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1st COST ACTION E51 JOINT MC AND WG MEETING
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Hirsch-Kreinsen Hartmut, Jacobson David, Robertson Paul (eds)

„LOW-TECH“ INDUSTRIES: INNOVATIVENESS AND DEVELOPMENT PERSPECTIVES

A Summary of a European Research Project¹

Pilot Project Consortium

The Project Results in a Nutshell

In the movement towards a knowledge society in the European Union (EU), the competence to generate, use and absorb new knowledge is increasingly viewed as critical for economic success and societal development. Against this background, the conventional wisdom sees so-called high-tech, research-intensive and science-based industries as the key drivers of future economic prosperity. Such industries are seen as the main source of highly sophisticated products that are not easily imitated elsewhere and, therefore, the policy conclusion is that high-cost industrialised countries should concentrate their efforts on promoting these industries. In this scenario, Low- and Medium-Low-Technologies (LMT) industries are deemed to offer severely limited prospects for future growth, and as a result, receive less explicit policy attention and support. A critique of this widely held view is the starting point of a EU funded research project with the acronym PILOT – “Policy and Innovation in Low-Tech: Knowledge Formation, Employment and Growth Contributions of the ‘Old Economy’ Industries in Europe”. The following points provide a brief summary of the results of the project.

(1) The project found that most growth and employment in OECD countries still emanate from so-called LMT industries. Moreover, the firms in these industries are innovative and knowledge intensive without, by definition, engaging in R&D to any great extent, thus providing a striking challenge to the currently held notions about the sources of future industrial growth. These research findings show that growth is primarily based not on the creation of new sectors but on the internal transformation of sectors that already exist. Over-emphasising the role of high-tech activities ignores this major dimension of change in advanced economies. As a corollary, in order to ensure continued future growth prospects for advanced economies, policy-makers need to focus on the processes of innovation and creativity in firms in all sectors, not just high-tech firms.

(2) The micro examples of what goes on at the level of the firm aggregate to raise serious questions about the assumed relationship between R&D and innovation at the macro level of a country or region. It is clear that as an alternative to – or at least in addition to – R&D expenditures, analysts must use other indicators of innovativeness and of the general level of technology in an economy. The PILOT project has tried to address the issue of the

appropriateness of currently used innovation indicators and the conceptualisation of innovation on which they are based. We argue that improvements can be made in the use and construction of innovation indicators. In particular, PILOT research shows that the adoption of a family of indicators rather than a composite indicator is more appropriate.

(3) What are the preconditions for innovativeness in LMT companies? It can be argued that R&D in the established sense is only one and generally not the most important prerequisite for an organisation's innovativeness. Drawing on the discussion in the management sciences and economics on dynamic capabilities, a concept of innovation enabling capabilities is introduced. This concept aims at analysing the facilitating mechanisms and interdependencies between available resources and innovation results of diverse kinds; our analysis shows that LMT innovativeness is based on a particular enabling configuration of cognitive, financial and material (machinery etc.) resources that a company possesses.

(4) The project findings show that internal organisation practices - knowledge management and personnel policy - unquestionably play a vital role in this matter. Contradicting another stereotype, PILOT research reveals that there is a variety of skill levels and forms of work organisation both among and within LMT firms in a range of sectors, rather than simply the low-skill, hierarchical model that is often assumed. Additionally, network relations between companies and supportive social networks on a regional level are of great and growing importance as resources for firm capabilities. Network embeddedness in various forms is becoming increasingly important for the capacity of LMT industries to act, given the growing challenges of the world market and globalisation.

(5) The project findings also emphasise that future industrial development in Europe does not depend on making a choice between high-tech and LMT industries. Rather, all these sectors are inextricably linked. As the project findings show, interrelationships of low-tech and high-tech sectors are of major importance for the innovativeness of industry in general. The so-called LMT industries are crucially important as customers of high-tech sectors in developed economies. This relationship means that the continued viability of the high-tech sector is inevitably linked to the on-going vitality of LMT industries, a symbiotic relationship that is often overlooked.

(6) The policy recommendations of the project focus firstly on the specific situation of the newer member states of the EU. The project results show that the performance of these economies in general and of their LMT sectors in particular cannot be grasped without taking into account historical conditions, and especially without understanding the trauma of wartime destruction and the effects of nearly 50 years of communist policy concerning the economy, culture and morality. As the example of Poland shows, LMT industries raise many policy dilemmas. For the countries in the study in general, policy towards innovation in LMT industries can be improved; policy needs to be tailored; policy should conform to market processes; and policy needs to be broad-based.

(7) The research findings lead to a number of problems concerning innovation policy in the LMT sector. Several policy issues can be highlighted. First, there is little if any awareness of innovation-supporting policies other than focusing on R&D. Second, it is an important policy task to devise measures and to support activities which aim at improving the knowledge base and the capabilities of low-tech companies. Third, policy should focus on the development of firm capabilities to meet the demands of cross-company co-operation with corresponding channels of communication, gateways and personnel responsibilities. Fourth, policies should encourage both the generation of knowledge and its diffusion between low-tech and high-tech sectors, and promote the interrelationship between the sectors.

1. Challenges and Context of Research on Low- and Medium-Low-Technology (LMT) Industries

The main starting point of research on low-tech industries and the discussion on the development perspectives of such industries in the old industrialised countries of the European Union is a fundamental criticism of the widely held focus on high technology and necessitates a reexamination of the relevance of LMT sectors. To a large extent, this one-sided attention reflects the idea that ongoing societal change in modern societies can be characterised as typical of an emerging “Knowledge Society” (cf. Drucker, 1994; Stehr, 1994; Willke, 1998; David and Foray, 2003) or “Learning Economy” (cf. Lundvall and Borrás, 1997). These writers and others share the idea that modern organisations and societies are undergoing a fundamental change process, based on the enhanced significance of knowledge as a productive force and asset. Continual innovation, accompanied by a restructuring of work processes and organisation, is a decisive determinant of economic and social development, while the generation, diffusion and utilisation of knowledge is a core characteristic of firms and of economic activity as a whole.

To be sure, these discourses on the emerging knowledge society do describe important tendencies in economic and social development. We share the view that knowledge is an increasingly important resource, but we dispute much of the conventional wisdom about how the knowledge economy is structured and the implications for economic trends and hence policy measures. On the one hand, the knowledge economy is usually identified with a very small number of research-based or science-based activities, especially information and communications technologies (ICT), and biotechnology. On the other hand, it is often argued that as a consequence of increased knowledge intensity, the economies of industrialised countries in Europe and elsewhere are currently going through at least two great changes (Carson, 1998):

- A significant part of industrial production is relocating from its traditional sites to developing countries. The classic example is the exodus of textiles from the rich world over the past three decades. This applies particularly to labour-intensive ‘mature’ industries: quite soon, it is argued, many big Western firms in such industries will have more employees and even customers in developing countries than in developed ones.

- In many industrialised countries the balance of economic activity is swinging from manufacturing to services. Even in Germany and Japan, which rebuilt so many factories after 1945, manufacturing's general share of jobs in relation to the whole economy is declining rapidly in favour of high-tech manufacturing and services.

Particularly in Western countries, those focusing on these trends have been involved in a debate about an ongoing process of “de-industrialisation”, originating in the 1970s (cf. Fröbel et al., 1977). By the end of the 1980s, many American and European experts had come to believe that their countries' industries were being “hollowed out” as many basic production activities relocated to other areas.

