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INSTITUTIONAL CAPACITY AND STRATEGIC ADAPTATION IN LESS FAVORED REGIONS

A SOUTH OSTROBOTHNIAN UNIVERSITY NETWORK AS A CASE IN POINT

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1 Introduction

The Knowledge Economy, as it is defined below, is a challenging environment for regional development agencies. In an industrial society, tangible resources and borders between nations, institutions, organizations, and regions largely determined the destiny of regional economies and societies. In a knowledge economy, however, borders still exist and matter, of course, but they are fuzzier than before. Now the positions of both organizations and regions are more determined by their own competencies and skills to learn and develop in a continuous process. Consequently, local initiatives and an enterprising disposition are becoming more and more important in regional development. Institutional and innovative capabilities of regions are crucial. Scarce resources need to be channeled and allocated more efficiently than before, and new operational models need to be created to achieve a sustainable, competitive position in global economy. For, as Cooke (1995, 19) points out, one of the key policy recommendations is that the regional and local competitive edge rests on a successful interlinking of local and regional networks with global networks.

In Finland mainly big university cities and/or smaller towns specialized in the electronics industry have been able to meet the challenges of the knowledge economy and been able to prosper economically in the global economy. (see Antikainen & Vartiainen 1999; Antikainen 2001; Huovari et al. 2001). People and firms have migrated to those city regions where they believe that future opportunities are situated (see Raunio 2001; Kostiainen 1999).

Less favored regions (LFR) often have little or no qualified human capital on which they can build or attract innovative activities to cope with the challenges of the knowledge economy. In a knowledge economy less favored regions face three major challenges; a) how to increase institutional capacity and b) how to mobilize scarce resources and competencies, and c) how to forge beyond many lock-ins hindering development efforts. These questions cannot be answered only by trying to find new policies; also new ways to organize policy-making and to manage policy processes are needed. Therefore, we are after a more profound understanding of the way policy processes are launched and lead in the knowledge economy.

This paper focuses on the efforts to raise institutional capacity in South Ostrobothnia, a less favored region in Western Finland, and especially the paper examines a key knowledge economy institution – the modern university – in the face of these conditions by asking 'how universities can respond to the challenges faced in less favored regions in a global, informational and networked knowledge economy', 'how is it possible to cross the many barriers between academia, business and public administration' and 'what are key factors in a successful development process'. We are therefore interested in how less favored regions can strategically adapt to the demands of a changing economy. Strategic adaptation refers to a process in which adaptation both to a changing environment and the strategic choices of agents play a significant role. This paper, however, gives only some tentative suggestions about what the actual effects of new institutions and networks are on the development of South Ostrobothnia; instead the new institutions and especially the South Ostrobothnian University Network are themselves seen as outputs of many development efforts, and according to our understanding they are a new foundation to build more solid and effective development in the near future. As interesting as the question of the effect of the new institutions on development of South Ostrobothnia might be, we are equally interested in the question of how these new institutions and a novel University Network were accomplished in a less favored region like South Ostrobothnia.

The research reported in this paper is based on 30 thematic interviews, seven workshops focused on building university networks (72 people involved altogether), statistics, other relevant research reports, and strategy and development programs and other written material about the innovation support work done in South Ostrobothnia. The interviews can be divided into four different groups according to the parent organization of the interviewee:

- Policy-makers in development agencies responsible for the promotion of economic development of South Ostrobothnia and Seinäjoki town (4 representatives)
- Representatives of firms (8)

- Representatives of the Seinäjoki Science Park, Centre of Expertise Programme and Technology Development Fund (Tekes) (8 representatives)
- University, polytechnic and other higher education personnel (10 representatives)

The lead author of this chapter also serves as chairman of the steering group of the University Network of South-Ostrobothnia, and was actively involved in creating the network. His experiences are also used in writing this article, but being aware of the importance of a distancing perspective on the crucial issues, the chapter is largely based on other data, with his expertise mainly used in designing rigorous research questions for the study.

2 Less favored regions in a knowledge economy

In the analysis of institutional capacity building and strategic adaptation in South Ostrobothnia, the point of departure is the societal and economic transformation towards knowledge economies. As Cooke (2002, 3) states, all economies are in a trivial sense "knowledge economies" being dependent on knowledge. In the early 2000s, however, advanced economies have entered, or to be more precise, are entering to what is often labeled knowledge economies, in which knowledge has a more crucial role than before. In knowledge economies, economic clusters consist of knowledge acting upon knowledge itself for productivity (Cooke 2002, 190; see Castells 1996 also). There are three main issues, according to Cooke (2002, 3-4), specific to knowledge economies; a) knowledge ages rapidly and new knowledge is constantly replacing the old, b) scientific (including social scientific) knowledge is highly valued, and the scale and economic penetration of scientific knowledge exceeds distinctly the previous economic development phases, and c) knowledge economies are especially characterized by exploitation of new knowledge in order to create more new knowledge. New knowledge may also be artistic knowledge in all its variety.

The development of a global market in knowledge economies is based on comparative and competitive advantage, hence quite largely on specialization. Therefore the significance of place-specific advantages is argued to be increasing and the aim in many places is to create place-specific advantages. These are effected on the basis of innovation and pools of skilled labor, different institutional environments and by offering often quite subtle distinctions in the operating environment. (Maskell and Malmberg 1999.) Based on this kind of reasoning much has been written recently about knowledge and learning and their role in regional and local development, and there are indeed places that can said to be economically successful, and that are claimed to exhibit the characteristics of networked, knowledge-based, strategic, learning,

regions or cities. Many other city and regional authorities have set their sights on strategies to develop knowledge-based activities, or to create networked learning communities.

As O'Gorman and Kautonen (2001) state, in the efforts to develop knowledge-based activities, policy-makers' attention has been directed towards linkages and interactions within and between different subsystems and towards actions that will improve the innovation capability of the whole economy. The role of government has become a) to facilitate the development of resources from "basic" to "advanced" factors; b) to invest in developing technologies and capabilities that are common to all the industries in a cluster; and c) to develop the labor force through an open and competitive labor market. Investment in resources and infrastructure will usually involve investments in the educational system, in industrial training, and in research activities within firms and within research institutions such as universities. (O'Gorman & Kautonen 2001.)

