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**THE REGIONAL SYSTEM OF INNOVATION AND REGIONAL  
DEVELOPMENT**

**Abstract:**

Innovations and the capacity to innovate are crucial factors in the development of a firm and its ability to adapt to changes in the external environment. Growing attention has been paid to the mechanism facilitating innovation in firms, both in large, small and medium-sized enterprises.

As a consequence, increasing attention has been on the role of innovation policy in regional development. The purpose of this project is to analyse the linkages between the business advisory systems' efforts to promote innovation and the innovative firm with special attention to small and medium sized enterprises. The analysis of this paper deals with entities and relations of the innovative environment. The focal point is the interaction between the analysed business entity and the external environment as a part of a broader network of innovative relations covering intra-firm as well as extra-firm relations and processes.

The first part of the paper addresses various concepts of innovation and the role of the advisory system in the creation of a regional innovative business environment. The second part of the paper presents the outline of a survey of manufacturing firms and advisory organisations in Western Denmark and Northern Germany. The essential objective of this part is to identify the potential of and the crucial obstacles to a proactive regional innovation policy, since previous studies have shown that in particular small firms have difficulties to use the advisory system and the services offered.

The final section of the paper provide an assessment of the expected outcome of the project and discusses how to create a proactive regional development based on literature and the empirical surveys.

**Key-words:** Regional system of innovation - Advisory system - business incubators and science parks - R & D programs

## **1. Introduction**

Innovations and the capacity to innovate are crucial factors in the development of a firm and its ability to adapt to changes in the external environment. Growing attention has been paid to the mechanism facilitating innovation in firms, both in large, small and medium-sized enterprises.

As a consequence, increasing attention has been on the role of innovation policy in regional development. The purpose of this project is to analyse the linkages between the business advisory systems' efforts to promote innovation and the innovative firm with special attention to small and medium sized enterprises. The analysis of this paper deals with entities and relations of the innovative environment. The focal point is the interaction between the analysed business entity and the external environment as a part of a broader network of innovative relations covering intra-firm as well as extra-firm relations and processes.

The first part of the paper addresses various concepts of innovation and the role of the advisory system in the creation of a regional innovative business environment. The second part of the paper sketches the outline of a survey of manufacturing firms and advisory organisations in Western Denmark and Northern Germany. The essential objective of this part is to identify the potential of and the crucial obstacles to a proactive regional innovation policy, since previous studies have shown that in particular small firms have difficulties to use the advisory system and the services offered.

## **2. Innovation and regional policy**

The aim of regional policy is broadly speaking to provide equal living condition<sup>1)</sup> throughout a given geographical area. The crucial issue is of course to define what equity is, and as a consequence hereof to formulate an adequate strategy, and to implement the policy. Concepts of regional policy has changed over time, some periods focused on infrastructure investment, other on transfer payment or had main attention on endogenous development strategies.

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1. Equity is not necessarily to be understood as economic equity. Non economic parameters can count as well. The former Danish Regional Policy act stated in the 1988 version: "According to the rules of this Act grants may be given to advance industry and commerce development in those parts of the country where it presumably will be of valuable importance for the population's access to the common economic, social and cultural progress of society". (here quoted from Cornett 1995).

The other central issue of the delimitation of regional policy is the problem of geographical demarcation of the relevant area of reference. Traditionally the nation state was the unit of comparison, but since the introduction of the EU regional policy in the mid seventies the EU became more important. In addition, in many countries regional policy responsibility was passed toward the local and regional authorities. The latter were often a consequence of the growing financial pressure on state budgets and co-financing requirements in other areas of business promotion policy, i.e. R&D policy and industrial policy. During the eighties and nineties there was a tied competition for funding between sectoral and regional targets in business development policy in many countries. In particular in North Western Europe with the R&D policy as the main beneficiary. Recently, political signals in Denmark have shifted toward new attention on regional equalisation. The first signs were already visible in the last year of the former social democratic government when launching new initiatives for Western Denmark. This has recently been reinforced by the new liberal-conservative government with proposals like an regional assessment for new governmental initiatives, relocation of public agencies and a new growth strategy<sup>2)</sup>.

The growing attention on the importance of innovations for economic growth and the systemic conditions required to stimulate innovations revitalised the interest in regional clustering and the notion of industrial district as an instrument in business development policy. In this perspective innovation policy became a tool in regional policy - to put it another way, regional policy adapted innovation policy as an integrated part of business development policy. The mushrooming of business incubators, Science Parks and Technology Centers is the best proof of this tendency<sup>3)</sup>.