The policy consequence drawn from this development is the well-known objective of making the EU the world's most competitive knowledge-based economy. How this objective can be reached has been debated since then, with the policy makers focusing especially on an important target indicator selected to reflect the objective, namely that the EU should achieve a R&D to GDP ratio of three percent. This political and economic objective has been strongly identified with the promotion of high-tech, high-R&D industries.

These arguments are interlinked with a well-known indicator measuring the ratio of R&D expenditure to turnover for a company or a business sector (OECD, 2002). According to the OECD categories, the industrial sectors can be classified as follows (Table 1):

Table 1: OECD classification of technology intensity

High-Tech industries	R&D/Turnover > 5%
Medium-High-Tech industries	5% > R&D/Turnover > 3%
Medium-Low-Tech industries	3% > R&D/Turnover > 0.9%
Low-Tech industries	0.9% > R&D/Turnover > 0%

High-technology sectors (“high-tech”) are those with a R&D intensity or more than 5 percent and sectors with complex technology (“medium-high-tech”) with a R&D intensity between 3 percent and 5 percent. Industries which are not research-intensive (“medium-low-tech” and “low-tech”) have a R&D intensity below 3 percent and are here referred to together as *low-tech and medium-low-tech (LMT)*. Pharmaceuticals, the electronics industry, motor vehicles, the aerospace industry as well as mechanical engineering, for instance, are categorised as high-tech or medium-high-tech. On the other hand, the LMT category includes “more mature” industries such as the manufacture of household appliances, the food industry, the paper, publishing and print industry, the wood and furniture industry and the manufacture of metal products – such as the foundry industry – as well as the manufacture of plastic products (Table 2).

Table 2: OECD classification of manufacturing industries by technological intensity

R&D intensity ¹ for aggregate of 12 OECD countries ²	1991	1995	1999
High-technology industries	9.4	9.2	8.7
Aircraft and spacecraft	13.9	16.2	10.3
Pharmaceuticals	9.4	10.6	10.5
Office, accounting and computing machinery	10.9	7.5	7.2
Radio, TV and communications equipment	7.9	7.7	7.4
Medical, precision and optical instruments	6.6	7.7	9.7
Medium-high-technology industries	3.1	2.9	3.0
Electrical machinery and apparatus, n.e.c.	4.2	4.0	3.6
Motor vehicles, trailers and semi-trailers	3.7	3.5	3.5
Chemicals excluding pharmaceuticals	3.4	2.8	2.9
Railroad equipment and transport equipment , n.e.c.	2.9	2.6	3.1
Machinery and equipment, n.e.c.	1.9	2.0	2.2
Medium-low-technology industries	0.9	0.8	0.7
Building and repairing of ships and boats	0.9	0.9	1.0
Rubber and plastics products	1.0	0.8	1.0
Coke, refined petroleum products and nuclear fuel	1.2	0.9	0.4
Other non-metallic mineral products	1.0	0.8	0.8
Basic metals and fabricated metal products	0.7	0.6	0.6
Low-technology industries	0.3	0.3	0.4
Manufacturing, n.e.c.; Recycling	0.5	0.4	0.5
Wood, pulp, paper, paper products, printing and publishing	0.3	0.3	0.4
Food products, beverages, and tobacco	0.3	0.3	0.3
Textiles, textile products, leather and footwear	0.2	0.3	0.3
Total manufacturing	2.5	2.4	2.6
Source: OECD: ANBERD and STAN databases, May 2003			
¹ R&D intensity defined as direct R&D expenditures as a percentage of production (gross output), calculated after converting countries' R&D expenditures and production using GDP PPPs			
² United States, Canada, Japan, Denmark, Finland, France, Germany, Ireland, Italy, Spain, Sweden, United Kingdom			
Source: OECD Science, Technology and Industry Scoreboard 2005, Annex A, p. 183, OECD 2005 (modified)			

In this debate, the fact that all industrialised countries have a large proportion of LMT industries, and the fact that these industries (whatever their vintage) provide goods and services that are absolutely vital to the function of modern societies (cf. section 3) are often

simply ignored. In spite of growing global competition, particularly in the sectors of traditional and mature industries, this continues to hold true for the industrialised countries of Western Europe as well as for the transition economies of Middle and Eastern Europe.

Further evidence for the importance of the LMT sector is provided by a number of empirical findings which emphasise the innovation ability of the low-tech sector particularly in high-tech countries (e.g. Maskell, 1998; Palmberg, 2001; Tunzelmann and Acha, 2005). Thus *The Economist*, for instance, referred to “the strange life” of low-tech industries in high-tech California (*The Economist*, 1998). From the perspective of economic history, one can argue that low-tech industries were among the pioneers of multi-divisional modes of organising the production and distribution of a continuous flow of branded goods. Hence, we agree with Mendonça and von Tunzelmann (2004, 15) that, “Innovation in low-tech industries should ... not be seen as a contradiction in terms.”

The questions which pose themselves are therefore:

- What are the reasons for the remarkable stability of LMT in the industrialised countries?
- Can LMT sectors be called innovative and is there a specific mode of innovativeness of non-science based companies?
- What policy recommendation for the promotion of LMT can be derived from the factual record and sound analysis?

These are the basic questions of the research project entitled “Policy and Innovation in Low-Tech: Knowledge Formation, Employment & Growth Contributions of the ‘Old Economy’ Industries in Europe” (PILOT), which was undertaken by a consortium of social scientists from eleven universities and research institutes in nine European countries. PILOT began in December 2002 and ran until the end of 2005.²

2. Research Objectives and Methodology

PILOT’s research on LMT industries has aimed at deepening the understanding of the growing knowledge intensity characterising economic and social development in Europe. A central assumption was that this process does not depend exclusively on industries with frontline technological knowledge but also on LMT industries. *The hypothesis is that these are not necessarily low-growth industries; many companies and branches within these industries are growing fast in comparison to the rest of the economy, are interlinked with high-tech and service branches, and provide an important basis for future growth and employment.* The role and importance of these industries in different European nations and for the economic and social prospects of Europe as a whole have been analysed by the project consortium.

² The PILOT project was financed within Framework Programme 5, Key Action “Improving the Socio-economic Knowledge Base” (HPSE-CT-2002-00112). The project was coordinated by the Chair of Economic and Industrial Sociology of the University of Dortmund (is@wiso.uni-dortmund.de). The duration of the project was from December 2002 to November 2005. For more information see: www.pilot-project.org. The project is also discussed in more detail in Hirsch-Kreinsen et al. (2005). The

The research objectives of the project were:

- To determine the role and importance of specific LMT sectors in the context of economic development in general.
- To identify the organisational and societal preconditions and mechanisms that enable innovation and knowledge creation in LMT industries.
- To ascertain the relevance of firm-level knowledge from a network perspective in order to gain an understanding of innovative ability along whole value-chains, including high-tech and service companies.
- To contribute to the formulation of policies on industrial restructuring which pay appropriate attention to the significance of LMT industries for the further economic and social development of Europe.

To achieve these project objectives and tasks, we have used a mix of different statistical and case study-oriented methodologies. On the one hand, conceptual, taxonomic and statistical data issues have been tackled, while on the other, low-tech firms have been scrutinised empirically. The core of the project was the generation of an extensive series of 43 company case studies in eleven countries across Europe.

