewees also illustrated the character of the polytechnic's activities by comparing these with the activities of universities as follows: "the contents of polytechnics' teaching and what we are doing in projects is closer to the practices of small companies than the issues that universities are researching" (I2) and "… in the paper machine industry we [the polytechnic] clearly have technical know-how and the university has more know-how on natural science." (I3)

It seems that in some cases the schools of technology also had tighter contacts with universities than some other fields did. This was due to longer history of co-operation. However, the contacts with universities varied a lot depending on the schools and individuals. Many interviewees (SA9, I3; I5, I8) had the experience that personal relationships had been particularly important in launching collaboration with universities whether these contacts were born through using common teaching staff and facilities, teachers' postgraduate studies or their mobility from one organisation to another or participation in common working groups. That is to say to become familiar with each other at first is the central prerequisite for starting long-term collaboration.

Reviewing the co-operation between polytechnics and universities at the national level through the polytechnics' teachers postgraduate studies one can perceive that at least 90 percent of senior lecturers have completed either a doctoral degree or licentiate degree in the fields of social sciences, business and administration, natural resources and the environment, natural sciences as well as social services, health and sport in 2007. Within the fields of culture (45 %), technology, communication and transport (76 %) and tourism, catering and domestic services (88 %) the share was a bit lower. (Ministry of Education 2008, 77.)

The fields of technology have diversified their funding base particularly at Jyväskylä and Satakunta Polytechnics (Table 15). At all case polytechnics, over 50 per cent of research and development expenditure is directed to the fields of technology as well as to the fields of business and administration. However, it is important to remember that the number of staff and students is also larger in these fields.

TABLE 15. Research and development expenses by field of education in 2004 and 2006: Jyväskylä, Satakunta, Seinäjoki and Tampere Polytechnics (% -share of all research and development expenses)

Field of education	Seinäjoki Polytechnic		Satakunta Polytechnic		Jyväskylä Polytechnic		Tampere Polytechnic		All Finnish polytechnics	
	2004	2006	2004	2006	2004	2006	2004	2006	2004	2006
Humanities	1	11	1	3	0	3	0	-	3	4
Natural science	3	3	3	9	3	3	20	34	7	7
Social services and health	16	16	18	10	6	4	–	–	12	14
Agriculture and forestry	9	12	–	–	17	10	0	9	4	4
Technology	18	12	54	39	30	24	65	21	41	31
Social sciences, business and administration	54	46	24	39	45	56	15	36	33	40
Total	100	100	100	100	100	100	100	100	100	100

Source: AMKOTA database

The traditions of the field of business administration seem to be quite close to the traditions of the field of technology. Interviewee I9's evaluation was that among the fields of education, technology and business administration are fairly close to each other. It was argued (by Interviewee I1) that these fields do not profile differently and that they have the same customers. It was expected that the field of business administration would be the growth field in the future. There has been growth in funding from second and third stream funding sources for business and administration. However, the difference between the fields has been that the field of business administration has organised its external co-operation more through the students and their curricula, whereas the field of technology has concentrated more on the staff's external engagement activities.

It has been observed that it is much more difficult to create linkages with industry and other external actors in fields such as the social sciences, humanities and education than it is for the field of technology (cf. Clark 1998a, 78, 119; Slaughter & Leslie 1997, 176). The schools of social services and health were mentioned as actors that actively sought ways to carry out their activities, particularly at Jyväskylä and Seinäjoki Polytechnics. Interviewee I5 expressed it as "they have persistently developed their expertise and sought partnerships". Another interviewee SA6 characterised the field as having "very active and effective actors". However, the challenge the schools

of social services and health had to overcome is the difficulty of finding external financiers and clients who have resources to pay for their services and expertise. This is due to the high proportion of funding for the health care sector that comes from public funding sources in Finland. The public funding agencies have also primarily promoted technology development. Therefore, the schools of social and health care are most dependent on the first stream core funding and student enrolments (see also Lyytinen et al. 2008, 62). They also often use a student workforce, which stimulates the teaching activities at schools. However, both interview statements (below) as well as statistics indicate that second and third stream funding through public funding sources for social services and health is growing. Among the case polytechnics it is higher than the national average at Jyväskylä and Seinäjoki Polytechnics (see Table 15).

> Social and health care is a very active and effective actor. There is one small problem: they can never find finance… It is a fundamental problem. It means that even if there is a lot of activity they have to use a student workforce. This is not a bad thing but there have not been many opportunities to use a paid workforce. (SA6) (22)

> Money moves rather a long way in the technical fields. If we think of social and health care, there is no one to pay. The financing structure is totally different. (SA9) (23)

The schools of natural resources have been actively involved in external relationships at Jyväskylä and Seinäjoki Polytechnics and found a useful role in particular by serving local agricultural companies. This has been possible primarily through third stream funding from European Union funding programmes. In terms of research and development expenditure, the volume of those services and project activities is greater in the natural resource units at Jyväskylä and Seinäjoki Polytechnics than in similar units at Finnish polytechnics on average (AMKOTA 2008). The Institute of Natural Resources at Jyväskylä Polytechnic has succeeded in utilising its diversified funding base by combining teaching, research and development activities in ways that stimulate each other (Jyväskylän ammattikorkeakoulu 2002–2006; I3; I5; SA6; SA14).

7.4 Diversification of funding sources

This section considers how the case polytechnics have diversified their funding base. It analyses particularly whether contract research and contract education have acted as the tools for diversifying polytechnics' funding sources. According to Clark (1998a), diversifying the funding base and the need for discretionary funding becomes essential if a higher education institution wants to fashion its change-

oriented nature, so it is able to increase its freedom of action and opportunities for flexibility (Clark 1998a, 6–7). A multifaceted funding base is needed because the core funding from governments is declining in most industrialised countries. It is argued that the adoption of the third mission and engagement in academic capitalism through university-industry relationships or spin-off companies can significantly diversify the range of funding sources and the income profile of higher education institution (Slaughter & Leslie 1997).

The strengthened regional responsibilities and co-operation relationships with business and industry and the lack of core funding have challenged Finnish polytechnics to seek and to diversify their funding sources (cf. also Marttila et al. 2008). However, the Finnish polytechnics still do not obtain significant financial resources from the sale of goods and services (Kohtamäki 2009, 45). In Finland polytechnics are public higher education institutions in their basic nature and they have a considerable dependence on core funding. Among Finnish polytechnics overall, the share of polytechnics' budgets drawn from core funding is approximately 79 per cent. First stream core funding comprises 73–88 per cent of the income of all case polytechnics (see Table 16); (National Board of Education 2008a). The differences between polytechnics' funding sources – other than core funding – emerge primarily due to how much project funding polytechnics receive from EU programmes, co-operation partners and maintaining organisations (Puoskari 2004, 21).