## **2.1 The concept of innovation<sup>4)</sup>**

Innovation is a multidimensional phenomenon that takes place in a certain organizational and economic context. Innovative activity can be part of a broader societal or commercial endeavor or be an objective on its own.

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2. A part of this strategy is to support regional development strategies with 20 mill DKK! (approx. 3 mill. EURO) over the next 4 years. For details see an interview with the Danish Minister of Economic and Business Affairs in Journal of Nordregio, 2002.

3. This tendency was also reinforced by the concepts of 'endogenous development' in the 1980's.

4. This section is based on Cornett & Freytag 2002.

Before embarking on the discussion of an operational approach to innovation and how innovation can be supported as a measure of regional innovation policy it seems necessary to address some principal problems related to the implementation of innovations. No matter what, whether innovations are done within one organization or as a result of a co-operative effort, a crucial factor of the innovative process in practice is the importance of relations in the process and to determine the key variables in the process. The aim of the proposed analysis of the innovative behavior in the Northern Germany and Western Denmark is to find answers to some of the following questions:

Who (i.e. firms, knowledge institutions or consultants) participate in innovative activities?

How are innovative structures or networks implemented?

What kind of innovations is the concern of the task?

Where are the activities taking place?

What are the crucial resources?

In which situation (time) are innovative activities performed?

Why are companies innovating?

The main focus of this paper is to provide an outline of what is required to use innovation and innovation policy as an instrument of regional business development policy. Innovative relations within or between companies are not addressed in this paper<sup>5)</sup>.

A system of innovation can usually not be analysed as a closed system, and is not limited to a specific organisational or geographical context (see Oinas P. & Malecki E.J. 2002). Innovation is not necessarily determined solely by national factors, but concerning innovation policy the institutional context as mediator in the implementation of a proactive policy is still important to reach the targets of the policy:

The individual firm or a specific industry or branch

The advisory system - innovation policy mediators.

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5. For an assessment of the whole arena of innovation see Comett & Freytag 2002, p. 204- 208 All three aspects will be addressed in the proposed survey of the regional innovative system in Western Denmark and Northern Germany.

While the former is the ultimate objective of the policy, the latter is usually a vehicle to address the former. From a policy implementation perspective we are dealing with a two-tier system.

Traditionally, a distinction between product and process innovation has been useful in the investigation of innovation patterns of firms or industries (see Christensen et al., 1999). *Product innovation* can be defined as the process of launching a new product, both technically and in a marketing perspective. *Process innovation* focuses on the process of production and on the way a certain product is placed in the markets.

From a regional development and policy point of view it can be argued that process-innovation is more important than product-innovation, due to the broader scope of skill-development and the creation of human capital in the former. From a commercial and property right perspective it also seems easier to solve the potential conflict between private profit and exclusiveness considerations and the public policy objective to spread knowledge and skills as a means of a proactive spillover oriented regional policy<sup>6)</sup>.

An essential part of the supply side environment for innovative activities consists of the public sector advisory system. Knowledge-based innovation policy deals with the process of transition and transformation of knowledge in an inter- and intra-organizational context. From the advisory system's point of view, the main focus is on the system of knowledge diffusion within and between the supportive bodies, and from the supportive system toward the target groups in the business community.

In the business sector knowledge diffusion has to be analysed up-stream and downstream in the production system as well as horizontally between individual firms. In this connection, it is a central question whether and in which ways the diffusion processes differ horizontally and vertically in the value chain.

Discussing the pros and cons of a proactive business promotion, and in particular innovation policy, always leads to the question to what extent it is possible by 'bureaucratic' means to peg a winning strategy in competition to the market as decision mechanism. The problem is hard to solve on the national level, and the most convincing examples from history, i.e. Japan, have lost much of their sheen. On the regional or firm level the application of 'national' or 'European'

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6. See Cornett 2000 and Ministry of Industry 2000.

strategies are even more doubtful, but still an important measure for Policy makers (see Ministry of Industry 2000, Ministry of Industry 2001).

## **2.2 Toward an innovation based regional policy**

The objective of regional policy is broadly speaking to improve living conditions and equalize disparities within a given area. The strategies used have changed over time mostly reflecting the general approach to economic policy. The effect, measured as convergence of economic indicators (i.e. the rate of unemployment or GDP per capita) has despite of some success stories been rather modest<sup>7)</sup>. In almost all countries, budget restrictions caused a reorientation of regional transfer payments in the 1970s.