Box 1: Methodological Background

The sample consists of companies of all the relevant PILOT economic sectors and thus covers the wide range of different economic sub-sectors in which low-tech companies are active. The sample also corresponds to the diversity of LMT sectors in terms of many other factors including turnover, ownership, value chain position, batch sizes, etc.. The bulk of the companies investigated were small- and medium-size enterprises with between 50 and 500 workers (Table 3).

Each project partner conducted four case studies in two different industrial branches. One branch – the metal sector – was pre-selected and the same for all partners, while the other branch was chosen individually by the partners according to their own national or regional backgrounds in terms of growth or employment.

Apart from visits to the company sites, the case studies consisted mainly of several interviews with representatives of the chosen companies, e.g. managing directors, departmental managers for production, personnel and/or R&D, shop floor personnel, works councils etc.

A standardised questionnaire was used to collect basic data on each company, its production process and its relations to suppliers, clients and, if relevant, partners. This research instrument was complemented by about half a dozen semi-structured extensive interviews for each case study (based on a master guideline common to all national project teams) with company representatives on different levels and with different functions, by site inspections and by an analysis of the firms' publicly available documents. The case studies were conducted over the period spring 2003-summer 2004.

Table 3: The PILOT case studies

Number of	Paper & Pulp	Textile	Food	Wood &	Metal
1 – 50		1	1	1	5
51 – 100	3	1	2	2	6
101 – 250	1		1		6
251 – 500		1	1	1	5
> 500	1		1		3
Sum (N=43)	5	3	6	4	25

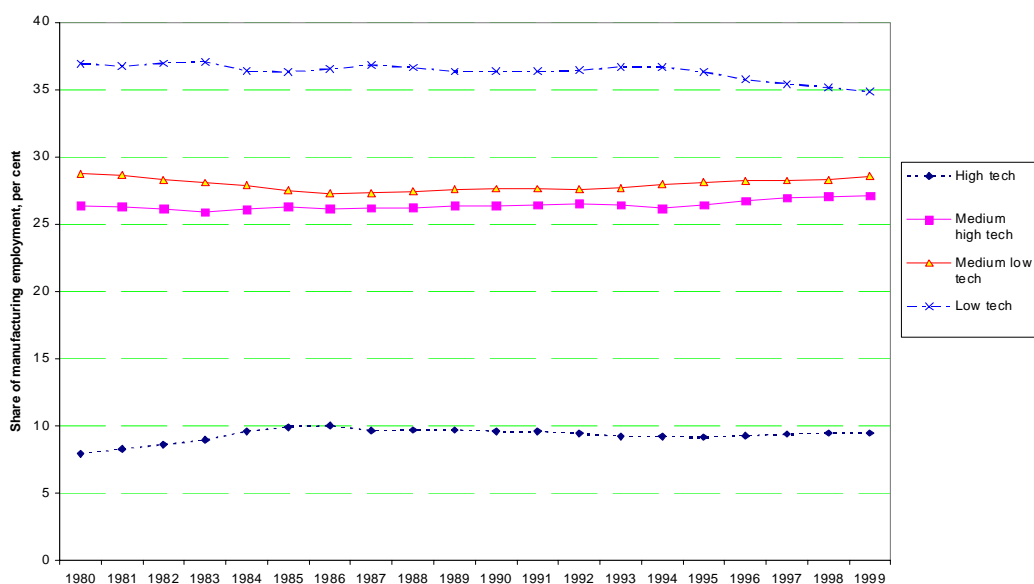
3. The “Strange Life” of LMT

Generally, and not surprisingly, the statistical data show the well-known picture of economic development in all mature industrial countries (for more details cf. Kaloudis et al. 2005). The following empirical findings should be stressed:

There is a clear and well-known trend for industry’s share of total employment to decrease rapidly and for that of the service sector to increase just as – if not more – rapidly. In the period 1981-1999 the share of services in employment grew strongly, from 60.7% to 70.5% of total employment in 15 OECD countries. The largest shares of growth in services occurred in two broad areas: financial services, and community and social services (the latter including such activities as health care and education). During the same period, manufacturing employment declined from 21.8% to 16.7% of total employment.

However, if one examines the industrial sector more closely, some surprising findings arise with regard to the significance of the LMT sectors. The data show that the LMT industries play a very important role in employment in all industrialised countries (Figure 1). LMT industries account, roughly speaking, for over 60 percent of employment in the whole manufacturing sector whereas the share of high-tech industries is less than 10 percent. There has been a tendency for the low-tech industries’ share of manufacturing to decline during the long period 1980-1999, while the share of high-tech industries has increased. A similar trend can be observed regarding the share of value added of the different sectors in manufacturing. In the long run, starting from a low level, high-tech sectors show a rising share of the value added in manufacturing while the share of the LMT sectors is declining. However, these declines are not marked, and the LMT industries still constitute by far the largest part of the manufacturing sector in OECD economies. It is debatable whether there is a real structural change in the period examined here. In fact, the low-tech sectors continue to evince remarkable stability and a high share of employment.

Figure 1: Shares of employment in total manufacturing. 1980-1999. 11 OECD countries combined³



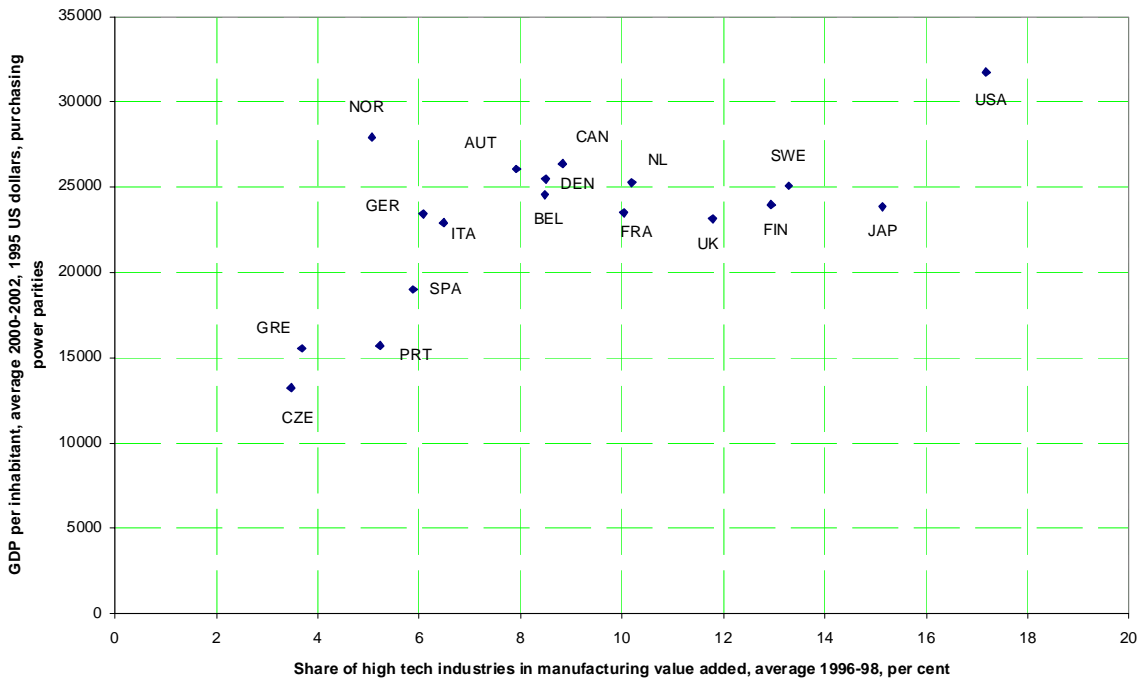
Source: Kaloudis et al. (2005)

In addition, there is no clear connection between high technology intensity and national growth rates. The question is whether countries with a higher share of high-tech sectors have the best growth performance. On the basis of the statistical data no positive correlation can be found between the high tech share in manufacturing value added and the rate of growth of GDP per inhabitant. This is illustrated in Figure 2.