There is now growing support for the view that innovation is an interactive process between firms and research institutions, between the different functions in the firm, between producers and users at the interfirm level and between firms and the wider institutional milieu. Both innovation processes and policy-networks aiming to promote innovation are nowadays seen as relationships of interactive learning in which a wide array of institutional mechanisms can play a role. (Lundvall 1992; Cooke & Morgan 1998; Brazyk et al. 1998; Kautonen & Sotarauta 1999.) This is an important change in the conception of innovation, since in the past innovation was rather narrowly equated with R&D activities and in addition R&D was perceived mainly as a supply-side phenomenon. As Morgan states, this has sometimes ended up as constructing cathedrals in the desert, i.e. facilities that are under-utilized by local firms, because their innovation capability demands do not match supply. To promote more interactive modes of innovation Morgan is stressing the need to develop a regional innovation process, in which, as he puts it, "regional stakeholders are enjoined to define a commonly agreed, bottom-up strategy which is attuned to the nuances of the region". (Morgan 1997, 496-497.)

Renewed view on policy-making and innovation is linked to the question how various development processes are shaped by a variety of institutional routines and social conventions. The result of this kind of framing of questions is that the literature has increasingly turned the attention of researchers and policy-makers away from purely "economic" reasons for the growth of new industrial agglomerations towards social and institutional factors (see e.g. North 1992; Cooke & Morgan 1998; Sotarauta & Bruun 2002), and as Moulaert & Sekia (2003) show, in "territorial innovation models" institutions are

frequently raised as important factors in regional development, and the policy-making and planning literature focuses on institutional capacity in terms of direction, policies, procedures, organization and other explicit guidance (see e.g. Cars et al. 2002; Brazyk et al. 1998; Healey et al. 1999). As Healey et al. state, the notion of institutional capacity building is not a new concept. It has been used to highlight the need to build up individual capabilities (e.g. labor force skills, or entrepreneurial capacity), and those of public development agencies. In the former case, the focus is on the institutions which help to develop such capabilities. In the latter case, the emphasis has been on the capacity of particular organizations. The new thinking about institutional capacity, however, focuses on the webs of relations involved in regional development policies, which interlink public development agencies, firms, and educational and research institutes in collective action. (Healey et al. 1999.)

As Lambooy and Boschma (1998) have stated, innovative behavior and adaptation to change are largely based on the boundaries of spatial matrices laid down in the past, and thus one of the key questions in South Ostrobothnia, our case of a less favored region, is how to break out of the constraints, how to change the path it has been dependent on, and how to create new institutions and networks for break out. Institution and network building in South Ostrobothnia are next analyzed as a means to break out of old structural, functional and cognitive constraints, to create a foundation for a new path for the future.

3 South-Ostrobothnia and its centre Seinäjoki town - the challenge faced

Located in western Finland, South Ostrobothnia is a region with a population of approximately 200 000, and the regional centre, Seinäjoki, is a town with a population of approximately 30 000. South Ostrobothnia accounts for 4 % of Finland's total population. The density of the population is 15 inhabitants per square kilometer. In terms of the distribution of the population and the structure of the economy, South Ostrobothnia is more uniform than any other part of Finland. The region's strengths and development potential are a traditional spirit of enterprise and a large number of small and medium-sized enterprises, the food industry, mechanical wood-processing, metal processing, and strong 'social capital' expressed in regional identity and cultural heritage. Weaknesses include resistance to change, minimal network cooperation, the dominance of primary production in the economy, a low degree of processing of goods and a low volume of exports. In addition, the region suffers from a low level of higher education and research, brain drain characteristics, and cut-backs in educational and research resources. (Regional Development plan 1994 and 2002.) In comparison to other regions of Europe South Ostrobothnia is clearly a less favored region;

the the GDP per capita in the South Ostrobothnia region is only 72.3% of the EU-wide average (regional development plan 2002). (regional development plan 2002).

In South Ostrobothnia, the levels of education, income and exports are among the lowest in the country. In terms of economy, the region is more dominated by primary production than the rest of Finland. Concentrations of various types of industry (furniture, farm machinery, carpet-making, and fur-farming) are also typical of the region (Regional Development Programme 1994 and 2002), but most of the region's firms are micro firms employing less than three people, and most of the micro firms and even the larger ones are not particularly well suited to meet the challenges of a knowledge economy (see Kautonen & Sotarauta 1999). In South Ostrobothnia, R&D expenditures in total (see figure 1), and in both firms and public institutions is one of the lowest in Finland (see Appendix 1). The number of patent applications is also very low in South Ostrobothnia; in 2001 there were only 19 applications, equaling 1,1 % of the patents of the whole country (see Appendix 2). The educational level is the second lowest among Finnish regions. The innovation supporting structures and innovation culture are weak, and most of the firms in the region are operating on short time horizons. Their development and innovation activities focus mainly on pragmatic problem-solving. Long term R&D does not have a significant role in the majority of the regions' firms. The best firms in the region, however, are at high level technologically, but their numbers are estimated to be very low (Etelä-Pohjanmaan alueellinen teknologiastrategia 2003). It can be concluded that South Ostrobothnia is not very well equipped to meet the challenges of a knowledge economy.

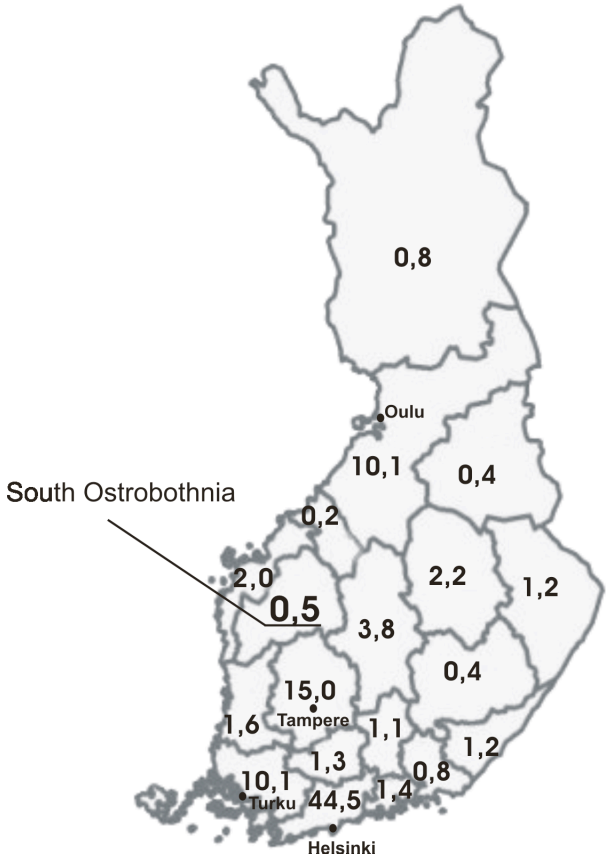

FIGURE 1. The share of Finnish R&D expenditures by region: 2001 (%)

3.1 The response - increasing institutional thickness as a main strategy

In the 1990's the dominant mood in South Ostrobothnia can be described as frustration and fear that the region has been left out of the recent innovation and technology oriented development. This was thought to imply a serious danger that South Ostrobothnia would end up being some kind of "peripheral pocket" in an otherwise well developed national knowledge economy called Finland. Therefore most of the regional, sub-regional and local development programs and strategy documents are directed towards this issue.