TABLE 16. Sources of income in 2004 and 2006: Jyväskylä, Satakunta, Seinäjoki and Tampere Polytechnics (1000 euros)

Funding source	Seinäjoki Polytechnic		Satakunta Polytechnic		Jyväskylä Polytechnic		Tampere Polytechnic	
	2004	2006	2004	2006	2004	2006	2004	2006
Unit price funding	20,912	23,788	27,416	30,531	30,659	37,641	24,405	28,296
%	73	76	82	90	76	76	81	81
Separate funding of state	595	582	1028	558	470	1307	1110	1311
%	2	2	3	2	1	3	4	4
Paid service activities (incl. external R&D funding)	5006	5668	4439	2746	9055	10,003	4122	4639
%	17	18	13	8	22	20	14	13
Other separate funding	346	964	323	207	308	377	384	515
%	1	3	1	1	1	1	1	2
Funding from licence holder	1851	200	234	61	0	0	0	0
%	6	1	1	0	0	0	0	0
Other funding	0	0	0	0	0	150	0	0
%	0	0	0	0	0	0	0	0
Total	28,710	31,202	33,440	34,103	40,492	49,478	30,021	34,761
%	100	100	100	100	100	100	100	100

Source: National Board of Education 2008a.

The second and the third stream funding sources (external funding sources) of the polytechnics are composed of all other income sources that polytechnics are able to acquire in addition to unit price funding and separate funding from the state (see also Ministry of Education 2002, 11, 14). This funding consists of paid service activities, funding from licence holders as well as other funding sources. In the Finnish context, such funding is channelled mainly through paid service activities, particularly contract research and development, contract education and other service activities (National Board of Education 2008b). The share of the second and the third stream funding of the case polytechnics varied from 9 per cent to 24 per cent during the years 2004–2006 (Table 16 and Table 17). Particularly Jyväskylä and Seinäjoki Polytechnics have diversified their funding base. However, the contract research and contract education generate net income only occasionally and only minor amounts of income are generated through the open polytechnic, teaching services and products, the enterprise incubator and farm teaching and forestry training (Table 17).

TABLE 17. Incomes of paid service activities in 2006: Jyväskylä, Satakunta, Seinäjoki and Tampere Polytechnics

	Open polytechnic	Services and products/ teaching	Teaching farm and training forest	Research and development	Selling of education and know-how	Other service activities	Total Revenue (incl. VAT)
Seinäjoki Polytechnic							
income	114	0	118	3281	1241	807	5668
expenses	182	33	151	3678	1375	733	6318
net income	-68	-33	-33	-397	-134	73	-650
Satakunta Polytechnic							
income	245	83	0	1503	482	287	2745
expenses	260	79	0	1521	507	208	2659
net income	-16	4	0	-19	-24	79	86
Jyväskylä Polytechnic							
income	175	761	0	5636	3199	232	10,003
expenses	201	786	0	6461	2520	0	10,229
net income	-26	-25	0	-825	680	232	-226
Tampere Polytechnic							
income	182	0	0	808	1659	1896	4639
expenses	182	0	0	808	1521	1999	4692
net income	0	0	0	0	138	-103	-53

Source: National Board of Education 2008b

It seems that polytechnics' options for generating income through services are essentially related to challenges to combine the polytechnic's role as educational and entrepreneurial institutions (see also Lyytinen et al. 2008, 45, 64–66; Marttila et al.

2008, 423–425). It means that there is the risk, for example, that carrying out projects that generate net income, so called hard money income, can be in contradiction with the polytechnic's general goals and development lines.

> The department of construction has 'productised' services, physics has some 'productised' services. They have defined what the service includes and how much it costs. They have customers. We should have a lot more testing and service activities, which are 'productised' and which have the price stated clearly. It demands that there are persons who are able to do the work. There has to be someone in charge who does the work. It can not be that we sell measuring and testing services and we look at the teaching roster and see that a teacher has two hours free. It has to become 'the job'. It is, however, professional work, and not everyone would do the work. The only way would be if we developed some products and services which we would sell and through this to generate income. (I1) (24)

> The kind of research and development units whose revenue comes mainly from projects that are financed from public funding sources, such as Tekes and structural funds, never produce a zero result. (I7) (25)

Second stream funds consist of income provided by the government through the national research councils. This type of funding is dependent on success in competing for research grants (cf. Clark 1998a, 45). In Finland, the major research councils are the Academy of Finland and the Finnish Funding Agency for Technology and Innovation (Tekes). Both are public research financing organisations through which about 44 per cent of the government's research and development funding is allocated (Statistics Finland 2006c). However, the share of that kind of second stream funding is still marginal at the case polytechnics and among Finnish polytechnics overall. The funding through the Academy of Finland has been below one per cent of the polytechnics' total research and development expenditure (AMKOTA 2008; Statistics Finland 2002–2008). Among the case polytechnics, Tampere Polytechnic was the only one that had funding from the Academy of Finland in 2005. It can be assumed that only occasionally will polytechnics' research and development activity be basic research of the type funded by the Academy of Finland. Correspondingly, the share of funding from Tekes was below 10 per cent among the case polytechnics except at Seinäjoki where it constituted at least 10 per cent between 2001 and 2005 (AMKOTA 2002–2006). According to interviewee I7 Tekes is a valued funding source because it has national funding criteria and success in obtaining Tekes funding is an indication that the polytechnic's know-how and the quality of activity is at the national level.

It seems that this kind of competitive research funding is an image question for polytechnics. One of the interviewees (I2) argued as follows: "… it confirms that our expertise is really top expertise at both the Finnish and international levels if we receive external funding, mainly for research". As Slaughter and Leslie (1997, 218)

have noticed, higher education institutions engage in markets for competing critical resources. Research funding is a critical resource for higher education institutions since higher education institutions also aim at maximising their prestige. However, it seems – according to the statistics – that the second stream funding provided by the Academy of Finland and Tekes have remained unchanged or even diminished at the same time as polytechnics' total research and development expenditure has grown extensively. That is to say, the growth of funding has come mainly from third stream funding sources which are generally regionally distributed EU funding or other public funding sources. (Statistics Finland 2003–2007.)

The case polytechnics have diversified their funding sources particularly from regionally distributed European Union funding, other public funding sources and funding from Finnish companies channelled through contract research and contract education (National Board of Education 2008b; cf. Clark 1998a, 6, 45). The share made up by third stream funding to research and development has grown extensively since the end of the 1990s (Lyytinen et al. 2003, 84; Marttila et al. 2008, 418; Suvinen et al. 2006, 24; Statistics Finland 2002–2008; Tulkki & Lyytinen 2001, 34). European Union funding constitutes the most significant funding source at Jyväskylä, Satakunta and Seinäjoki Polytechnics. Particularly at Jyväskylä Polytechnic, over half of the expenditure on research and development from external sources is composed of European Union funding. The share of European Union funding is smaller at Tampere Polytechnic. (AMKOTA 2002–2006.) Although companies are important co-operation partners for polytechnics, the share of the direct company financing is quite small at the case polytechnics and at Finnish polytechnics in general (AMKOTA 2002–2006; cf. Marttila et al. 2008, 418). However, the third stream funding through Finnish companies seems to be more important at Satakunta and Seinäjoki Polytechnics than at either the other case polytechnics or at Finnish polytechnics overall. Funding from companies forms about one-fifth of the total research and development expenditure at Satakunta Polytechnic and 12 per cent at Seinäjoki Polytechnic. Company funding has grown progressively during the 2000s, particularly at Satakunta Polytechnic. At the national level, the share of direct company funding is about seven per cent (AMKOTA 2002–2006; Statistics Finland 2006–2008).