Furthermore, it cannot be generally concluded that only high-tech countries are also high growth countries. Rather, it can be shown that many low-tech countries have a significant growth performance. All our findings lead again to the question: What are the reasons for this remarkable stability of LMT industries? The answer requires a discussion on the mode of innovation in non-science based industries.

³ The figure is based on the OECD's STAN database, which comprises data at 2 and 3 ISIC digit levels for the manufacturing sectors of OECD economies. Data are shown only for those OECD countries for which sufficient data are available: Austria, Denmark, Finland, France, Italy, Japan, Norway, Portugal, Spain, Sweden and USA. The two most important countries which are excluded during this first period 1980-1991, on account of insufficient data, Germany and the UK, are included in the second period covering the years 1991-2002 (Kaloudis et al., 2005).

Figure 2: GDP per capita. Average 2000-2002, 1995 US dollars (y-axis); share of high tech industries in manufacturing value added. Average 1996-1998 (x-axis)



Source: Kaloudis et al. (2005)

Box 2: A general conclusion concerning the economic relevance of LMT

In the words of Kaloudis et al. (2005): “There is no evidence supporting the argument that the high tech economies are also the high growth economies. This suggests that different economies can follow different paths of economic growth. Countries play different roles in the differentiated international economic system with clear patterns of division of labour among the highly developed economies.

Based on these conclusions we would hypothesize that growth is not primarily rooted in the creation of new sectors but in the internal transformation of sectors which already exist and/or are growing, such as, the service sector. Overemphasising the role of the high tech sectors as isolated contributors to growth ignores this major dimension of change due to transformation in advanced economies.

Such oversimplifications in the conventional wisdom are rooted in fundamental assumptions supporting modern research and innovation policies, which by overemphasising the role of R&D in economic growth often underestimate processes of change and the needs of those sectors of the economy with low R&D-investments.”

4. Mode of Innovation

A central precondition for the surprising stability of the LMT industries is their strategic flexibility and ability to innovate. These enable them to face up to the pressures of world market competition by developing new products, new process technologies and new ways of organising. For a better comprehension of this connection, it is essential to come to an understanding of innovation processes that a narrow focus on R&D intensity obscures. In order to deal with this issue, PILOT has focused on the central dimensions and mechanisms that underlie the innovation ability of firms in LMT sectors.

4.1 Basic Dimensions

The starting point of our analysis is the argument that the dominant concepts developed so far to describe and analyse industrial and technological change have many shortcomings. The main argument in this respect is criticism of the interpretation of innovation processes as a linear model. This linear model assumes that research and development activities are the starting point of any kind of innovation and that scientifically generated knowledge is a prerequisite for the development of new technologies. If firms with low or no R&D – i.e. most LMT firms – are innovative, then the linear model should not be accepted as the basis for debates on innovations. A more theoretically based criticism refers to Joseph Schumpeter's concept of innovation (cf. Laestadius et al., 2005). This concept establishes no compelling connection between innovation and scientific or technological originality at all. All creative activities which contribute to diversity and thus generate profits count as innovations in Schumpeter's concept. Many of the problems faced by today's innovation researchers, such as classifying the "uniqueness" or "technology height" of innovations, are of little relevance from this perspective. What matters is not the existence of a science base but professional creativity that can score in the marketplace. Schumpeter's formulations allow for a better understanding of the creative processes which take place in so-called low-tech manufacturing sectors as well as in many service sectors, including those labelled knowledge intensive business services.

Following this basic idea, an analysis of LMT innovation processes may start by asking how successful companies manage to develop or create the capabilities and competencies which make them perform better than their competitors or at least help them to survive commercially. Part of the answer may, of course, be found in R&D activities or in what can be identified as R&D, carried out and financed in-house or acquired from outside sources. Another part may be related to other activities, of which some may be called innovations and others may be a far cry from what innovation researchers normally focus on. A convincing analysis has to identify and capture all these "profit enhancing" or "survival facilitating" activities irrespective of their labelling. To analyse the requirements and preconditions for the innovativeness of low-tech companies more closely, it is therefore necessary to clarify the specific structural conditions of these firms. These can be characterised relatively precisely by recourse to the R&D intensity indicator: The companies have limited or no independent R&D capacities at all and their in-house expenditures on, for example, R&D personnel and other costs and investments connected with R&D activities are low. Their outside spending on R&D by other companies or organisations is likewise small. As a result, one can assume that these firms have other kinds of resources and capacities to act, on which their innovation ability is based and which (functionally) compensate for their lack of R&D capacity (Palmberg 2001).

Box 3: Towards an alternative system for classification of innovativeness

Laestadius, et al. (2005) emphasise that at least five dimensions should be considered when analysing the innovativeness of LMT firms: "So far we argue that all firms in all industries may be analyzed in five dimensions which can be measured through quantitative data collection and/or surveys. We may thus classify firms according to their:

- R&D intensity
- Design intensity
- Technological intensity
- Skill intensity (Human capital orientation)

Innovation intensity

So, this will end up with five indicators – or six if adding an organizational one – which together make up a profile for the individual firm and/or for an aggregate of firms, e.g. an industry or a "sector" aggregate of different industries (e.g. the "ICT-sector" or the "technological system for pulp and paper"). These indicators may require different sets of questions or data. The R&D intensity indicator is probably the most obvious: we may here stick to a revised and ... narrower version of the Frascati manual. As regards design intensity we may include a broad design concept including parts of what hitherto has been included in the D of R&D. As a result of that reallocation of design activities, R&D intensity will, *ceteris paribus*, decline in the statistics. In addition the broadening of the design concept may have consequences for what aspects should be included in the new innovation intensity and thus have some impact on the further revisions of the Oslo Manual."

4.2 Capabilities

A possible starting point for such an analysis could be resource-oriented analysis concepts of innovation and management research (e.g. Penrose, 1959; Foss, 1997) which lend themselves well to attempts to specify the above-mentioned connections. These concepts aim at examining how firms attain competitive and innovative advantages, what resources they have at their disposal in this respect and how they employ these resources. The central argument is that companies can be characterised by means of their specific combination of more or less special and rare resources, especially of knowledge in miscellaneous forms and not only of R&D based scientific knowledge. Furthermore they must apply a specific competency to be able to make use of these resources for their strategic goals in each case. The capability approach of Teece et al. (Teece and Pisano, 1994; Teece, Pisano and Shuen, 1997) elaborated more recently by Zollo and Winter (2002), is relevant in this context because it provides a framework for examining the broad variety of firm-specific factors that are important for explaining innovations. Design and synthesising capabilities can be regarded as especially significant in this respect.