The general policy discussions in various forums (such as media, seminars, conferences, and strategic planning processes) about the development of South Ostrobothnia and its challenges often culminated in the observations regarding the lack of a local university. Even though the policy discussions often result in a shared mourning at not having "the most important resource of a knowledge economy" South Ostrobothnia was already in the 1980s and especially in the 1990s active in building the institutions of a knowledge economy. The main development lines in strengthening the institutional base of South Ostrobothnia can be summarized as follows:

- **Raising institutional capacity by inducing universities to open branch units in Seinäjoki**
  - University Association of South Ostrobothnia (11 employees in 2003) – founded 1960
  - University of Tampere, Institute for Extension Studies in Seinäjoki (app. 25 employees) – founded 1981
  - University of Helsinki, Institute for Rural Research and Training in Seinäjoki (app. 35) – founded 1988
  - Sibelius Music Academy Training Centre in Seinäjoki (app. 5) – founded 1991
  - University of Vaasa, Seinäjoki Unit (app. 10) founded 1998
  - Tampere University of Technology/ Digital Media Institute DMI/ Telemedicine Laboratory - Medical Information Technology research unit in Seinäjoki (7+5 employees) – founded in 2003
- **To found and strengthen Seinäjoki Polytechnic as the only locally owned and independent higher education institute in the region** (reached permanent polytechnic status in 1996, it was put together from earlier independent colleges)
  - A total of 21 undergraduate and 2 graduate degree programmes
  - Approximately 3200 students and 275 staff members
  - Seinäjoki Polytechnic annual R&D expenses are almost EUR 2.500.000 (in 2001) and the share of external funding of its total R&D expenditures is 85%.
- **Raising institutional capacity by founding new specialised development agencies**
  - Seinäjoki Technology Centre Ltd, (owned by the Town of Seinäjoki and the Seinäjoki Polytechnic). The Seinäjoki Technology Centre Ltd has incubator-, facilitator-, and business-development services for knowledge and technology intensive start-ups and/ or spin-offs.
  - Foodwest Ltd, (owned by municipalities and foodstuff companies), specialises on the product and process development in the foodstuff sector. Founded in 1995.
  - Mechanical wood-processing marketing office South Bothnia Wood Innovation Centre Wincent (Coordinated by the University of Helsinki). Founded in 1997.
  - Life IT ltd specialises in the R&D activities of the medical information technology field. Originally founded as an association in 1998, company established in 2000.
  - Tietoraitti Ltd specialises on telecommunications network management and network support services. Founded in 1989.
- **Building infrastructure in Seinäjoki**
  - TRIANO Seinäjoki Science Park (built during the years 2000-2003) includes Mediwest technology park, Frami and Foodwest Ltd
  - The investors are local municipalities, Seinäjoki Polytechnic, South Ostrobothnia Hospital District (hospitals and municipalities), private companies, and a German investment bank. Investments are totally 43 million euros for Mediwest and Frami between years 2001-2003. (Frami 25 million euros)
- **General and targeted development programmes (only a few examples mentioned)**
  - *Centre of Expertise Programme* - The Centre of Expertise Programme is an objective programme created in accordance with the Regional Development Act and the result of the programme is a network of centres of expertise around Finland. Seinäjoki has had since 1998 Seinäjoki Centre of Expertise in Food. From the beginning of 2002 Seinäjoki was nominated a centre of expertise in intelligent products and systems.
  - *The ePohjanmaa Programme* is part of the national "Regional Centre Programme" in the Seinäjoki region. At national level the aim is to strengthen town regions, and at local level in Seinäjoki the programme focuses on information and communication technology aiming to build wide regional cooperation and public-private partnership in the development of a local innovation environment.

- *Research and Innovation Development Programme* for the years 2000-2006 is one of the 12 thematic regional development programmes of South Ostrobothnia.
- *EU Structural Fund Development Programmes* – South Ostrobothnia does not form a unified entity concerning EU structural fund area classification. Therefore three types of development program are implemented: Objective 2 (a) with municipalities and sub-regions under a restructuring process, objective 2 (c) with municipalities and sub-regions under a restructuring process, but performing relatively well and in transition to no-funded status, and finally Objective 3 programs for social restructuring projects.

In South Ostrobothnia and especially in Seinäjoki Town the strategy has been to increase institutional capacity, and a significant change has happened during the last 20 years, especially in the 1990s. It may be summarized that in South Ostrobothnia there are now institutions of a knowledge economy, but that they still are quite small and fragile, and at the early stages of development. Regional activity in themes related to knowledge and innovation has significantly increased during the last ten years, but in comparison to major city-regions in Finland it is still quite low. The cognitive patterns of policy-makers and firms have changed considerably in ten years. Moreover, channels to global and national sources of information and knowledge have developed but they are still very weak and scarce, and in addition the quantity and quality of research has remained one of the lowest in Finland.

It is also worth mentioning that before the renewal of the Finnish regional governance system in the mid-1990s, the most important development agencies were located in Vaasa, while in Seinäjoki there were only branch units. Thus reform has meant most of the decisions concerning promotion of economic development can now be made in the region instead of Vaasa.

4 The emergence of the South Ostrobothnian University Network – EPANET

With the turn of the millennium South Ostrobothnia had taken many small, yet from a regional perspective large and integrated steps towards engagement in the knowledge economy. The infrastructure and organizational base of an innovation system was developed. In spite of new developments and significantly changed perceptions among policy-makers, most of the firms in the region did not see the need to integrate themselves with the knowledge economy and its operational models. Thus even though its innovation system had become stronger, by national standards the innovation culture among firms was undeveloped, and the danger of "constructing cathedrals in the desert" was obvious; firms had, however, shown some signs of awakening.

> *"Firms are now much more active than in the early 90'; here (in South Ostrobothnia) firms have not actively utilized research and development funds, there are lot of small firms and firms with*

low productivity and they haven't traditionally had any interest in research" (Representative of the Seinäjoki Innovation and Technology Village)

"Many firm have realized that they need to put more effort into process development, flexibility and quality, and stuff like that. This has raised the question, also here, if firms can cope with the new challenges alone, and this has forced firms to rethink their relationship to the research world, and they have asked more often than before, where to find help in this kind of development work. Now there is lot of demand for new pieces of information and new knowledge and for organizations who can produce this kind of knowledge." (Representatives of Tekes)

In "the Development Program for Research in South Ostrobothnia - 1998", founding a university network was raised as a means to strengthen the quantity and quality of research in South Ostrobothnia, and opening new pipelines to new knowledge created elsewhere. The idea of a university network was first introduced already in the early 90's, but in the program and in the ongoing policy discourse in the region, it was unclear what it meant in practice, how to get funding for it, how to get universities interested in participating in it, how to organize it, what disciplines to focus on, and so on. A Network University, however, was not the only solution presented in the policy discourse. Especially during the national parliamentary elections (1999), many kinds of initiatives in the air were presented by parliamentary candidates; the choices ranged from the foundation of a local university – University of Seinäjoki - to a specific faculty of foodstuffs at the University of Vaasa, to founding a research centre of Tampere University of Technology, to integration of existing university *filials*, the idea being to have one large unit instead of many small ones. There was one thing common to all these ideas presented in the media, seminars, and strategy processes, which is that they all focused on organizational structures.