It can be said that the external third stream funding sources make polytechnics responsive to the needs of the environment but at the same time, they have become more vulnerable because of the dependence on the structural funding from the European Union and the resource scarcity of public sector or small and medium-sized enterprises. (Impiö et al. 2003, 25; Lyytinen et al. 2008, 44–45; Lyytinen & Marttila 2008, 36; Marttila et al. 2005, 17–20; Marttila et al. 2008, 418; Statistics Finland 2001–2008). It seems that third stream funding through contract research – particularly small projects – only seldom helps polytechnics to build reserves. Nor do they stimulate school's activities in the wider context. According to the interviewees,

the third stream funding mainly creates flexibility to hire personnel to carry out activities.

> External funding, whether it comes from European Union sources, Tekes or somewhere else, is related to a certain final result for the customer or customer group. There is nothing left over at the end. (I8) (26)

> The EU and Tekes programmes offer the possibility of gaining funding to cover staff labour costs. The projects funded via the European Social Fund do not provide the opportunity to make investments… The only possibility to gain an income stream is to act as the provider or subcontractor for an organisation that is undertaking a project and pays for services rendered on invoice. (I1) (27)

The lack of time and economic resources has proved to be a problem, particularly for small and medium-sized companies (Lyytinen et al. 2003, 106; Marttila et. al. 2004, 79; Marttila et. al. 2007). Companies fund primarily short-term and tailor-made activities, which are aimed at specific outcomes that serve the customers, but rarely is it possible to generate income from these activities.

> If we operate with our limited financial resources or with the small amount of resources which we have received from companies, then it is difficult to get continuity in the activities. Therefore, we need larger projects that continue over many years. There is always one public sector funding source or another as a participant. (I2) (28)

The goal of polytechnics is to find ways to create a continuity of activities and to undertake more and larger projects. The strategy of the case polytechnics is to create continuity by using public funding sources and by attracting external funding to their core areas of expertise.

7.5   Building an integrated culture

In the polytechnic context the change of culture is a complex issue. The question is not only about the change of traditional `ivory-tower' higher education institutions into more entrepreneurial institutions. Instead it can be said that the establishment of the whole polytechnic system has been a big cultural change in itself. The field of education-based educational institutions that merged and were transformed into polytechnics had a history that focused primarily on teaching activities. This fact has caused at least two kinds of challenge. First, there has been the challenge of merging divergent cultures into a single, more integrated and outward-oriented culture appropriate for a multidisciplinary polytechnic. Along with and after the merging

process, polytechnics' areas of responsibility have also multiplied. To become part of the higher education system has presupposed that the polytechnics would upgrade the academic level of their teaching activities and assume the added responsibility for applied research and development functions to the list of their basic tasks. At the same time polytechnics' regional responsibilities have also been extended. This section analyses how the case polytechnics have built and are building an integrated and more outward-oriented work culture.

The history of all the case polytechnics is similar in the sense that they are new higher education institutions, established by merging several vocational education institutions. Therefore, building an integrated organisational culture and set of practices has been challenging for all of them. The structures and processes form the most visible, surface level of culture (Schein 2004, 25). From the viewpoint of the senior institutional management, establishing common administrative policies and organisational procedures has been the first step in reinforcing an integrated work culture. According to interviewees I5 and SA9, centralised development and service units and common working groups have been important tools in creating and strengthening an integrated culture.

> Little by little, the purpose is not to standardise but instead to build certain basic frames in which we operate. That means we would have certain targets for what we want and that would enable us to look like a coherent polytechnic. On the other hand, we want to allow for the possibility of originality and differences between the fields of education. (I5) (29)

> There was the issue that each unit might send applications to the Regional Council of Satakunta and the Employment and Economic Development Centre without the central administration knowing about it. We might therefore make funding decisions which were not in line with the strategy of the whole Polytechnic. Now this is surely much more under control. We follow the focus areas. (SA9) (30)

However, there were differences among the case polytechnics relating to the extent to which the senior institutional management emphasised centralised procedures that reinforced an integrated culture, and the extent to which they considered that the sub-cultures of schools and fields of education could flourish. The integrated culture was particularly emphasised at Jyväskylä Polytechnic, whereas more decentralised practices, rules and the values of the schools and fields of education were highlighted more at Seinäjoki Polytechnic.

However, in addition to changes in structures and processes, the development and reinforcement of an integrated, outward-oriented work culture has required and still requires change at deeper cultural levels. Those are the changes in values, beliefs and assumptions of each polytechnic's staff (cf. Schein 2004, 25–27). The antecedent polytechnics' educational institutions had long histories as educational institutions.

The cultures and traditions of these institutions varied. As discussed in Chapter 7.3 the cultures of the fields of education still vary and are in different phases of the change process. The interviewees emphasised that the successful development and reform of the activities has often required purposeful and long-term development as well as changes in the attitude and activity of the staff. The interviewees characterised schools that have successfully developed and reformed their activities as follows: "There is a view that they have developed their know-how persistently and started to search for partners" (I5) or "… The staff have been developing the School for five years and it has very good company networks and international projects. This is the result of purposeful work." (I3)

Instead, one area in which the change of culture has taken time in several fields of education is the scope of teachers' work and what it ought to be. That has required changes in the beliefs and values that teacher's work no longer consists only of teaching duties but it includes also other tasks – research, development and co-operation with various external actors. The change process has required teachers to reform their teaching methods as well as undertaking researcher education.

> How the new culture is accepted is a very important issue. The incentive system of universities is based on personal merit. It is quite easy side there to get universities to do research and development. The driving force is one's own ambition. This system [the polytechnic system] which was originally a system of educational institutions, how we manage to do that, is the core question. (I3) (31)

> Little by little we have to adapt to the attitude that it is part of teaching. It can perhaps be carried out above all by offering examples of how it is possible to teach by means other than teaching traditionally from behind the teacher's desk. It is more natural for young and new teachers to integrate teaching into project studies and so forth, so that students become integrated into research and development activities. The change has not been quite that easy for all older teachers. (I5) (32)

The central challenge of polytechnics' senior institutional management has been and is to create incentives that encourage and motivate teachers.

8
Conclusion and discussion

The role of higher education institutions in society has varied at different times. Nowadays knowledge and know-how are seen as the central factors in the social and economic development of societies. Accordingly higher education and research institutions are considered to be the primary players of the innovation system. That means universities and polytechnics are expected to collaborate closely with business and industry and to contribute directly to regional and national well-being, among other things. (Hakala et al. 2003, 32–33.) The policy guidelines expect polytechnics to be responsive, particularly at the regional level, by supporting small and medium-sized companies, developing welfare services as well as strengthening regional innovation activities through their adult education, service activities and research and development work (Ministry of Education 2004a, 45–46, 55).