To be able to analyse these connections and the mechanisms linking available resources and innovation outcomes of diverse kinds more precisely, a specification of the capability approach is needed. Bender and Laestadius (2005) provide this by suggest that the term capabilities should not be understood as a pattern of activities but rather as a term to address specific preconditions for specific activities: a particular configuration for enabling the cognitive, financial and material (machinery etc.) resources that an organisation possesses.

They further suggest two fundamental dimensions, namely transformative and configurational capabilities. The former focuses on the enduring ability of an organisation to transform externally available, codified knowledge into company-specific knowledge, the latter on the enduring ability to synthesise novelty by creating new configurations of knowledge, artefacts and actors. Three specific aspects of configurational capabilities are described:

- cognitive: configuring distributed knowledge of different kinds;
- organisational: configuring distributed actors and other repositories of knowledge and know-how;
- design: configuring functional features and solutions.

The distinction between transformative and configurational capabilities is analytical; empirically the two dimensions are tightly interwoven.

Given the types of companies which were examined, the analysis of the empirical results on the basis of these categories yields no surprising findings. Innovation in this sense is to a great extent the result of the transformation and reconfiguration of well-known internal and external knowledge and of components and technologies developed elsewhere. What all the case firms in this sample had in common was that not one of them based their innovativeness on recent scientific findings and knowledge. The conclusion of this analysis is that even within mature industries with unfavourable cost conditions at least some firms may develop capabilities which make them profitable and competitive over a relatively long period. In these cases, innovation is to a great extent the result of processes of transforming and configuring generally well known knowledge, components and technologies developed elsewhere. There may also be knowledge formation processes similar to what can be found in other firms labelled as high-tech or medium high-tech. In general, this approach to “innovation enabling capabilities” developed in the context of the PILOT project is not only appropriate for the analysis of innovation processes in LMT industries but may also be useful for science-based innovations.

Box 4: An example of an innovative LMT company

Bender and Laestadius (2005) describe an example of a specific aspect of configurational capabilities: “We have seen many examples of creative configuring of distributed knowledge and competence in the case studies. One of them is an Austrian producer of rails. Their capabilities to join forces with external expertise in order to foster development of innovative product solutions are a critical success factor. It is important to note that we are not talking about just the competence to organise external support for continuous improvements of their core products. This is something one can reasonably expect from any competitive producer. The competitive edge results from the ability to be more creative when needed. In this specific case the company is confronted with a general trend in the railway industries. Due in part to structural changes on the side of many railway transportation companies (liberalisation, segmentation into independent functional units etc.) the customers tend to ask for system solutions rather than simply for tracks. In such a situation suppliers have to be able to functionally augment their core products without giving up the advantages of specialisation. The firm discussed here is well known for being able to produce the worldwide longest head hardened non-welded pieces of rail (120 metres). This is in itself an innovation. But they also offer a novel process to lay these bulky pieces. The appropriate handling system was developed in collaboration with a German manufacturer of railway equipment and machinery; its design embodies the merged expertise of both partners.”

5. Practices and Resources

5.1 Knowledge Management and Personnel Policy

The concept of capabilities refers to the conditions on which an enterprise's ability to be innovative depends. This question can be answered by looking at the findings of innovation studies. According to these, one can basically start from the assumption that this ability is strongly embedded in the practices and processes of the firm's organisation (cf. Henderson and Clark 1990). Following Schmierl and Köhler (2005), these include the modes of knowledge management and personnel policy used by a firm as central elements of transformative capabilities in LMT companies. According to the case studies findings, there is neither one common pattern regarding work-force and work organisation nor one shared pattern of knowledge creation and utilisation. The knowledge base of the low-tech companies investigated can be characterised as "accumulated internal knowledge". Regarding the processes of knowledge creation, two main, opposing, patterns were identified:

- The stimulation of collective accumulated knowledge on the shop-floor, and
- The concentration of knowledge creation in the hands of specialised personnel in the planning departments in terms of a Taylorist tradition of work design.

Both patterns are characterised by a systematic combination of dispersed knowledge and an incorporation and assimilation of external knowledge. It can be shown that LMT firms are not basic innovators but combine existing codified knowledge with practical knowledge in a competitive way. The knowledge management strategies which can be identified are not at all different from other sectors although there was one frequently expressed position: "We are followers, not trendsetters". LMT firms very often improve their capability to incorporate external knowledge which has already been implemented and tried by others. Benchmarking and learning from the best is a very common practice which requires the capability to observe, to obtain information, to analyse and to transform machines, design or organisational structures from other contexts.

As regards work organisation and personnel policy, many low-tech companies are characterised by specific capabilities in processing technology and logistics which produce uniqueness and competitiveness. The case study sample ranges from companies using ultra-modern machinery and highly automated processes (especially in the paper industry, but also in parts of the metal-working industry) to companies which are barely automated and still largely depend on traditional manual labour and standard technology (as in the food, textile and wood processing industries). However, as a general rule, it can be emphasised that the term low-tech as a classification of sectors is not necessarily synonymous with low-tech manufacturing processes.

The same holds true for patterns of work organisation:

- The workforce and work organisation vary from company to company. This means that there is definitely no low-tech specific pattern of work organisation and qualification levels which is systematically distinct from medium or high-tech sectors. This heterogeneous economic segment is indeed characterised by a variety of different forms of work organisation.
- The concrete work organisation is determined by an interplay of many factors, such as product complexity, production process characteristics and automation, personnel policy, quality requirements and customer demands. There is also a wide variety of qualifications and skills with differences as to where and in what form transformative capabilities are located internally.
- Most firms, however, are characterised by the concentration of strategic knowledge in the hands of a rather small group of managers and technical staff while the production workers are more or less skilled operatives.

The dominant patterns of personnel policy rely heavily on the predominance of internal training, which is mostly supplied unsystematically during daily work and at the workplace. In most cases there are forms of vocational further training predominant with a great range of intensities. Apart from characteristic differences (e.g. between the sectors or certain types of enterprises). Schmierl and Köhler (2005) found three predominant basic modes of vocational education and training in the sample. In order of importance, these are:

- Internal training on the job and learning by doing;
- Recruitment of key workers on the external labour market followed by an internal phase of training on the job; and
- Cooperative further training with other institutions and companies.

To summarise the PILOT findings with respect to knowledge management and personnel policy in the investigated low-tech companies, it can be stated that the regular workforces of many companies hold a considerable, as yet underdeveloped, potential for the improvement of transformative capabilities which can be tapped by strategic training and by improved and appropriate forms of work organisation. As the authors emphasise, most of the investigated low-tech companies seem to follow a policy of “muddling through” instead of a systematic and foresighted personnel policy.

Box 5: An Example for a Systematic and Foresighted Personnel Policy in LMT

Schmierl and Köhler (2005) suggest that a German paper mill with approximately 100 employees may stand as a prototype for an advanced personnel policy including an integrated work organisation, technology and workforce related strategy. Within the process the paper-machine plays a central role. Modern ones are up to 140 metres long, up to 25 metres high and can produce 1900 m/minute of paper. Hence the key challenge in this industry is to adapt all other productive factors hierarchically to the paper-machine.