The means of regional policy has been altered, focus shifted toward endogenous development, sustainable growth, or innovation oriented strategies. Common for all of them are that they emphasize bottom-up and decentralized approaches<sup>8)</sup>. Within the EU, this has been reinforced through the alterations of the EU structural policy toward a more program oriented approach since the reform in the late 1980s emphasizing the regional participation. The reverse side of the coin is, that regions compete, and are tempted to embark on a kind of ‘beggar your neighbor’ policy competing to offer the best conditions for new or moving industries. The strong and wealthy regions or municipalities can easily out compete the less well off part of the country with increasing disparities as consequence if the central government - or the EU competition agency - not takes action. A beneficial consequence of this shift toward a proactive regional business development policy is that regional authorities became aware that a successful policy has to be holistic and integrate all aspects of the local or regional economy, including universities, R&D institutions and technological advisory agencies etc. A proactive strategy should work as a mediator and integrate the local actors (see Steiner 2002, p.17f). The result of a proper implementation of a policy according to the above sketched guidelines would aim to embark on

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7. An recent assessment for Europe at the turn of the century can be found in Cuadrado-Roura & Parellada (2002).

8. As ‘side payment’, central governments in many countries used this shift as an excuse to transfer the responsibility for regional development funding to regional authorities.

a path to create a comprehensive and interrelated economic system, to stimulate clusters of firms and knowledge in a particular area or industry<sup>9)</sup>.

### **2.3 Relations and clustering: Creating industrial districts**

Originally, the concept of industrial district is related to the way manufacturing industries were organized, as first described by Marshall<sup>10)</sup>. Nowadays, the Italian industrial districts in the Emilia-Romagna in particular are well-known and have been the target of many in depth analyses. In a study of Italian industrial districts Signorini stresses the important features (Signorini 1994, p. 370):

- The division of labor, through inter-firm specialization, improves productivity and flexibility
- The environmental or milieu aspect, dealing with cultural factors (attitudes, knowledge and behavior) and infrastructure (physical as well as the availability of service)
- The network element, in casu forward and backward linkages reinforcing the potential for the district as a whole.

Particularly the second and to some extent the third element could be the targets of a business development policy to help rise above regional disadvantages and to reinforce the interrelatedness of business and industry in a specific region. A consequence of this broader perspective is that the concept of industrial districts has to be elaborated in two ways. First, the concepts are enlarged in scope in order to deal with sectors other than manufacturing and production. A modern system of production and innovation goes beyond the traditional division

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9. The following section is mainly based on Cornett 2000 where the issue of 'creating industrial districts' by political measures is discussed in some more details. See also Steiner (2002, p. 19) who focus' on the institutional setting: "This perspective starts with the hypothesis that cluster can be regarded as a form of Coase institution trying to integrate the positive external effects of innovation, technological knowledge and development activities. The creation of such institutions may be endangered and put into question by high transactions costs. Yet because of the specific character of technological knowledge, its asymmetric and tacit character these transactions have to be mediated by non-market methods, primarily through networks and other forms of arrangement between organisations and individuals, procedures which build trust and work to limit the damaging consequences of asymmetric information. *So we need the support of clusters by policy reducing transaction costs*" (Italic added).

10. Signorini (1994, p.369) summarized the concept of Industrial Districts: "As usually understood in the literature, an "industrial district".... is a local agglomeration of small independent manufacturing firms, all specialized in one industry, and enjoying idiosyncratic, community-dependent external economies".

of labor within an industry or branch: business service is also of increasing importance for the regional economic base (Illeris 1999). Second, a distinction between industrial clusters (agglomeration of industries or sites of production) and true industrial districts<sup>11)</sup> is introduced.

Central issues to be addressed in following sections of the paper are:

- The nature of industrial clusters and industrial districts
- The nature of systems of production with regard to regional and/or functional characteristics
- The advisory system as supportive measure: supply-side vs. demand-side orientation driven

Finally, an attempt is made to answer the question stated in the title of the paper: “*Is it possible to create industrial districts by public policy initiatives?*” or is the best practice for business development policy (agencies) to be supportive rather than to be pro-active.