Studies in higher education have made several attempts to analyse and understand how higher education institutions change as part of the knowledge society. The responses of higher education institutions to global markets, financial stringency as well as other environmental uncertainties have been conceptualised in terms of academic capitalism (Slaughter & Leslie 1997), the Enterprise University (Marginson & Considine 2000) and the entrepreneurial university (Clark 1998). Common to all of these studies is that they focus primarily on the institutional level of higher education institutions by analysing the governance, management, and leadership of organisations. It is argued that these are the areas in which changes in higher education institutions are manifested more obviously than in academic units (Marginson & Considine 2000, 2). The studies approach entrepreneurship from slightly different viewpoints. In its narrowest sense, entrepreneurial activity means market-like behaviour which is reduced from its business form. Entrepreneurial activity can, however, be conceptualised in a wider perspective encompassing both economic and academic (Clark 1998; Marginson & Considine 2000) as well as organisational dimensions (Clark 1998). Clark sees entrepreneurialism in a wider perspective and he particularly emphasises that entrepreneurial (managerial) and academic (collegial) values should live side-by-side. The studies by Slaughter and Leslie (1997)

and Marginson and Considine (2000) see the consequences of entrepreneurship in a more negative light.

This chapter discusses and analyses the extent to which the conceptualisations of the above mentioned studies are applicable to Finnish polytechnic context. It especially focuses on analysing how Clark's concepts of organisational change dimensions are suited to describing Finnish polytechnics' institutional capacity building for regional engagement, as well as how well they describe the current development of higher education institutions. Clark (1998) does not mention regional engagement as a separate organisational transformation characteristic neither does he conceptualise the environment of organisations but the results of his case analyses point out that external collaboration had been a significant way for higher education institutions to transform themselves into more entrepreneurial and responsive institutions (cf. also OECD 1999, 41). It is also evident that polytechnics are not sealed off from their environments but instead are interacting continuously with the actors in their environments. At the regional level, the social and institutional contexts and the distinctive regional culture can influence the practices of organisations and shape the way polytechnics, universities and companies interact with each others. (cf. Asheim & Gertler 2005, 300.)

Clark's transformation paths included a strengthened steering core, an expanded developmental periphery, a diversified funding base, a stimulated academic heartland and an integrated entrepreneurial culture. Even if all of these are challenges which have also been faced by Finnish polytechnics in one way or another, and even though the polytechnics have been given a pronounced role as regionally responsive higher education institutions, there are some restrictions on the applicability of Clark's concepts to polytechnic institutions. This is understandable because Clark's concepts were developed and applied in the university context; the mission, tasks and history of the polytechnics are somehow different. Even if the steering and governance of Finnish polytechnics have moved closer to the university sector in recent years, polytechnics lack of the traditions of academic authority and science-base enjoyed by universities. It is argued that the governance structures of the Finnish polytechnics are driven more by political and entrepreneurial values than the governance structures of the universities, which are still primarily coordinated by academic values (Larsen, Maassen & Stensaker 2009, 52). It can also be noted that the management of polytechnics comes closer to the enterprise sector because of polytechnics' relationships with business, industry and other representatives of working life (Nikander 2003, 92). However, the role of the polytechnics and other higher education institutions as public organisations has been and still is particularly strong in Finland compared with the higher education institutions closest to Clark's own citizenship, those of the United States and Great Britain, for example. In those countries, entrepreneurship has emerged bottom up due to lack of centralised control. In Finland entrepreneurship is rather a top down phenomenon and has come as a result of central government regulation (cf. Mowery & Sampat 2005; Etzkowitz 2003).

It has been suggested that to become entrepreneurial, polytechnics would need more autonomy. The concrete manifestation of entrepreneurial behaviour can be institutional legal status which enables higher education institutions to make strategic choices and profile their activities (see Davies et al. 2009, 87–88, 105–106). The development of management and control of Finnish polytechnics has followed a similar set of guidelines as in the higher education institutions in other European countries. By reducing state control and increasing the decision-making authority of higher education institutions, the aim has been to improve polytechnics' entrepreneurial capacities and responsiveness to their environment. The reform of the Polytechnics Act in 2003 strengthened polytechnics' autonomy in terms of their internal issues. It also strengthened the position of the polytechnics' rectors and polytechnic boards. The rector and the polytechnic board can now decide themselves on several issues that were previously the responsibility of the board of the maintaining organisation (Kohtamäki 2009; Varmola 2004, 239). However, the possibilities of the management of polytechnics to make strategic choices are limited because polytechnics are legally and financially closely linked with the state and the local maintaining authorities (cf. Kohtamäki 2009, 25).

Even if there were differences between the case polytechnics, the results of this study indicated that polytechnics have strengthened their managerial capacities: they have strengthened the positions and task specialisation of senior institutional management and middle-management and established new managerial positions to manage and co-ordinate external engagement activities. Strategies and targets also direct the activities more than in earlier times. At the same time polytechnics have increasingly decentralised decision-making and passed this responsibility down to schools. The regional responsibilities have even encouraged the schools to search for their diversified profiles and fields of know-how, raise additional funds and establish linkages to other actors. However, to constitute common strategies, practices and shared culture to whole organisation the collegial forms of governance and decision-making have been particularly important. Their role has been emphasised in the situation in which several, previously independent educational institutions with their own cultures, own integrity and histories have merged into one polytechnic. (cf. Schein 1992, 14, 255.) The different cultures and histories, as well as the ways of action have also set a conflicting starting point for the management and planning of polytechnics. Therefore, creating an integrated culture for the whole organisation has been the polytechnics' central challenge (Nikander 2003, 80, see Liljander 2002). The challenge of multidisciplinary polytechnics was and remains both to strengthen the internal integrity of the higher education institution as well as to respect the diversity and freedom of choice of schools and fields of education (see also Auvinen et al. 2005).

The central idea of studies of entrepreneurial universities is that the decline of government funding has pushed the higher education institutions to diversify their funding sources and to seek, compete or increase their competition for critical

resources (e.g. Clark 1998; Slaughter & Leslie 1997). However, the studies have different stresses in which light they see the development. The optimistic view emphasises that by diversifying its funding sources, a higher education institution can maintain and enhance its academic position as well as increase its flexibility to make moves and respond different needs (Clark 1998, 7; Shattock 2003, 28; Sporn 1999, 28). The more pessimistic view considers that there is an academic and organisational downside to higher education institutions' massive growth of external funding sources. This means they become dependent on short-term interests of markets, business and industry (cf. Ceryh & Sabatier 1992; Clark 1998a; Fairweather 1988; Lane 1992, 946–947; Marginson & Considine 2000; Slaughter & Leslie 1997; Shattock 2005, 17). Problems can arise particularly if the traditional functions and goals of teaching and research are in conflict with adapting them to the needs of a particular company or local political pressures. One criticism has been that the activities that higher education institutions and regional agencies have established cannot be economically self-sustaining and will be dependent on continuing subsidies from regional or national sources. Consequently, the relationship between higher education institutions and their regions can become complex and bureaucratised. (Kitagawa 2005; Shattock 2005, 19–20.) There has also been criticism that while a higher education institution is not wholly dependent on core funding from the central government, its only real autonomy can be the freedom to decide which consumers to sell services to (Williams 1998, 86).