The company's business strategy is characterised by a very modern and innovative work organisation, including maintenance. The huge paper machine is operated in a five shift system, each shift consisting of 14 workers, who run the whole production line. Each shift can be further differentiated into four teams of three workers and one team of two, with each team responsible for a specific segment of the paper machine. The different shifts and teams operate – in contrast to the usual very hierarchical work organisation in the paper industry – relatively autonomously and are individually accountable.

For example the change of the shifts is organised by the respective shift personnel themselves. The workers in a team have different, distinct qualifications. In general one is a paper-maker, one is an electrician and one is a mechanic. Such hybrid team qualifications are necessary, as the teams have to fulfil an extraordinarily wide range of tasks and activities. Remarkably, each shift is not only responsible for the running and operating of the machine, but also for its maintenance. The degree of reliance on the knowledge of the workers is reflected in the fact that only skilled workers are employed.

The model of integrative maintenance requires hybrid qualifications – within the entire workforce and even within the single work teams. Furthermore, through the teams a continuous transfer of knowledge is enabled. A system of reciprocal training-on-the-job prevails, in the sense that the mechanics, for example, train the paper makers regarding the maintenance of the machines, while the paper makers in turn impart their paper-specific knowledge to their colleagues. Finally, the relevance of this internal source of knowledge is reflected in the efforts the management undertakes to promote learning processes.

For example a specific collective agreement regarding the working time was implemented at the plant. Whereas the weekly working time in the paper industry is usually 38 hours, this firm's workers of the company must put in 39 hours. In the additional hour they are obliged to take part in on-the-job training, e.g. to learn to operate on different sections of the paper machine. It is striking that the concrete nature of this training is not determined by the management. The complete training – even the timing – is organised autonomously by the employees. Only its content is agreed with superiors according to production necessities and the company's business strategy.

5.2 Networks and Local Embeddedness

Network relations between companies and supportive social networks are also of great and growing importance as resources for the companies' capabilities. Network embeddedness in various forms is becoming increasingly important for the capacity of LMT industries to act, given the growing challenges of the world market and globalisation. This is the basic argument of Garibaldi and Jacobson (2005), whose systematic analysis of the empirical findings concludes that:

- The equation “low-medium- tech industry = locally embedded processes” is not tenable; while some of the businesses studied are highly embedded, others are not.

- Likewise, the equation “low-medium-tech = structural weakness in the face of globalisation” is wrong; some of the study cases provide evidence of strongly embedded processes but nonetheless proved able to attain a global market position.

Many of the cases investigated concur with overall business trends towards increasing internationalisation. For many LMT firms, an increase in internationalisation has meant a decrease in territorial embeddedness. What is significant, though, is that a number of the firms have successfully increased their level of globalisation while simultaneously maintaining a high degree of local embeddedness. In these cases, the research findings substantiate the connections well-known from earlier regional research – that firms in general, but especially LMT firms, are very sensitive to the density of the institutional set-up both on the national and sub-national levels. “Density” in this case stands for a mix of physically available infrastructures, of educational and vocational knowledge creation, and of diffusion and brokerage facilities. Thus there is no typical LMT firm characterised by standard behaviour concerning global or local orientation strategies. On the contrary, there are close interdependencies between these factors.

Box 6: The Dilemma between Globalisation and Territorial Orientation

As Garibaldo and Jacobson (2005) sum up their findings, the success of LMT firms can depend on contradictory strategies: “Successful LMT firms are going global though different paths either by strongly reducing their own degree of embeddedness in a specific territory or utilising it as a competitive asset. Whether adopting the latter strategy has to do with being an SME should be investigated. The first strategy is sometimes very complex because it seems that successful firms following this path are aiming for a mix of embedded and non-embedded elements. The rationale is very clear: to utilize the embedded factor to shape a specific product/service asset in the global scene while at the same time to disembed the standardised products/services. This results in activities competitively done in – and unique to – a location remaining there, while others are moved to where they can be done more cheaply. Designing the proper mix is quite difficult.

The second strategy stems from the simple fact that in a global world there are broad sets of products and services whose value depends on being associated with some kind of uniqueness. A clear example can be a specific sector, such as food, but also a traditional pairing of some product quality – for instance quality or delivery reliability – with a country or a region. In this case, too, the strategy is not simple because it cannot be the mere continuation of the tradition; the same “content” should be made available according to new stan-

In this context, the aspect of the integration of LMT firms into value chains is also of importance. Especially in the light of a progressive restructuring process of value chains, the question of where LMT firms position themselves is of strategic importance. The empirical findings show that LMT firms are distributed at different levels so that there is no single formula for success. Box 7 discusses the importance of a firm’s location in a value chain and outlines ways of increasing integration.

LMT companies often play a strategic role in the smooth functioning of value chains. It is not surprising that proximity plays an important role in this regard. However, this need not necessarily mean spatial proximity. More important are cultural and organisational proximity that constitute the precondition for the passing on of knowledge (especially practical, non-

codified knowledge) between companies. Again the social context is of critical importance for technological evolution and innovative capacity. In many cases, value chains as well as clusters need strong intermediate institutions and institutional infrastructures to provide resources for the management and organisation of networks. Such institutions can be created through the combined efforts of public institutions and local stakeholders so that social contexts can be generated that strengthen the innovation process. Where LMT firms are otherwise excluded from innovative networks, this process can lead to their inclusion.

Box 7: How to integrate LMT companies into global value chains

“The devaluation of the global value chain is a very difficult strategic issue that must be confronted. Generally speaking the overall process of concentration in most business activities leads to a restructuring of the value chain with a trend towards a devaluation of the manufacturing activities in favour of the final producers or distributors. In this case the position along the value chain is of critical importance. LMT firms are distributed at different levels so no single recipe exists for all. Basically the ones in the upper part of the value chain are not so keen on designing new strategies for moving up the value chain. For the others moving up is a matter of survival; moving up means acquiring the capability (managerial capability, organisational renewal and workforce skills) to handle customised product/service innovation. This presents the problem of a new degree of integration with clients and suppliers. What is really new is the fact that generally clients and in many cases also suppliers are no longer bound by geographical proximity, so again the problem is to cope with the globalisation trend. The conclusion of our research is that – depending on their actual positioning along the value chain - our LMT firms have a low level of integration. OEMs, and more generally, firms at the top of specific production chains, are looking at some kind of closer integration with specialists and first tier suppliers, the so called integrators; to decide how close, if at all, an LMT firm should be to other firms is of course a difficult choice but this is one of the critical strategic choices to be made. The evidence suggests that most of these firms will have difficulty making this choice because it implies a general restructuring of their businesses and therefore new managerial capabilities, a different and more sophisticated organisational structure and in many cases new skills for the workforce” (Garibaldi and Jacobson, 2005).