In the late 1990s expert thinking on the matter of 'structures' changed, and founding new organizations was no longer seen as a good solution. Most importantly, initiatives focusing on reorganization of existing structures raised lot of opposition and resistance to proposed changes, and they tended to freeze the discussion. A new way of seeing the issue of strengthening research, and especially the mystical university network, began to emerge. Official opinion was mobilized and in four years the concept of a "university network" was created and implemented. By late 2003, there was a new community of 12 research professors and three senior research affiliations together with 48 researchers with significantly better quality research and better pipelines to international research and to major universities of Finland than before.

What happened?

Phase I - the starting shot

In the late 1990s the heated discussion about (re)structuring existing university activities began to "freeze" the thinking of new operational modes in South Ostrobothnia. In addition many university people began to be frustrated with all the "empty talk" around their activities; there were many demands, expectations and even criticism of existing university filials, and they began to experience time-constraints negating further focus on their core activities that amounted to participating in wishful discussions with the policy-makers. There was also a huge gap between the goals of regional development strategies, plans and programs, i.e. the wishes of policy-makers, and the actual outcomes, resources and realities of the region. Therefore a network-university, a new faculty, Seinäjoki's "own university" or integration of filials were not materializing. In fact, nobody even tried to materialize those ideas and there were no serious negotiations about these initiatives. Universities and their filials saw the discussion as a normal "policy rhetoric full of nice ideas but nothing to take seriously".

In this kind of environment the Research Unit of Urban and Regional Development Studies (Sente) of University of Tampere made a proposal to the Regional Council of South Ostrobothnia for a project to create a "University Network of South Ostrobothnia" concept in 1999 in collaboration with the University Association and other interested partners. The "hidden aim" was to thrash out the matter of a university network and if possible to create an implementable concept for it, or if that was not possible to reach consensus that it is a far fetched utopia, to forget the whole idea, and in that way to get more space to focus more on other things. The Regional Council of South Ostrobothnia granted €11, 000 for the project, and regional council prioritized it sufficiently actually was to decouple funding from action. There was, however, no need to invest more money on the creation of the concept at this point, the question was not about money but taking time to think and to organize discussion of all the relevant players of the region and external to it.

Phase II – preparatory analysis and commencement of discussion 'roundabout'

The actual project began with analyses of the previous discussions on the issue in the media, development programs, reports, and various studies. In addition, analyses focused on the roles of universities in regional development and different models of organization in the research literature. The analysis was done by a "core group", i.e. two researchers from University of Tampere and one official from the University Association of South Ostrobothnia. In the analysis the core group identified five different models of possible 'knowledge laboratories',

from which four were based on earlier initiatives and discussions and the fifth one was a new one. The five models were:

- *Strengthening the network* - increasing quantity and improving quality of co-operation between existing university branch units
- *Founding a new research centre* - preferably focusing on some specific technology and related to Tampere University of Technology
- *Strength from merger* - incorporation of existing university branch units and thus having one "big player" (in practice it would have still been a small unit in national comparison and especially in international comparison).
- *Focus on education* - creating unique masters program(s) specific for South Ostrobothnia
- *Focus on creating an attractive milieu to competitive academic individuals* - founding 12 new research professorships for 5 year terms in co-operation with interested universities, the aim being to have a new interdisciplinary research community of 40-60 researchers, professors being the core.

Phase III – communication 'roundabout'

After identifying five possible models, introduced briefly above, a series of workshops were organized for regional development agencies, firms, business associations, university filials, the executive group of Seinäjoki polytechnic, and for the universities of Helsinki, Vaasa and Tampere. Workshops and further informal discussions included much face-to-face discussion with key persons – the figure of people involved in different forums was 72.

At the workshops the five models, and the analysis of their strengths and weaknesses, were introduced. The discussions mainly focused on the potential of the five models to achieve desired policy objectives. It was also evident that the models were not mutually exclusive but in many ways overlapping. In the discussions "the 12 research professor" model attracted most of the attention and raised a lot of surprised, enthusiastic and/or cautious reactions. The most frequent reactions were like: "Crazy idea – 12 professors, here, in an academic wasteland? There is none here now!", "it is expensive, isn't it", "we'll be never able to recruit professors to Seinäjoki, there is no academic tradition here", and "who wants to destroy his/her university career by coming to Seinäjoki, the periphery of academe...", "after the five year term, they will leave this place and then we'll be in the same situation again", "they will not work here, they will be suitcase-professors", and finally "sounds interesting, where is this model adopted from, where has this been done earlier?" In spite of the vivid discussion and series of critical questions, it became obvious that most key policy-makers had a positive but cautious approach to the '12 professor' model.

In discussions, formal and informal, the cautious and surprised first reactions began step by step to become more enthusiastic, and a certain kind of excitement began to spread among key policy-makers and university people. The 12 research professor model was perceived as

both challenging and radical but at the same time realistic so that key players began to see it as a concrete opportunity to do "something big" and "to get back into the game".

> *"I believe that we, here in South Ostrobothnia, will be able to create something genuinely new and surprising, and hence we'll be more credible also in the national and international scientific community". (Representative of university filial)*

> *"We realized that we were totally out of the Finnish R&D funding circles. I mean 100 % out. And that money is not applied for by regions or organizations but people in them, and the same goes with the networks, it is people. It is not some university unit that plunges into R&D networks but nationally and internationally well-known researchers". (Representative of university filial)*

Through the many-faceted discussions and a report of the core group (Sotarauta et al. 1999), the '12 research professorships model' gained approval and finally emerged as the core of a South Ostrobothnian University network known as Epanet. The most important realization was that the low quantity and quality of research in South Ostrobothnia was not a problem as such, but the true problem lay in the fact that there were not enough competent individuals who could compete for national and international research funding and who were respected and credible actors in wider circles. The whole innovation system and R&D climate was distinctively regional and thus rather introverted in nature. Based on this kind of reasoning an objective to create a multidisciplinary research community of 40-60 researchers formed by more than one university was set. The central idea was to found 12 new research professorships as the core of a new community, and professors themselves were supposed to attract funds for their own research groups.