This study contributed to the discussion by analysing diversification of funding sources for Finnish polytechnics, particularly how polytechnics have diversified their funding base and whether contract research and contract education act as tools for further diversification of polytechnics' funding base. In Finland, polytechnics and other higher education institutions have a long tradition of being public higher education institutions. Accordingly the public core funding from the government forms the great majority of polytechnics' budgets even if there is a lot of variation between polytechnics (National Board of Education 2008a). The common objective of all the Finnish polytechnics is to increase their share of external funding in the form of competitive research funding and revenues from paid services. Polytechnics' external funding sources – consisting primarily of a range of third stream funding sources, seldom generates income or strengthens a polytechnic's self-regulative capacity in the wider context. Instead, the third stream funding, especially funding from companies, is often bound to particular outputs and the specific needs of the client. That makes polytechnics responsive to their environment but the flexibility in using funding is very limited. Compared with universities, the share of the second stream funding channelled through research councils into basic academic research still has only a minor role in Finnish polytechnics. It also seems that polytechnics do not actively seek out those funding sources. Nevertheless, success in gaining competitive research funding was considered to be essential for enhancing a polytechnic's prestige.

The other means of generating income, such as alumni fundraising or donations are not common in Finland. Nor are polytechnics allowed to earn income through tuition fees. In Finland higher education institutions do not have a culture or tradition for gaining a significant amount of their income from the markets. Instead higher education institutions are just beginning to develop their fund-raising strategies. The change in legislation has enabled polytechnics to charge tuition fees to students that come from outside the EU/ETA region and who take certain foreign language degree programmes leading up to polytechnic's Masters Degree (Polytechnics Act 351/2003, 26b §).

The growth of boundary roles, units and relationships with external bodies has also been argued as being a characteristic of an entrepreneurial organisation (Clark 1998a, 6). Higher education institutions can establish linkages to the environment to gain resources and to participate in competition for moneys (Slaughter & Leslie 1997) but the reasons for boundary spanning can also be judged more by academic values (Clark 1998, 139). Contrary to the study of Slaughter and Leslie (1997), this study indicated that the need for securing resources or seeking profit were only rarely the primary reasons for the case polytechnics to establish boundary units or relationships or enter into co-operation with external actors. Instead the objective was rather to stimulate academic activities, to generate institutional prestige and approval of regional stakeholders and exchange and gain information from environment. This is parallel with the Polytechnics Act which integrates teaching, research and regional engagement tasks. It seems that polytechnics have increasingly brought the academic units and external environment closer together by giving up separate outreach units and personnel and by bringing teachers and students closer to external actors and problem contexts. The institutional prestige was achieved particularly through the approval of stakeholders in terms of educating experts whose know-how respond to the needs of the companies, industry and other employers. The critical question of polytechnics is the extent to which it is reasonable and possible for them to offer expert services to business and industry which are separated from the teaching activities.

The heartland units of polytechnics have primarily been formed around their teaching activities even if the role of research and development activity is growing. It was evaluated that reforming the activities and strengthening the ties of the schools to environment have often started from students' thesis projects. After that the curricula, educational methods, teachers' tasks and working in schools have steadily become more open to environment (see also Lyytinen et al. 2008; Marttila et al. 2007). As has been observed in other studies (e.g. Clark 1997; Clark 1983; Clark 1998a, 141; Lyytinen et al. 2010; Slaughter & Leslie 1997, 175–176; Ylijoki et al. in press) this study revealed that higher education institutions do not constitute one homogenous entity but instead they consist of several fields of education which differ from each others in terms of how close they are to the markets, which external groups they establish linkages with, and how easy and characteristic it is for them to adopt

entrepreneurial behaviour. Particularly the technical fields and schools have the tradition of contracting with external partners and involving in applied and problem-oriented research which is funded through external funding sources. However, those involved in the field of social and health care find it more difficult to find customers who can pay for their services. It is obvious that the heartland of polytechnics is situated somewhere between universities' disciplinary-based and globally-oriented research and companies' innovation activity, which is more practical, specific and locally-oriented (cf. Frenken & Oort 2004, 42–43; Lyytinen & Marttila 2008, 38). The challenge of polytechnics is to establish linkages both to business life and to the academic community.

In summary, it can be said that polytechnics have developed their capacity for regional engagement in several ways during recent years. However, the traditions towards entrepreneurial activity and collaboration with external actors in a wider framework have yet to be developed. The practices are presently taking shape but there are still constraints that hinder polytechnics' scope of action (see also Lyytinen & Marttila 2008, 31–39; Lyytinen et al. 2008; Marttila et al. 2007; Marttila et al. 2008). It is often noted that the changes take place more rapidly in structures and institutional systems of higher education institutions than in their culture and academic units (e.g. Clark 1983; Marginson & Considine 2000). It has been even argued that the lack of entrepreneurial culture in higher education institutions is a central constraint for lively interaction with business and industry (Jongbloed et al. 2008, 317). Further research is needed to follow-up whether and how the culture and academic activities of polytechnics change in the long run. Accordingly, the study could go deeper into analysing the similarities and differences between the different fields of education. It would also be interesting to do a more wide-ranging follow-up study after a couple of years to analyse whether the governance and management structures and models of polytechnics have developed towards more entrepreneurial and strategic direction due to strengthened institutional autonomy and increased regional responsibilities. It would be particularly interesting to study the above-mentioned change and development processes in new, recently merged polytechnics. The study could also be expanded to the whole higher education sector, encompassing both polytechnics and universities, as well as into the international context via a comparison between several countries.

When the entrepreneurial ways of action are applied and analysed in the polytechnic context it is important to remember the history of polytechnics as well as their public mission. The history of Finnish polytechnics as multidisciplinary higher education institutions is still young. Polytechnics have been operating on a permanent basis only since 2000. In addition, polytechnics and other higher education institutions have a public mission to offer services that produce benefits for the wider society. Their organisation and funding is also primarily in public hands (Ojala 2003, 130; cf. Jongbloed et al. 2008, 318). In Finland, both central and local governments exert a strong influence on polytechnics' steering and funding.

Along with the national goals and needs, the local license holders set expectations and demands for polytechnics to serve local and regional educational and research needs. It seems that the emergence of more entrepreneurial ways of action in Finnish polytechnics are in may ways due to steering of central government and the response to the national and regional higher education policy.

At the end of 2010, the administrators made suggestions how to reform the administrative and financial position of polytechnics so that polytechnics' possibilities to successfully conduct their tasks and establish co-operation relationships with the higher education institutions and other actors of the innovation system would be improved. The main suggestion was that polytechnics and their maintaining organisations could merge into one legal person which would be a limited company. In addition, the administrators proposed that the responsibility for the core funding could be transferred completely to the state. (Salminen & Ali-Yrkkö 2010, 40.) The idea is that by decreasing the constraints of co-operation, polytechnics can become more responsive to their environments and the needs of the knowledge society. Accordingly, the essential question is what kind of linkages and co-operation polytechnics succeed to create with the other actors. On the regional level a polytechnic and its stakeholders can make the impetus for establishing new degree programmes even if the Ministry of Education and Culture confirms polytechnics' degree programmes. Polytechnics also have quite a lot freedom to carry out applied research and development together with the representatives of business and industry and other higher education institutions. The challenge for Finnish polytechnics is to find entrepreneurial ways of action that are appropriate in each regional context as well as to Finnish culture and society in a wider perspective.