The final section of the paper provides an outline for an empirical study of the regional system of innovation in Northern Germany and the Western part of Denmark. The paper tries to contribute to the still lacking understanding of the connections between regional systems of innovation (Oinas & Malecki 2002, p.122).

The main question of research to be addressed in this study is to map the external linkages of firms to the advisory system and to actor outside the regional and national context, i.e. to identify spatial system of innovation, see figure below:

To use the phrase quoted in footnote 8 ‘we need the support of clusters by policy’. This is actually what a holistic oriented modern business development policy should be<sup>12)</sup>. Another precondition is to have in depth knowledge of the innovative system and behaviour in the particular region to be able to provide appropriate support. The next section sketches key elements of an investigation of the regional system of innovation in Western Denmark and Northern Germany and their external linkages.

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11. The concept ‘industrial district’ is not without its ambiguities. Ann Markusen (1996) distinguishes between 4 types: The Marshallian NID with Italian variants, the hub and spoke district, the satellite industrial platform and the state-centered district (p.296) For details see section 6 below.

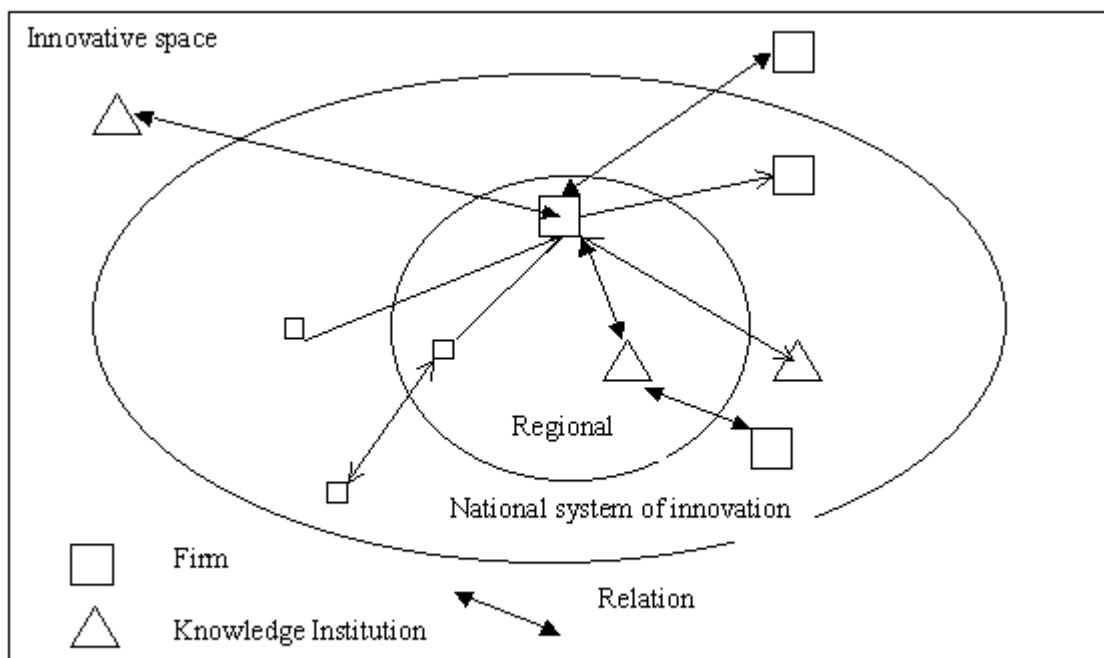
12. SJEC, Sønderjyllands Erhvervs Center is at least an attempt to fulfill the organizational part of this requirement.



### 3. The regional system of innovation in a spatial context

The purpose of this section is briefly to sketch the main element of a proposed study of the linkages of the innovative systems in Northern Germany and Western Denmark. The aim of the project is basically to shed some light on the links and nodes of figure 1 based on an investigation of the interactions and co-operation pattern of a specific regions in Northwestern Europe.

**Figure 1** The Innovative Space: Actors and Relations



#### 3.1 Mapping the system of innovation.

Based on an investigation of the innovative behaviour of manufacturing firms in the western part of Denmark (the Peninsula of Jutland and the Island of Funen) and Northern Germany (Schleswig Holstein, Hamburg and Meklenburg Vorpommern) to analyse the linkages between innovative firms, the advisory system and research and development institutions. The aim is to provide guidelines for how to make a policy set-up facilitating the innovating firm as well as societal objectives. Based on the theoretical framework sketched in the previous section the analysis will be conducted in a two step approach. The first layer is explorative, based on a questionnaire.