Founding professorships was seen as a good way of creating attractive opportunities for talented and competitive individuals. In Finland, there is a fixed number of professorships at the universities, and in many fields the competition for professorships is quite fierce. Therefore the assumption was that there are plenty of young and hungry academics preparing themselves for the competition of permanent professorships in their fields, and thus an opportunity to have a fixed term professorship for five years might later turn out to be a crucial factor in their future aspirations. Based on this kind of reasoning it was believed that it might be possible to attract competent academic people to the "periphery of Finnish academe" to build their own competitiveness.

> *"One can sacrifice five years of his/her life in Seinäjoki, and hence be more competitive in Helsinki, Tampere or abroad, it's not a bad deal. It is not a bad deal for Seinäjoki either, we'll have bunch of hungry people here for five years wanting to show the world how good they are, and then they leave, and we'll get new group of them, and thus we always have active professors here, and our ties to universities deepen after their departure – we'll be connected to them afterwards too " (Representative of university filial)*

Seinäjoki not having a reputation as an academic town, there was a danger that there might be a nationwide discussion about "Seinäjoki professors" referring to lower standards and quality, and therefore it was decided at the outset that every professor must be recruited using the standard procedures of respective universities, and that they must meet all the same criteria as any other professor in Finland. In addition it was decided that each new professorship to be founded must be new in Finland, that is, they should add new resources and fields of research not only to South Ostrobothnia but to the whole of Finland too. This was seen as important for the anticipated criticism that the scheme would deconcentrate Finnish research resources "all over the fields and forests". The counterargument was that all the new professors are faculty of respected universities and that they do not compete with existing research units or professors and therefore they contribute not only to the innovation system of South Ostrobothnia but to the scientific research of Finland as a whole. (Sotarauta et al. 1999.)

Phase IV – Communication 'roundabout' continues and becomes more focused

After publishing their report, based on literature but especially on the discussion with various interest groups, the discussions about the concept went further and involved even more people. In autumn 2000, a press conference was organized and the idea of recruiting 12 research professors to Seinäjoki was made public. At that time there was no idea how to finance the proposed professorships. There were only some general ideas that professorships should contribute to those economic areas that are central in South Ostrobothnia, i.e. SME growth, foodstuffs and metals, and in addition should strengthen the regional capacity for applying information and communication technology in traditional fields of economic activity.

The press conference highlighted the discussion around the Epanet model throughout South Ostrobothnia and beyond with media commentary welcoming this "new bold initiative". In some instances, mainly outside the region, the idea was seen as competing for existing activities, resource decomposing and hastily planned.. Some media coverage, in other regions, commented on the "ghost professors of Seinäjoki", but all in all the concept became very well known very quickly and it began to attract proposals for specific professorships and also funding for professorships. The managements of the nearby universities were interested in the Epanet-concept, but they were very cautious at the beginning. All in all, outside the region the general feeling was disbelief; firstly it was not believed that South Ostrobothnians would be able to raise enough funding for 12 professorship, and secondly it was not believed that enough qualified researchers would apply for the positions.

The press conference was, in a sense, an open invitation to participate in discussion about the network itself, its focus and finance. The invitation was widely accepted and people responsible for the Epanet-endeavour received many phone calls, e.mails, and hence questions, doubts, ideas, etc. After the press conference there were signs of "a snowball effect". Concrete developments began to happen, initiatives for the professorships and funding began to emerge from several, also quite surprising directions. Some organizations (a hospital, some firms, etc.), which were not strongly involved in the conceptualizing process, were among the first organizations to negotiate about the professorships and funding and also the research facilities. All this raised even more questions: Which universities? What professorships? What research facilities? Who should be given the coordination responsibility of the swiftly rolling snow-ball, of an emerging network?

Phase V – management of process

If the first phases were characterized by the creation of new interpretations of research and university networks and to some extent of their content too, and also of giving birth to creative tension and hence mobilizing people and resources, now there was an immediate need to institutionalize the management of the rapidly emerging network and a public discussion about the model, its prospects and realities.

After further negotiations and new rounds of discussions the University Association of South Ostrobothnia was given the management of the Epanet network by universities and other key actors. The University Association, being a small independent association employing only few people without big ambitions to develop Epanet to benefit itself, was seen as a neutral and objective organization that everybody could trust. The co-ordination was not possible at that stage to be placed in the hands of some of the universities. University units operating in South Ostrobothnia did not trust each other enough on this specific issue; they all believed that most of the new professorships might end up being part of the co-coordinating university. This was openly discussed.

> *"This (Epanet) was organized through such an organization that does not have money or power. Suddenly an organization that is used to organizing summer university courses is in the core of the regional development here. It is, however, so that this kind of endeavor cannot be given to the universities only, they are some easily tempted to cash the profits. And I wouldn't like to see the co-ordination in the hands of some of the regional development agencies. This must not end up being some bureaucratic development process. University association is just right in between universities and regional development agencies.. (Representative of university filial).*

Epanet culminated in the signing of a program agreement in spring 2001. With the nomination of the responsible coordinator, the original quite informal core group was changed

to a formal university association-managed network. An executive board was nominated including representatives from universities, Seinäjoki Polytechnics, Town of Seinäjoki, Regional Council of South Ostrobothnia, Employment and Economic Centre of South Ostrobothnia, and other influential regional organizations. It is chaired by a representative of the University of Tampere, and the deputy chairmen are from the University of Vaasa and Seinäjoki Polytechnics. At the same time the first research professors were nominated and the group of deeply involved people grew larger. By the end of 2003 there were 12 full-time and three part time professors already at work and the objectives have been met and exceeded. In addition there are six professorships in the process of being endowed and at the time of writing it seems that there will altogether be 21 professor operating in South Ostrobothnia. Their fields of research and universities are as follows:

Information technology applications

- Research professorship in Health Care Information Technology - Tampere University of Technology.
- Research professorship in Electronic Business with a particular focus on the development of new kinds of business activities and forms of service - University of Tampere
- Research professorship in Virtual Technology with a particular focus on mechatronics and embedded systems applications – Tampere University of Technology
- Research professorship in Logistic Systems – University of Vaasa

Economics and business administration

- Research professorship in Consumer Behaviour with food industry as the field of research - University of Vaasa.
- Research professorship in Rural Entrepreneurship - University of Helsinki
- Research professorship in Entrepreneurship, with a particular focus on the growth and management of SMEs - University of Vaasa.
- Research professorship in Concept Management**,** with special focus on furniture industry as the field of application – University of Vaasa

Regions and welfare

- Research professorship in Regional Development, with a special focus on urban competitiveness and promotion of strategic regional development – University of Tampere
- Research professorship in Popular Music, with focus on Musicology, Art Management and New Technologies - Sibelius Academy.
- Research professorship in Laboratory Medicine, with a particular focus on addiction medicine – University of Tampere
- Part-time professorships in the field of health-care: rehabilitation and nursing science - University of Lapland and University of Tampere

Industry specific topics

- Research professorship in Food Chains and Food Safety – University of Helsinki
- Research professorship in Plastic Composite Technology – Tampere University of Technology
- Management of the research and development of Aluminium Technology –In collaboration with the University of Vaasa

The complexity of the funding of Epanet can be illustrated by following figures: there are altogether 85 funding organizations (including 58 firms and 27 municipalities), approximately 200 contracts between a donor and University Association of South Ostrobothnia that channels the funds to the involved universities.