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Tiimiakatemian opinto-opas 2004–2005.

Tutkimus- ja innovaatio-ohjelma 2000–2006. Etelä-Pohjanmaan teema-ohjelmat.

Appendixes

Appendix 1. Invitation to stakeholder analysis

Tampereen yliopisto   x.x.2003
Hallintotieteen laitos, FINHERT
Kehruukoulunkatu 1
33014 Tampereen yliopisto

Kutsu osallistuja-analyysiin

Ammattikorkeakoululla on tärkeä tehtävä uusien ammattilaisten kouluttajana sekä teknologian ja osaamisen välittäjänä. Yhteistyön lisäämiseksi ja ammattikorkeakoulun roolin selkeyttämiseksi on tärkeää käydä vuoropuhelua alueen eri toimijatahojen kesken.

Kutsumme Teidät mukaan keskustelemaan Etelä-Pohjanmaan innovaatiojärjestelmän mahdollisuuksista. Tilaisuus järjestetään Seinäjoen ammattikorkeakoulun tiloissa. Sen tarkoituksena on jäsentää ja määritellä alueellisen innovaatiojärjestelmän keskeisiä toimijoita, niiden tehtäviä sekä ammattikorkeakoulun roolia tässä kokonaisuudessa. Jäsennyksen apuna käytetään ryhmäkeskusteluna toteutettavaa osallistuja-analyysia. Se mahdollistaa toiminnan vaikutusten selvittämisen eri sidosryhmille.

Osallistuja-analyysi liittyy osaksi tutkimusta (liite), joka selvittää ammattikorkeakoulujen keinoja vahvistaa rooliaan alueellisessa innovaatiojärjestelmässä neljällä koulutus- ja elinkeinorakenteeltaan erilaisella alueella.

Tilaisuus järjestetään 8.1.2004 Seinäjoen ammattikorkeakoulun tiloissa (Seinäjoen ammattikorkeakoulun kuntayhtymän toimisto, kokoushuone, Keskuskatu 32K, 3 krs) klo 12.00–15.30. Iltapäivän aikana määritetään aluksi alueellisen innovaatiojärjestelmän toimijoita ja niiden tehtäviä, jonka jälkeen syvennytään ammattikorkeakoulun rooliin tässä kokonaisuudessa. Kukin osallistuja edustaa keskustelussa omaa näkemystään, mikä ei ole sidottu organisaation viralliseen kantaan.

Näkökulmanne tilaisuudessa on tärkeä. Mikäli ette itse pääse tilaisuuteen, toivomme että voisitte nimetä organisaatiostanne tilallenne toisen henkilön. Keskustelun pohjana toimiva materiaali toimitetaan osallistujille joulukuun aikana. Tilaisuuden jälkeen kaikki osallistujat saavat käyttöönsä keskustelun tuloksista kootun raportin.

Yhteistyöterveisin,

Seppo Hölttä   Timo Aarrevaara
ma. professori   tutkimusjohtaja
p. 03-215 6386   p. 03-215 7559

Appendix 2. Introduction of the research

TAMPEREEN YLIOPISTO
hallintotieteen laitos
FINHERT
tutkija, YTM Anu Lyytinen

Ammattikorkeakoulut alueellisessa innovaatiojärjestelmässä

Yksi ammattikorkeakoulu-uudistuksen ja viimeaikaisen politiikan keskeisistä tavoitteista on ollut vahvistaa korkeakoulujen roolia alueidensa kehittäjinä ja innovaatiojärjestelmän toimijoina. Kouluttamisen ohella ammattikorkeakouluilta odotetaan myös aktiivista yhteistyökumppanuutta ja osallistumista alueensa yritys- ja palvelutoiminnan kehittämiseen, erityisesti soveltavan tutkimus- ja kehitystyön avulla. Ympäristön haasteet aiheuttavat paineita sekä ammattikorkeakoulujen ohjausjärjestelmälle että yksittäiselle organisaatiolle. Vastatakseen monimutkaistuvan ympäristön haasteisiin ammattikorkeakouluilla on oltava joustavia mekanismeja toimintansa ja yhteistyönsä organisoimiseen.

"Ammattikorkeakoulut alueellisessa innovaatiojärjestelmässä" -tutkimuksen tavoitteena on selvittää, minkälaisia vuorovaikutuksen keinoja ammattikorkeakoulut käyttävät vahvistaakseen rooliaan alueensa innovaatiojärjestelmässä. Tällöin keskeisiä kysymyksiä ovat, kuinka ammattikorkeakoulut pyrkivät vastaamaan ympäristönsä haasteisiin johtamisen, hallinnon ja koulutusyksiköiden toimintojen tasoilla ja ovatko ammattikorkeakoulut luoneet yhdessä alueen muiden toimijoiden kanssa joustavia toimintamalleja, jotka edistävät niiden vuorovaikutusta alueellisessa innovaatiojärjestelmässä.

Tutkimus syventyy analysoimaan ammattikorkeakouluja neljässä koulutus- ja elinkeinorakenteeltaan erilaisessa maakunnassa. Tutkimuksen ensimmäisessä vaiheessa selvitetään ammattikorkeakoulun ja sen ympäristön välistä suhdetta kartoittamalla alueellisen innovaatiojärjestelmän keskeisiä toimijoita, niiden tehtäviä ja toimijoiden välisiä suhteita sekä ammattikorkeakoulun roolia tässä kokonaisuudessa. Jäsennyksen apuna käytetään osallistuja-analyysia. Toisessa vaiheessa tutkimus syventyy tapaustutkimuksiin neljässä ammattikorkeakoulussa. Kussakin ammattikorkeakoulussa tutkimus kohdistuu organisaatiotasoisen tarkastelun lisäksi yhdelle tekniikan koulutusalalle, joka edustaa myös seudun/maakunnan osaamiskeskusohjelmassa mukana olevaa alaa.

Tutkimus on osa Tampereen yliopiston hallintotieteen laitoksella toteutettavaa Korkeakoulututkimuksen ja -opetuksen kehittämishanketta. Hanke on opetusministeriön rahoittama. Sen tavoitteena on tukea tutkimuksella, perus- ja täydennyskoulutuksella sekä tutkimustiedon jalostuksella suomalaista korkeakoulupoliittista suunnittelua ja päätöksentekoa sekä yliopistojen ja ammattikorkeakoulujen johtamista ja hallintoa (ks. http://www.uta.fi/finhert/).