Based on this, in depth interviews will be made with selected firms and advisory agencies. The purpose of these case studies is to get profound knowledge of the innovative processes and in particular the relation within and between the firms and the advisory bodies. Previous studies have shown that large gaps exist between the intentions of the providers of innovative advice and the needs of the potential customers (see Christensen et al. 1999).

The aim of the analysis is to provide a deeper understanding of the processes of innovation in an interorganizational context, and to identify key success factors for a proactive regional development policy based on the creation of an innovative environment. Key actors in this process are:

- The firm
- The advisory system (business development agencies etc.)
- R & D institutions

The main issues to identify in the survey are:

- Organizational patterns of co-operation between firms and external advisers
- Spatial linkages within a specific region and to external partners
- Nature and intensity of co-operation
- Differences in behavior according to size of the firm and industry.

The targets for the survey are small and medium sized manufacturing firms and the advisory system (see table 1 below). With regard to the advisory system, all relevant entities will be approached. The main sources are public records of relevant institutions, mainly based on the Danish Ministry of Industry<sup>13)</sup> and the SMEPOL project and relevant German sources. To provide full coverage the firms are asked about their contacts to the advisory system, which will provide information about other relevant actors in the system of innovation, probably in particular outside the area of investigation.

With regard to sector affiliation, the survey will be sent to SME's belonging to the following industries which are of central importance in the Western Denmark and Northern Germany. It is widely accepted that the small and medium-sized enterprises play a major role for economic development, and particular in the study-area. Both in the German and Danish part this type of

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13. Now Ministry of Economic and Business Affairs.

companies dominates. The study will focus on the following 7 branches of the manufacturing sector. Regional relevance and importance in the study area, as well as the focus on the two types of product and process innovation, has mainly caused the selection. Small and medium sized firms from the following branches will be included in the survey:

**Table 1** Industries in the survey

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<b>Sector affiliation:</b>
1. Manufacturers of food, beverages and tobacco
2. Manufacturers of wood products and furniture
3. Manufacturers of textiles, wearing apparel, leather
4. Manufacturers of rubber and plastic products
5. Manufacturers of basic metals and fabr. metal products
6. Manufacturers of electrical and optical equipment

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### **3.2 A brief presentation of the survey<sup>14)</sup>**

The overall idea of the survey is threefold. First of all the survey provides an assessment of the innovative behaviour of small and medium sized manufacturing companies and their integration in the regional and international system of production. The second issue addressed deals with the supply side of innovation policy, i.e. the advisory system. According to figure 1, this system has to be seen in a functional rather than an geographical or organizational context. Figure 2 in the conclusion sketches the Danish system in this perspective.

The third aspect is to shed some light on the efficiency of innovation support policy as a tool of a proactive business development policy. It is well known that we often find a mis-match between policy intention (of the advisory system) and the demand from the single innovating company (see Christensen et al. 1999). The aim of this survey is to dig a little deeper into this problem. The approach used is based on a two step process.

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14. For details see 'Innovation 2002', Interreg proposal by Department of International Management, University of Flensburg and Department for Marketing, SDU Sønderborg.

**Table 2:** Variables in company questionnaire

<b>Variables</b>	<b>Indicators</b>
Organizational:	Age, year of establishment Branch according to NACE Main areas of activity, domestic vs. foreign (export share, start of export activity). Representation on external markets, subsidiarity, agents, joint ventures etc. Ownership Number of employees Turnover
Products and product development:	Own assessment of technological level Customers: industrial or consumption market, public sector Mass vs. to order production Number of patents Experience of development of new products or processes Is product development supply or demand driven? What is the most/ least successful product development Co-operators and intensity of cooperation (i.e. other firms, advisory system etc.)
Reasons for co-operation	wn vs. partner initiative Partners: other firms, advisory agencies, universities etc.
Type of service and advice used:	Economic and financial Judicial Research and Development Marketing , Project management, Logistics Management, Human Resources
Financial issues:	Own resources, co-financing with partners or public sector programs
Cooperation with advisory agencies and public sector institutions:	Name of institution Who initiates the relationship Method of communication with clients (reactive, proactive etc.) Is the advisory firm economically involved in cooperation? Timing of contacts: Idea-stage, technical development stage, partner search, marketing etc. Role in relationship: lead partner, balanced relationship, consultant dual vs. mutual partner relationship.
Relations:	Evaluation of relations with regard to time, confidence and quality

The first step is to ask the companies and the advisory system about their experience, and which partners or supporting agencies they have been involved with. Of particular interest is to figure out whether the initiative was taken by the firm itself or the partner. Of special interest is to identify patterns regarding firm size and the nature of co-operation, i.e. up-stream or down stream

in the value chain. Regarding the advisory system we hope that the survey can contribute to answer the question whether the advisory system is demand or supply driven<sup>15</sup>).