TABLE 1. The funding of Epanet network in September 2003 (each professorship is an individual project and thus division of funding bodies varies significantly between professorships) (Source: University Association of South Ostrobothnia/Epanet co-ordination office)

	Euro	*%*
European Union and state of Finland	3 038 000	43,4
Municipalities	2 429 000	34,7
Firms	1 127 000	16,1
Other public sector funding (universities and polytechnic)	406 000	5,8
Total	7 000 000	100,0

4.1 Epanet as an organizational innovation

Epanet is an *organizational innovation*; through Epanet many difficult borders and barriers between universities, between universities and polytechnic, between business and universities have been overcome. The Epanet network has been built up together with universities that have their main campuses elsewhere, and the professors are faculty of the host universities but working mostly in and/or for the Seinäjoki region. Epanet has thus been able to induce five prominent universities to be more actively involved in the activities of South Ostrobothnia. In addition Epanet has been able to transcend disciplinary borders by creating a research community of researchers from different disciplines and universities.

> *"It (Epanet) was able to overcome some of the characteristic problems of the Finnish universities: the dominance of disciplines, the hobby like nature in interdisciplinary studies, and thirdly a fear of founding new institutions to compete with old university departments". (Representative of university filial)*

The Epanet network is funded by many national, regional and local organizations and through Epanet South Ostrobothnians have been able to utilize many kinds of funding resources in implementing a shared strategy, and thus also been able to transcend through partnership borders between funding bodies. Epanet has also been able to induce important firms of the region to fund the research professorships and therefore also to participate more deeply in the discussion about knowledge, innovation, applying new technologies, etc.

"One of the most positive things has been the new activity between firms and these professors ... there are already now some projects in which firms have actively raised research questions, and firms have also made initiatives for the professorships, and their disciplines." (Representative of Seinäjoki technology Centre Ltd.)

In spite of the obvious success in creating and putting together the Epanet concept and network, and getting funding for it, three issues are frequently raised: a) Is Epanet a project of definite duration or is it a long-lasting institution? b) Is it contributing to business and regional development in long or short run? And c) should the professors carry out more basic and applied research or should they become pragmatic problem-solvers for firms? There are significant expectations of the Epanet professors ranging from pragmatic problem-solving for industry through contract research and consulting, to bridging research in South-Ostrobothnia to national and global top-level research, and the creation of a new research and innovation culture.

"A professor has an academic freedom and therefore his/her interests of course determine what will be studied. We should be able to recruit people who understand firms, and who are interested in taking their needs into account. Hopefully both professors and firms will be active in creating new forms of interaction." (Representative of firms)

Most notably the first issue is whether Epanet is a series of projects or an institution. Will it became a permanent part of the research and innovation system of South Ostrobothnia or fade away after five or perhaps seven years? In its early phases Epanet is based on contracts of definite duration, and the desire in the region is to get permanent funding for Epanet, and thus institutionalise it. It seems to be evident that the whole Epanet network will not be funded through the state budget. Therefore the question is also about how well the Epanet professors (and their research groups) will succeed in their research and other activities, and so receive further funding also after the first duration of a term.

Second, many policy-makers and firm representatives are expecting quick solutions to daily problems of regional development and innovation in firms. The idea, however, is that the Epanet professors are to strengthen applied research in the region and draw also on research carried out elsewhere, and they are not supposed to end up being practical problem-solvers, or varieties of consulting professors. So, third, Epanet professors and their research groups are also expected to bridge the "academic wasteland of Finland" (Seinajoki) to the main scientific centres of Finland and beyond, and in that way channel information to and from South Ostrobothnia. It is too early to say anything definite about the outcome of the activities of the Epanet network, only time will tell, but so far through Epanet, and by other related processes, a) the belief in the future has been strengthened, b) an enormous discussion

about research and innovation in firms has been raised, c) positive curiosity towards South Ostrobothnia in Finland has been aroused, and thus the image of the region has improved, and d) universities are more committed to the region, and a new interdisciplinary and inter-university research community has been born.

5 Conclusions

South Ostrobothnia has consciously made efforts to free itself from past path dependence and to branch out by creating new institutions, by seeking out new human capital to draw on and by creating a new perception of the region, its current state and future prospects. The developments in South Ostrobothnia raise questions how it was pulled together; are there any general messages for the management of regional development?

Firstly, the swiftly emerging organizational innovation, focused upon *the spirit of the time* in Finland, was the soil in which the seeds of the new path were rooted. It made a more collective interpretation of "South Ostrobothnia in the knowledge economy" possible. When the knowledge economy and related issues were discussed everywhere, i.e. in the media, conferences, literature, etc., and when the national bodies began to channel resources into it, also the local "inspirers", the champions of development efforts, were thus able to utilize general societal discourse in their own argumentation.

Secondly, *intensive collaboration* among firms, the public sector and educational institutes made it possible to launch a new flagship process. However, it should be remembered that in Finland in the 1990s a common strategy for all public efforts to promote regional development was to build networks for policy-making and implementation. The experiences of South Ostrobothnia, as well as other Nordic regions (see Linnamaa 2002, Bruun 2002a, 2002b and 2002c; Kostiainen & Sotarauta 2003), show that those authorities that themselves invest financial and/or temporal resources in the development processes have more success as network builders than those who do not. In contrast, authorities that enter network building without such investments face considerable skepticism and will probably have small chances to make the most of the network strategy.