Appendix 3. Original Finnish interview quotes

1. Siinä nimenomaan sen järjestelmän uudistamisessa ja rakentamisessa ammattikorkeakoululla on iso rooli, koska siinä tarvitaan organisaatio, jolla on kompetenssia olla aktiivinen ja jolla on myös jonkin verran omia resursseja. (SA11)

2. … me ollaan joskus oltu ensimmäisenä sijoittajana. Se on ollut itse asiassa tuolla Mediwestissä ja Nikkarikeskuksessa Jurvassa. Me ensimmäisenä, erittäin pitkän jauhamisen jälkeen päätettiin, että vuokrataan sieltä tiloja. Kun me vuokrattiin, niin sitten tulee muitakin mukaan. Tää on ollut meidän yksi rooli, joka ei ole hirveän paljon ulos lausuttu, eikä ole ehkä aina mietittykään. (SA14)

3. Sitten on pyritty ohjaamaan sitä, että meidän yliopettajilla olis yhteydet EPANET-professoreihin. Me on kutsuttu ne yliopettajakokouksiin esittäytymään, että meidän ihmiset sais kuvaa, ketä siellä on. Yritetään houkutella, keksiä porkkanoita, että tehtäis yhteisiä hankkeita ja näin poispäin, että tää vuorovaikutus tiivistyis koko ajan. (I5)

4. … meille tuli EU-jäsenyys ja sitä myöten varsinkin maaseutupuolella ja perustuotannon puolella aukeni hanketoimintamahdollisuudet. Siellä ei varsinaisesti tehdä tutkimustoimintaa, vaan silloin puhutaan nimenomaan kehitystoiminnasta ja hankkeista ja tällaisesta soveltavasta tutkimuksesta. Se on yks yksikkö, joka osas lähteä hyödyntämään niitä mahdollisuuksia ja sitä rahoitusta, joka oli tarjolla, koska osaamistahan sekin vaati. Semmoista pitkäjänteistä on myös sosiaali- ja terveyspuolella, varsinkin sosiaalipuolella. Ne on nykyisin sama yksikkö myös, sosiaali- ja terveysalan yksikkö. Siellä on semmoista näkemystä, pitkäjänteisesti kehitetty sitä osaamista ja lähdetty hakemaan sellaisia kumppanuuksia. (I5)

5. Meillä on se hyvä tilanne, että meillä on sentään niitä yrityksiä. Vaikka ne on pk ja pieniä vielä suurin osa, niin niitä kuitenkin on ja sieltä löytyy sitä kehittämishalukkuutta, mutta se on sitä jatkuvaa markkinointia ja kontaktointia. Tietyllä tapaa toimien olis paljon helpompaa, jos olis muutama iso, jolla olis koko ajan jotain juttuja. (I7)

6. Tällainen kollegiaalinen ja demokraattinen lähestymistapa, niin sitä kautta hyväksyy ja sitoutuu myös muiden jutut. (I8)

7. Sitten on tää tutkimus- ja kehittämiskeskus O´Sata, joka myy tavallaan tutkimus- ja kehityspalveluja ja toimii tällaisena tiedonsiirtolinkkinä yrityksiin ja elinkeinoelämään. (SA9)

8. Ammattikorkeakoulun perustamisideakin oli se, että se palvelee aluetta jne. Rakenteita on pyritty sen mukaan myös siinä alkuvaiheessa kehittämään. Jos ajatellaan sitä, että meilläkin oli 13 oppilaitosta, jotka lyötiin yhteen. Koko organisaatiolle rakennettiin sitten yksi yhteinen kehittämis- ja palvelukeskus, joka nyt on sitten tää tutkimus- ja palvelukeskus O´Sata. Luotiin nimenomaan sitä funktiota, että on tällainen oma kanavansa. (SA9)

9. … tässä Satafood oli mainittu yhtenä toimijana tuolla Huittisissa. Tässä on tää Satafood ja ammattikorkeakoulun Huittisten yksikkö, niin nehän toimii periaatteessa samoissa tiloissa. Toimitusjohtaja on ammattikorkeakoulusta lainassa tai virkavapaalla Satafoodissa. Sen synnyttämisessä oli ammattikorkeakoululla merkittävä rooli. (SA9)

10. Koska Jyväskylän seudulla on monia toimijoita yritysten kehittämisroolissa, niin me ollaan tavallaan suhteellisen pieni tai sanotaan yksi toimija monen joukossa. Mutta kun mennään tonne reuna-alueille, niin meidän rooli on siellä aivan toista suuruusluokkaa eli siellä ei näistä muilla työelämän kehittämistoimijoilla ole niin paljon roolia kuin mitä meillä siellä on. (SA6)

11. Siinä mielessä ammattikorkeakoulun aluestrategia on luonteeltaan merkityksetön, ellei se ole yhteisymmärryksessä muiden toimijoiden strategioiden kanssa. Sen takia se ei voi olla itsenäinen. Ammattikorkeakoulu ei voi vetää tätä maakunnan kehitystä yksin, mutta se voi olla siinä mukana. (SA6)

12. Meillä on yksi hirmu tärkeä asia, mikä meidän täytyy lähiaikoina saada aikaiseksi, saada itsemme läpinäkyvämmiksi tuonne työelämään päin. Meidät koetaan sellaisena isona mammuttina, johon on vaikea käydä mistään kohti kiinni. On vaikea saada yhteyksiä sellaisiin yrityksiin, jotka eivät meitä ennestään tunne. Sen organisointi ei ole meillä vielä kunnossa. (SA6)

13. Tää aluekehitystehtävä on aika mielenkiintoinen täällä Tampereen seudulla kaikkiaan, kun meitä on kolme korkeakoulua ja VTT ja muutenkin paljon sellaista t&k-myönteistä yritystoimintaa. Täällä on t&k-toimijoita aika paljon, sitten osaamiskeskuksia ja kaikkea. Täällä kaikki pistävät oman lusikkansa aluekehitykseen tällä seudulla ja sitä on vaikea ajatella meidän tehtäväksi erityisesti. (I2)

14. Ennen kaikkea se, että kun tätä strategiaa tehtiin, niin siinä syntyi tällaisia henkilökohtaisia kontakteja ja oppii tuntemaan toisiamme, jolloin se kanssakäyminen on paljon helpompaa myös niillä aloilla, joissa tätä perinnettä ei ollut vielä. Sehän ei jää pelkästään siihen asiakirjaan, vaan neuvottelukunta yhdessä kokoontuu pari kertaa vuodessa niitä hankkeita valmistelemaan. (SA9)

15. Nää tän tyyppiset organisaatiot ovat hirveän tärkeitä, koska minun mielestä ne monesti kutoo yhteen sitä aika hajanaista organisaatioiden kirjoa, mikä löytyy monista maakunnista. Jos sieltä puuttuvat nämä verkostomaiset organisaatiot, niin se yhteistyö on minun mielestä aika niukkaa ja aika muodollista sillä tavalla, että ei mennä välttämättä kovin syvälle näissä asioissa. (SA11)

16. … että kun tehdään alueellisia strategioita, niin halutaan olla niissä itse mukana jo siinä laatimisvaiheessa. Ei välttämättä sillä tavalla, että haluaisimme olla rakentamassa itseämme sisään siihen. Ehkä sekin on yksi ajatus, mutta se että olla mieluummin proaktiivinen kuin reaktiivinen, ettei vaan reagoida siihen, että joku sanoo, että meillä" (I9)

17. Melkein jopa enemmän strateginen linjaaja, koska tää on niin merkittävä toimija tällä alueella. Täällä on paljon osaamista, taloudellisesti vahva yksikkö. Ei me pelkästään tyydytä seuraamaan, mun mielestä, että mitä mennään ja tarjoamaan osaamista, että jos ei kelpaa, niin ottakaa, vaan kyllä tässä ammattikorkeakoulussa yhtymähallituksessa koko kuntayhtymässäkin tehdään linjauksia.(I5)