5.3 Interrelationships of LMT with High-Tech Sectors

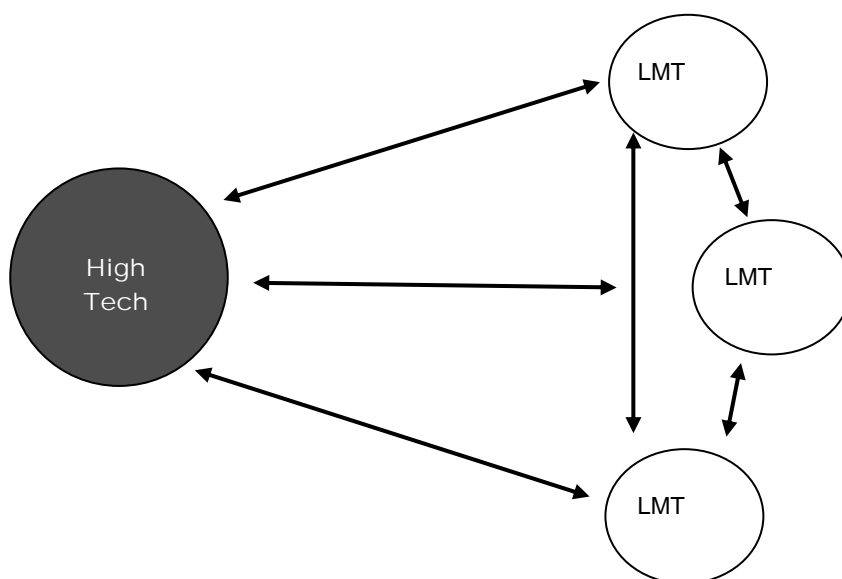
As shown above, the term low-tech as a classification of sectors is not necessarily synonymous with low-tech manufacturing processes. Therefore both the ability to integrate and to utilize high-tech manufacturing technologies and the relationship of low-tech to high-tech sectors are of decisive importance for the development perspectives and prospects of LMT companies.

However, as the PILOT findings show, technological flows do not move only from new and higher-technology sectors to older and lower-technology sectors. The analysis of the interrelationships between LMT companies and high-tech companies within value chains clearly show the strategic role LMT companies play for innovation in high-tech (cf. Bardi et al. 2005). In different cases it could be recognised that LMT companies actually boost the innovative capabilities of high-tech firms. In the case of the paper industry in Germany the main impulse for innovation typically comes from the paper manufacturer's request that the chemical supplier, a high-tech company, should either alter an already existing product or develop a new one (e.g. a new dye). The fostering of innovation in high-tech companies by LMT firms is also illustrated by an Italian case on the value chain for sintering. In this case a

die manufacturer, which is formally defined as a low-tech company, is involved in continual product innovation and is able to influence the design processes of its high-tech clients.

Furthermore, Robertson and Patel (2005) emphasise that in many cases the viability of high-tech sectors and the levels of resources devoted to research and development are directly related to the rate of diffusion because the main customers for high-tech products are in the LMT sectors, and therefore the rates of return to R&D in high-tech areas are a direct function of rates of technological diffusion. For Robertson and Patel (2005) “perhaps the most important backward linkage from LMT to high-tech industries comes simply from the revenue that sales provide, which helps to cover the substantial fixed costs that arise out of the innovation process and engenders economies of scale. In innovative situations, lumpiness and resulting non-convexities affect several areas including gearing up for production and the expenses associated with R&D itself. Diffusion can be crucial at this stage because the larger the number of LMT industries that adopt an innovation, the quicker the rate of amortisation of development costs will be. These economies of scale can then be translated into lower prices of innovative products for the LMT industries (greater pecuniary externalities), further economies of scale for the high-technology industries, and the generation of what Nurske (1953) has termed a ‘beneficent circle’”. This relationship between high- and low-tech industries is depicted in Figure 3.

Figure 3: Reciprocal Relationships between High Technology Sectors and Other Sectors



Source: Robertson and Patel 2005

The project findings emphasise that future industrial development in Europe does not depend on making a choice between high-tech and LMT industries. Rather, the performance of all these sectors is inextricably linked. On the one hand the productivity of LMT sectors is based on high-tech innovations, but on the other, the innovative capability of the high-tech sectors depends on their narrow relationship with LMT industries.

6. The Specific Situation of a New EU Member State: Poland

The conditions and patterns of innovations in LMT sectors outlined above mostly relate to Western and Northern European countries with their generations-long free market experiences. It is obvious that the economic and industrial situation in the new Central European Member States is structurally different from that of the Western states. In the context of the PILOT project, this was exemplified by the situation of Poland. The situation of the low-tech sector in Poland is not comparable to that of the corresponding sector in the Western EU countries.

In their analysis, Borkowski and Marcinkowski (2005) refer to the agrarian past of the majority of Central and East European societies, their limited industrial traditions, the strong impact of so-called socialist industrialisation, years of communist rule and finally the transformation process and the new imperatives of the market economy. Their conclusion is that all of this resulted in a lower level of innovativeness in the LMT sectors and in the country's economy as a whole. And they continue: "There is a difference between LMT firms of the East and the West which is a result, first of all, of the backwardness of their social, cultural, legal, capital and institutional environment which is firstly due to differences formed over time (historical determinants), and secondly due to the separation of these countries, with the consent of the Allies, from Western civilisation, and especially from its work ethos, culture, learning and the democratic system of government (political determinants)." As described by them in more detail, these determinants are reflected in the organisational culture of the enterprises as well as in the institutional and economic environment.

For instance, the fact that currently approximately 70 percent of the banking system in Poland is in Western ownership can be regarded as a decisive factor in the specific Polish situation.

- On the one hand, this takeover led to the modernisation of the financial system and the surprisingly rapid introduction of methods, techniques and financial tools previously unknown in Poland.
- On the other hand, such a situation holds certain threats. Banks are a decisive precondition for the economic development of the country in which they are based.

The latter has led to a well-founded apprehension about loss of access to necessary investment capital. Indeed, it is well documented that firms competing with their counterparts in the countries in which the banks have their headquarters may encounter problems in obtaining loans. This has already taken place in Poland and has also been connected to the purchase and later with the closing of competitive plants.

At the same time, however, it is obvious that the economic situation in Poland – contrary to the situation in other new Member States – is characterised by an at least limited tradition of independence and entrepreneurship. Last but not least out of fear of local mutinies, the governments in the Communist era allowed and fostered sectors of small craftsmen's workshops and, to a greater extent, private agriculture. Furthermore there is a long-standing tradition of an informal economic sector. The question is whether this tradition offers a potential basis for lasting development. Given an adequate framework, it might become the source of economic initiative and development dynamics.

According to Borkowski and Marcinkowski, these very diverse and partly contradictory conditions constitute a number of dilemmas for public policy in dealing with SMEs and thus also indirectly with LMT firms. They point out that policy makers are still completely undecided about whether to follow a national or a regional approach with regard to support programmes; they see a further dilemma in the unsolved question of whether one should follow foreign models or should develop one's own models with respect to political programmes. From a Polish perspective the question is still unanswered as to whether policy can really shape the LMT situation and – if so – what type of policy can be effective. Concerning the Polish situation and possible policy measures in general, one can therefore formulate the following thesis: The present situation in Poland is very much characterised by policy dilemmas on how to promote low-tech sectors. At the moment, it is almost impossible to say which policy tasks and measures are appropriate and might be successful. Simple concepts are certainly not appropriate in this case.