Thirdly, *individuals* and *coalitions* formed by local actors have played a decisive role in the crucial phases of development. In strengthening institutional capacity and creating the Epanet network, the combination of enthusiasm and authority that the key actors embodied transmitted a positive and regionally anchored view of new prospects to other development agents, firms and the general public. Fourthly, in mobilizing people and resources the role of *an ambitious but believable story* was of utmost importance in a world that is full of

information, development programmes, projects and other development efforts. In one of its dimensions regional development is about competing ideas and interpretations, and by a believable story it is possible to link fragmented pieces of information together, and in the emergence of Epanet, an *inductive and inducing strategy* was applied that was wrapped with constantly emerging story line. The whole process was based on a collective sense-making of the knowledge economy and its reflections in South Ostrobothnia, and thus collective interpretation and conceptualization formed a core in the strategy process. The story of a less favored region in the global knowledge economy with its own identity, strong pipelines and a stubborn unwillingness to give up in the face of "big changes" and to adapt strategically formed the plot of the Epanet story. It is also worth noticing that it was not a question of having a ready made plot, but a constantly emerging and ongoing discussion that bounced back and forth between vision and practical issues, and between many organizations.

Fifthly, *the capacity to bring forth a vision* of a different future for the region was important in the emerging story line. The mechanical formulation of a vision and strategies was not sufficient but the skills and abilities of key actors to use visions and strategies as tools in creating the story and its implications is more important than a strategic plan with well formulated and documented visions. To be truly functional in the development work, vision should be communicable, challenging and appealing. Vision is not an outcome of a planning process but a long process itself.

Sixthly, in an inductive and inducing strategy process it is important to create a *sense of urgency*, because often the formulation of a vision or development program and, for example, receiving EU-funding provide a development network with a false sense of security. (Sotarauta & Lakso 2000.) Development efforts need the sense of drama that in South Ostrobothnia was found in a combination of crisis, a believable story, credible individuals and a desire to show rest of the Finland that "our region is not out of the game yet". In creating a sense of urgency the role of the media as a forum of critical discussion is important in making the discussion public and people aware of the challenges and opportunities.

Seventh, a strong message is that *institutions* provide inducing and inductive processes with a general framework, and they have a major directing effect on processes. Institutions frame the stories and actions of individuals, and prevent them getting out of hand. At their best, institutions open new opportunities for individuals and small active groups of people but do not to trap them in bureaucracy and thus lock the whole region into the past. South Ostrobothnia was in the 1990s able to increase institutional capacity in strategically important

sectors through the creation of new institutions and hence opening opportunities for new processes like Epanet to be launched.

Based on the South Ostrobothnian case, it can be concluded that in strategic adaptation, first of all, the sensitivity to identify various changes is important, but especially crucial is to create the region's own perception of a new phase of development, as well as its own "story of the future" and its support. Also the capacity for bold and fast decisions in the community is important. If successful this capacity may be institutionalized in the community and become an object of local pride and an important part of local culture. This experimental process of strategic adaptation is not a mechanical policy-making process but a complex and emergent set of interactions that crosses many borders and administrative levels.

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APPENDIX 1. R&D expenditures in the Finnish regions in the year 2001.

R&D Expenditures/ Year 2001 Regions (their central cities/ towns)	Totally million euros	%	Companies million euros	%	Public institutions million euros	%	Universities and Polytechnics million euros	%
Uusimaa (Helsinki)	2 057,7	44,5	1 384,7	42,2	331,8	66,2	341,2	40,9
Tampere region (Tampere)	694,1	15,0	540,2	16,5	40,5	8,1	113,4	13,6
North Ostrobothnia (Oulu)	527,3	11,4	411,2	12,5	29,5	5.9	86,6	10,4
Varsinais-Suomi (Turku)	466,6	10,1	347,8	10,6	14,2	2,8	104,5	12,5
Central Finland (Jyväskylä)	174,7	3,8	114,4	3,5	15,5	3,1	44,8	5,4
Pohjois-Savo (Kuopio)	100,3	2,2	38,0	1,2	12,4	2,5	49,9	6,0
Ostrobothnia (Vaasa)	90,2	2,0	79,2	2,4	0,8	0,2	10,3	1,2
Satakunta (Pori)	74,4	1,6	65,6	2,0	1,1	0,2	7,6	0,9
Itä-Uusimaa (Porvoo)	65,4	1,4	65,0	2,0	0,3	0,1	0,1	0,0
Kanta-Häme (Hämeenlinna)	58,5	1,3	29,9	0,9	25,8	5,1	2,9	0,3
North Karelia (Joensuu)	56,3	1,2	22,6	0,7	8,0	1,6	25,7	3,1
South Karelia (Lappeenranta)	55,8	1,2	36,7	1,1	1,7	0,3	17,4	2,1
Päijät-Häme (Lahti)	52,3	1,1	47,1	1,4	1,1	0,2	4,1	0,5
Kymenlaakso (Kotka)	37,9	0,8	36,7	1,1	0,3	0,1	0,9	0,1
Lapland (Rovaniemi)	37,7	0,8	14,9	0,5	9,6	1,9	13,2	1,6
South Ostrobothnia (Seinäjoki)	**22,2**	**0,5**	**18,1**	**0,6**	**0,6**	**0,1**	**3,5**	**0,4**
Etelä-Savo (Mikkeli)	18,9	0,4	10,3	0,3	3,4	0,7	5,2	0,6
Kainuu (Kajaani)	16,4	0,4	12,4	0,4	1,5	0,3	2,5	0,3
Central Ostrobothnia (Kokkola)	10,9	0,2	8,6	0,3	2,0	0,4	0,3	0,0
Åland (Mariehamn) (autonomous area)	1,5	0,0	0,7	0,0	0,8	0,2	-	-
Whole country	4 619,0	100,0	3 284,0	100,0	500,9	100,0	834,1	100,0

APPENDIX 2. Domestic patent applications by business enterprises in Finland, the proportion of the Tekes R&D funding for companies and the research personnel (all, companies, universities, public R&D institutions) in Finnish regions at the year 2001.

Regions (their central cities/ towns)	% the whole country's applications	Number of applications	% of Tekes R&D funding to companies in regions/ year 2001	Research personnel in the regions/ 2001
Uusimaa (Helsinki)	34,3	611	45,2	30 000
Pirkanmaa (Tampere)	17,4	310	8,8	9 096
Varsinais-Suomi (Turku)	8,4	150	9,7	6 684
North Ostrobothnia (Oulu)	7,7	137	8,4	7 917
Central Finland (Jyväskylä)	7,6	135	5,2	2 891
Satakunta (Pori)	3,0	54	2,0	1 333
Päijät-Häme (Lahti)	3,0	53	2,0	982
Pohjois-Savo (Kuopio)	2,6	47	3,1	2 181
Kymenlaakso (Kotka)	2,0	36	1,4	700
Kanta-Häme (Hämeenlinna)	1,9	33	1,8	1 193
Ostrobothnia (Vaasa)	1,3	24	2,3	1 402
Itä-Uusimaa (Porvoo)	1,3	23	1,8	612
North Karelia (Joensuu)	1,2	22	1,0	1 258
South Ostrobothnia (Seinäjoki)	**1,1**	**19**	**1,6**	**468**
Etelä-Savo (Mikkeli)	1,0	18	2,2	457
South Karelia (Lappeenranta)	0,8	15	0,4	1 044
Lapland (Rovaniemi)	0,8	14	1,6	1 016
Central Ostrobothnia (Kokkola)	0,8	14	0,5	225
Kainuu (Kajaani)	0,3	5	1,0	293
Åland(Mariehamn)	0,1	2	-	36
Domestic total	96,7	1 722	100	69 788
Foreign	3,0	54	-	Included in total
Total	100	1 780	100	Equal to total

APPENDIX 3. Education level by degrees taken after basic level education of the population (over 15 years-old) in the municipality in 2001.