18. Siinä on ehkä se, että ammattikorkeakoulun rooli nyt hyväksytään. Ammattikorkeakoulusta ei tiedetty, miten se toimii. Tavallaan ne ennakkoluulot siellä yliopiston puolella on hälventyneet. Nyt on lähdetty tasavertaisemmasta tilanteesta, että ammattikorkeakoulu tunnustetaan merkittäväksi innovaatiotoimijaksi. Pystytään varmaan sopimaan semmoisia

alueita, joissa ammattikorkeakoulu on selkeä veturi ja sellaisia alueita missä yliopisto on ja sitten ne, missä tehdään yhteistyötä ja miten. Työnjakoa pystytään selkiyttämään. (I3)

19. Jos tää yhteistyöhalukkuus lisääntyy, niin se luo mun puolesta paljon uusia mahdollisuuksia sille, että me voidaan sekä koulutus- että tutkimuspuolella tehdä yhteisiä juttuja ja sillä tavalla päästä yhdistämään toimintoja, vaikka näitä organisaatioita ei sinänsä mitenkään muutettaiskaan. Lähinnä se on nähdäkseni siitä kiinni, että saadaan yhteistyöasenne leviämään näihin suuntiin. (I2)

20. Edelleen tätä tutkimus- ja kehitystyötä ollaan ajamassa sisälle, mutta näyttöjä on jo vuosilta ennen kaikkea tekniikan puolelta. (SA9)

21. Meidän tekniikka on hyvin vahva toimija, aika isojen ja kovien hankkeiden kanssa. (SA6)

22. Sosiaali- ja terveysala on erittäin aktiivinen ja tehokas toimija, mutta siihen liittyy yksi pieni ongelma. Ne ei löydä koskaan rahoittajia. (SA6)

23. Rahaa liikkuu aika pitkälle tekniikan puolella. Jos ajatellaan sosiaali- ja terveyspuolta, niin siellä ei ole sellaista maksajaa. Rahoitusrakenne on ihan erilainen. (SA9)

24. Rakennuspuolella on tuotteistettuja palveluja (mittauspalvelut: kosteus- ja äänimittaukset), fysiikan puolella on jotakin tuotteistettuja palveluja. Niille on määritelty, mitä palvelu sisältää ja mitä se maksaa. Niille on olemassa asiakkaat. Meillä pitäisi olla paljon enemmän testaus- ja palvelutoimintaa, joka on tuotteistettu ja sillä on selkeä hinta. Se vaatii myös sen, että sillä on omat tekijänsä. Siinä on joku vastuuhenkilö, joka tekee sitä työtä. Se ei voi olla niin, että me myydään jotain mittaus- tai testauspalvelua siten, että me katsotaan listasta, että tuolla opettajalla on kaksi tuntia vapaata, käypä mittaamassa. Se on kuitenkin ammattityötä. Ei se oikein onnistu. Siinä pitäisi olla aina joku, joka tekee sen. Ainut on, jos me oltais oikeasti kehitetty jotain tuotteita ja palveluja, jota me myytäis ja sitä kautta saatais tulorahoitusta. (I1)

25. Toinen oli se, että tämmöinen tutkimus- ja kehitystoiminnan yksikkö, jonka liikevaihto tulee pääosin näistä julkisrahoitteisista projekteista, Tekesin ja rakennerahaston jutuista ja muista. Ei se pääse ikinä nollatulokseen budjettiteknisesti, kun sinne tulee kaikki, osuus ammattikorkeakoulun yleisistä kustannuksista ja kaikki muu nämä. (I7)

26. … ulkopuolinen rahoitus, tuli se sitten EU-rahoituksena tai oli se Tekesiä tai mitä vaan, niin siihen kaikkeen liittyy tietyn lopputuloksen tekeminen asiakkaalle tai asiakasryhmälle. Silloin se tarkoittaa, että siinä ei ole mitään löysiä. (I8)

27. EU:n ja TEKES:n ohjelmat tarjoavat mahdollisuuden hankkia rahoitusta työntekijöiden palkkakustannuksiin. Läänin hankkeet eli ESR-rahaston hankkeet ei pysty investointeja tekemään…Ainut, miten tuollaisista pystyisi saamaan tulorahoitusta on, että toimii toimittajana eli alihankkijana jollekin jo hankkeen saaneelle organisaatiolle, joka laskuttaa ja saa sitä kautta. (I1)

28. Jos me tehdään omilla pienillä rahavaroilla tai yrityksiltä saaduilla pienillä, lyhytkestoisilla rahoituksilla, niin silloin me ei saada kunnolla sitä jatkuvuutta tähän. Senkin takia on tarvetta tällaisiin isompiin monivuotisiin hankekokonaisuuksiin, joissa aina on joku julkinen rahoittaja mukana. (I2)

29. Pikku hiljaa, ei olis tarkoitus tasapäistää, mutta antaa tietyt perusraamit, missä toimitaan. Yhtäältä näkyis, että ammattikorkeakoululla olis tietty tavoitetaso, mikä me halutaan ja näyttäis yhtenäiseltä ammattikorkeakoululta. Toisaalta halutaan antaa mahdollisuus omaleimaisuuteen ja kunkin oman alan erilaisuuteen. (I5)

30. Tää oli sellainen asia, että kukin yksikkö saattoi lähettää hakemuksia Satakuntaliittoon ja TE-keskukseen ilman, että niistä tiedettiin keskushallinnossa oikeastaan mitään ja saatettiin tehdä sellaisia rahoituspäätöksiä, jotka eivät olleet linjassa koko ammattikorkeakoulun kanssa. Kyllä tää varmasti nyt on paljon enemmän linjassa. Näiden painopisteiden mukaan mennään. Tavallaan tiedetään, mistä ne hakemukset tulee. Ne tulee O'Sadan kautta, prosessin läpi käy. (SA9)

31. Tämä on hirveän tärkeä asia, että miten se kulttuuri hyväksyy sen. Yliopistossahan se kannustinjärjestelmä perustuu semmoiseen henkilökohtaiseen meritoitumiseen. Se on semmonen aika helppo puoli siellä, että yliopistot saadaan tutkimaan ja kehittämään. Se on se oma kunnianhimo, joka ajaa. Tässä järjestelmässä, joka on pohjimmiltaan tällainen oppilaitosjärjestelmä, niin miten se siihen saadaan, se on se ydinkysymys. (I3)

32. Pikku hiljaa pitää muokata tätä asennetta, että se on osa opetusta. Ehkä ennen kaikkea tarjoamalla esimerkkejä, että opettaa voi muutenkin kuin sieltä opettajan pöydän takaa perinteisillä menetelmillä. Nuorille ja uusille opettajille se on luontevampaa kytkeä opetusta projektiopintoihin ja kaikkea muuta, niin että opiskelijat tulee kytkettyä tähän tutkimus- ja kehitystoimintaan, mutta vanhemmille opettajille se muutos ei ole kaikille ole ihan helppo. (I5)