The second planned stage of the survey is to make in deep interviews with selected firms and the advisory system, see table 3 below.

**Table 3** Feature of advisory institutions

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<b>Variables</b>	<b>Indicators</b>
Organizational:	Age, year of establishment Sectoral affiliation (State, EU etc) Principles of organization i.e. sectoral. geographical, functional Number of employees Turnover
Objectives:	Advice, participation in concrete projects, network formation, education etc.
Type of service and advice:	Economic and financial Judicial Research and Development Marketing , Project management, Logistics Management, Human Resources
Financial sources of organization:	State, EU, county etc. User fees, private foundation, organizations
Cooperation with companies:	Who initiates the relationship Method of communication with clients (reactive, proactive etc.) Is the advisory firm economically involved in cooperation? Timing of contacts: Idea-stage, technical development stage, partner search, marketing etc. Role in relationship: lead partner, balanced relationship, consultant dual vs. mutual partner relationship.

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15. Technically, the questionnaire is set up in a way that the advisory system inquiry ‘mirrors’ the specific questions in the company survey.

#### **4. Conclusion and expected outcome.**

Innovation policy and support to the improvement and development of regional founded systems of innovation has become increasingly an popular instrument, not only of general business development policy, but in particular in a regular perspective. A core element in a recent Danish policy initiative is the improvement of the technological service system (Ministry of Science 2002).

The regional aspects of this policy has recently been highlighted by the decision to establish four new information technology cores in Western Denmark<sup>16)</sup> aiming to improve the spread of knowledge and technology between universities, research institutes and the business community in a regional context.

With regard to the general approach to deal with regional disparities the most important announcement is to introduce a 'regional assessment procedure' similar to the well known environmental assessment procedures concerning the regional impacts of governmental policy (Ministry of the Interior and Health 2002, p. 102ff.)

The project presented in this paper aims to contribute to the understanding of the process of implementation of means aiming the creation of a proactive regional business development concept linking the regional system to the national and global process of innovation. More specific is the purpose of the project to generate new knowledge within the area of innovative systems, and in particular the communication of knowledge to relevant actors:

- Knowledge about the most appropriate way to analyze innovative activities in cooperation between different partners
- The creation of knowledge about the way advisory systems work and improvements of instruments aiming the transformation of new knowledge about new processes and products.
- The importance of innovations for regional development in the short as well as the long run.

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16. According to the initiative four centers of competence will be established in university towns in Århus, Aalborg, Sønderborg and Odense (<http://www.videnskabsministeriet.dk> 18.6.2002).

- Identify and development of new tools for regional business development policy
- Identification of specific innovative strategies and key success factor

Basically, the proposed project tries to bridge the gap between theoretical knowledge about growth and innovations in a spatial context (see Acs & Varga 2002a) and the problems facing a particular geographical area, i.e. Western Denmark and Northern Germany.

**Figure 2** Functions and units in a system of innovation (with Danish examples)

	Administrations	Implementation	Knowledge
Local/regional	Counties & municipalities	TIC GTS	Universities and R&D institutes
National	Ministries and governmental agencies	Technological Institutes Consultants	Universities and R&D institutes
Spatial	EU International Agencies		Universities and R&D institutes

In the context of the system of innovation the institutional aspects are of particular importance, as stated by Acs& Varga (2002b, p.142), in particular with regard to the role of the public sector:

“In real world, the state and the public sector are rooted in national states, and national borders define their geographical sphere of influence. The focus on national systems reflects the fact that national economies differ regarding the structure of the production system and regarding the institutional setup.” (Acs & Varga 2002b, p.142)

Figure 2 above illuminates the functions and relations in the system of innovation with examples from the Danish part of the German Danish border region. This leads to the final expected outcome of our study, to assess the significance of different institutional frameworks for the innovative behavior of the firm and the region.

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