Regions (their central cities/ towns)	Number of persons taken degrees	% from the population in the region	% of the population in the biggest city/ town in the region	Number of persons taken *higher education degree*	% from the population in the region
Uusimaa (Helsinki)	699 924	65,0	66,7	339 763	31,6
North Ostrobothnia (Oulu)	179 075	61,8	70,2	64 249	22,2
Pirkanmaa (Tampere)	230 012	61,7	67,0	88 387	23,7
Varsinais-Suomi (Turku)	222 323	59,7	63,8	86 428	23,2
Central Finland (Jyväskylä)	129 946	59,7	69,8	48 014	22,1
Pohjois-Savo (Kuopio)	122 209	58,9	67,4	42 581	20,5
Kymenlaakso (Kotka)	91 462	58,6	61,1	31 100	19,9
Lapland (Rovaniemi)	90 475	58,4	67,3	30 464	19,6
Kanta-Häme (Hämeenlinna)	78 873	58,0	62,6	29 710	21,8
Ostrobothnia (Vaasa)	81 542	57,8	65,2	31 450	22,3
North Karelia (Joensuu)	81 262	57,6	67,8	25 845	18,3
Päijät-Häme (Lahti)	93 285	56,9	59,1	32 971	20,1
South Karelia (Lappeenranta)	65 026	56,6	61,0	22 168	19,3
Itä-Uusimaa (Porvoo)	40 808	56,5	58,6	16 996	23,5
Kainuu (Kajaani)	41 320	56,4	63,3	12 978	17,7
Satakunta (Pori)	110 316	56,1	59,2	38 425	19,5
Åland (Mariehamn)	11 883	56,0	62,4	4 546	21,4
Etelä-Savo (Mikkeli)	77 369	55,5	62,9	25 758	18,5
South Ostrobothnia (Seinäjoki)	**87 690**	**55,3**	**67,1**	**28 976**	**18,3**
Central Ostrobothnia (Kokkola)	31 188	54,8	58,9	10 109	17,8
Whole country	2 565 988	60,2	60,2	1 010 918	23,7

Sources: Finnish Technology Agency Tekes, web-pages 26.9.03, 29.9.03, Statistics Finland's "Alue Online" and the StatFin Internet services 26.9.03 and 29.903, Research in Finland Internet-service 26.9.03, Ministry of Education and Ministry of Interior Internet service 26.9.03, Regional Council of South Ostrobothnia, web pages and Internet foresight service (in Finnish) 26.9.03., Regional Technology Strategy of South Ostrobothnia 30.5.2003/ Swot Consulting Oy, and Seinäjoki Technology Centre Ltd.

The Local Innovation Systems Project

The Local Innovation Systems Project, an international research partnership based at the Industrial Performance Center (IPC) at MIT, is addressing a central issue now confronting industrial practitioners and economic policymakers throughout the world: How can local economic communities survive and prosper in the rapidly changing global economy?

Our particular focus is on the role of innovation – in products, services, and processes – in promoting productivity growth and competitive advantage at the local and regional levels. National and local governments around the world, as well as other institutions with an interest in economic development, are greatly interested in creating and sustaining local environments that are attractive for innovation. Firms, too, recognize that their innovation performance is affected by their location.

The policy debate has been dominated by a few outstandingly successful centers of technological entrepreneurship, notably including Silicon Valley and the Boston area in the United States, and the Cambridge region in the U.K. But most locales do not have clusters of high-technology ventures of such scale, nor are they home to research and educational institutions with world-class strengths across a broad range of disciplines. Many, on the other hand, do have distinctive industrial capabilities and vibrant higher educational institutions, and some of these locales have been quite successful in harnessing new technology to revitalize their economies or even to reinvent themselves as centers of innovation and competitive advantage.

The Local Innovation Systems Project is investigating cases of actual and attempted industrial transformation in more than 20 locales in the United States, Europe, and Asia. Our research is aimed at developing new insights into how regional capabilities can spur innovation and economic growth. We seek ultimately to develop new models of innovation-led industrial development.

We are currently completing the initial year of a projected multi-year study. In the first phase of research, we are investigating the roles of universities and other public research institutions as creators, receptors, and interpreters of innovation and ideas; as sources of human capital; and as key components of social infrastructure and social capital. Later phases of our research will explore the process of enterprise growth and the ability of different locations to attract and retain innovating firms. We are also investigating different approaches to individual and institutional leadership in locally-based systems of innovation.

The founding research partners of the Local Innovation Systems Project consist of an interdisciplinary team of faculty, graduate students and research staff at the MIT Industrial Performance Center, together with their counterparts at the University of Tampere and the Helsinki University of Technology in Finland, the University of Cambridge in England, and the University of Tokyo, Japan.

Current research sites include several locations in the United States (Boston, MA; Rochester, NY; Akron, OH; Allentown, PA; Youngstown, OH; New Haven, CT; Charlotte, NC; and the Greenville-Spartanburg area of SC), Finland (Helsinki, Turku, Oulu, Tampere, Seinajöki, Pori), Japan (Hamamatsu, Kyoto), and the United Kingdom. Additional research

is being carried out in Ireland, India, Taiwan and Israel.

At each location, teams of researchers from the partner institutions are studying innovation trajectories and developing comparative case studies of growth and transformation in several industries, mature as well as new, including polymers, ceramics, optoelectronics, industrial machinery and automation, auto/motorsports, medical equipment, biotechnology, and wireless communications.

The outreach activities of the Local Innovation Systems Project will include the preparation of discussion papers and books, executive briefings and informal workshops, international conferences, and executive education and training programs for policymakers, research managers, and industry executives.

Current sponsors of the Local Innovation Systems Project include, in the United States, the Alfred P. Sloan Foundation and the National Science Foundation, Tekes (the National Technology Agency of Finland), the Cambridge-MIT Institute, and the University of Tokyo.

For further information, please contact the Project Director, Professor Richard Lester (617-253-7522, rklester@mit.edu).