Box 8: Specific Policy Conclusions

Two policy conclusions developed by Borkowski and Marcinkowski (2005) should be highlighted:

1. There exist essential differences between the Western and Eastern parts of the EU in the proportions of their economies accounted for by low and high technology firms, respectively. These differences should be taken into account when drawing up policy on the low tech sector. In Central and Eastern Europe the participation of the high-tech sector is very low. Therefore a question should be posed whether, and if so, how existing differences can be levelled out. Should the objective be to systematically expand the high tech sector and simultaneously to "export" the low tech sector outside the borders of EU e.g. to Third World countries? It seems that the low-tech sector cannot be endlessly restricted, as this can threaten the development of the high-tech sector and possibilities of high technology transfer. It must be admitted that the high-tech sector is not in a position to perform well without a close co-operative bond with the low-tech sector and vice versa. It would be a mistake to attribute absolute significance to any of these sectors. In the light of the PILOT research one thing seems to be unquestionable: these segments of the economy depend on each other in various ways (functionally, cooperatively, organisationally, technologically etc.) and each of them needs the other.

2. Simple development reserves of the LMT sector in Poland and surely in other new member states of the EU have already been exhausted. By simple reserves we mean the establishment of new small and medium firms based on small amounts of ownership capital. Resourcefulness, entrepreneurship, motivation of success and scanty personal resources no longer suffice to launch one's own company. In Poland one can notice the tendency to concentrate resources and aid around enterprise formation and entrepreneurship; less attention is devoted to supporting already existing enterprises. Perhaps an important manner of supporting already operating SME and LMT firms would be a separate European fund designed exclusively to cover (entirely or partly) the costs of introducing standardised systems of management (quality, knowledge, CRM). We mention this because both for high-tech firms and for low-tech firms operating in the West the possession of such standardised systems by firms of new member states would be a signal that these firms are in a position to meet the requirements of potential Western partners and to become a component of their value chains. We also believe that the PILOT research gives grounds for formulating a hypothesis that implementing such systems contributes to increased innovativeness of firms, in the area of organisational innovations, as well as product and process innovation.

7. Policy Issues

One of the main objectives of the PILOT project has been to make policy recommendations for the promotion of LMT sectors. On the basis of the research findings of the project, Jacobson and Heanue (2005) have identified a number of significant factors and problem situations concerning innovation policy for LMT sectors.

7.1 Limited Awareness of LMT Industries

Referring to the EU in general, our empirical findings show that there is little if any awareness of innovation-generating policies other than those focusing on R&D. Correspondingly, the low-tech sectors receive little attention from innovation policy makers on different levels, such as the EU, the national state and the regions. Therefore, a key policy task is to support activities and measures raising the awareness of low-tech industries and their specific needs and conditions. A fundamental precondition for this is the development of a new and broad understanding of innovation and the insight that one should no longer equate innovative ability with R&D activities alone. The more recent debate within the Commission and the OECD about the need for new R&D indicators certainly points in the right direction and should be intensified.

Such intensification might include the establishment by the EU of a mechanism to closely investigate the needs of LMT firms so as to identify ways of supporting innovativeness. Whatever means are identified to provide support must be flexible enough to correspond to the objective and cultural needs of the recipients. The problems – illustrated by the Polish cases – of differences in Europe in the attitudes of entrepreneurs underline why such institutional flexibility is essential.

PILOT research suggests that Polish and other new member LMT firms may have an importance that extends beyond their immediate geographical contexts and across the EU as a whole. There is a need to examine this more closely and to research the potential for integrating the capabilities of Central and Eastern European firms into the dynamic of the Union, rather than *de facto* treating these companies as dinosaurs destined for extinction as a result of natural selection.

A further fundamental prerequisite is a holistic view of industrial innovation processes and the relevant interlocking of different kinds of knowledge as well as of the different elements of the companies' capabilities which enable them to be innovative and profitable. The policy conclusion to be drawn would therefore be that it is necessary to focus on the industrial innovation chain as a whole, to concentrate more strongly on inter-sectoral connections and to make a point of finding the potentials of low-tech industries.

However, it must also be emphasised that the firms themselves have a low level awareness of innovation policies for LMT industries and that policy measures are perceived very differently by different firms. The policy measures that are regarded as helpful by some firms as a rule concern general aspects such as national policies providing tax incentives and subsidies for various activities and EU policies such as the Framework Programmes and Eureka. On the whole though, one can state that there are great innovation policy shortcomings as far as the specific problem situations of LMT companies are concerned.

7.2 The Relevance of Knowledge and Company Capabilities

As for the knowledge base, low-tech innovations presuppose the availability of specific practical in-house knowledge as well as the integration and use of complex knowledge inputs within networks. It is therefore an important policy task to conceive measures and to support activities which aim at improving the knowledge base and the capability of low-tech companies. This task can be realised at both the level of EU-wide support programs and also at national and regional levels. In practice, such measures should be directed at promoting the different dimensions of and particularly the preconditions for the capabilities of companies; especially the organisational conditions and management skills regarding a more efficient use of existing knowledge should be further developed.

In this context a key problem relates to training and recruitment needs. The necessary training for the array of skills required by workers in the LMT companies is not readily available from mainstream providers. Standard qualifications do not provide the mix of skills that LMT firms require. Additionally, many of the firms are experiencing recruitment difficulties due either to the negative image of the industries or to skills shortages.

7.3 Local Embeddedness and Network Relations

Policy tasks should focus on the development of the companies' organisational structure so that they are geared to the demands of cross-company co-operation with corresponding channels of communication, gateways and personnel responsibilities. In this respect, the professionalism of management of LMT firms should be supported and further developed. Another important policy task is to concentrate on improving the firms' capabilities for making the right strategic choice as regards the dilemma between globalisation and local embeddedness. The findings of the PILOT project show the importance of a balanced dynamic between global, local and regional policies that operate in all sets of "environments" to which a firm may belong; the aim of policies at different levels to create infrastructure supporting the innovation process must facilitate this balanced dynamic. Clusters and fragmented economies need strong intermediate institutions and institutional infrastructure to provide appropriate local conditions. To set up such institutions, the positive combination of the vision of public bodies and the interests of the stakeholders (i.e. collective actors) are important factors.

7.4 Relations between LMT with High-Tech

A key policy question underlying the PILOT project was whether European innovation policy should focus on so-called high-technology or science-based industries in attempting to solve growth and employment problems, or whether it should look to the growth prospects within the low- and medium- technology industries on which the European economy is actually based. An important PILOT result is that the policy issue is not a choice between these apparent alternatives.

The PILOT project showed that the vast majority of output and employment in modern economies is accounted for by both manufacturing and service LMT sectors. Such sectors are also significant users of the output from high-tech sectors. In a modern economy, the levels of

performance of both high-tech and non-high-tech sectors are heavily interdependent, and policy should view the economy as a whole. As a result, the promotion of the 90 percent of the economy that is made up of LMT sectors also promotes the welfare of the high-tech sectors (Robertson and Patel, 2005). As a corollary, policies need to ensure that they encourage both the generation of knowledge and its diffusion, and that both operations are carried out at high velocity to maintain competitive advantage.

EU establish a mechanism to closely investigate the needs of LMT firms and *the desires and aspirations of entrepreneurs and managers*. From what you have hinted, it seems clear that these issues are not even on the radar screens of Commission bureaucrats and that policies are often made *in vacuo* from an informational point of view. Some mention might also be made of the importance of designing institutions for delivering help so that they correspond to the objective and cultural needs of the would-be recipients.

Box 9: Policy Recommendations

Among the main results of Jacobson and Heanue's (2005) examination of policy issues arising from the case studies is that there is little awareness of policies aimed specifically at innovation that is not R&D based. While there are significant differences among the case study firms, they to varying extents show evidence of non-research-based innovation. The policy conclusion is that the type of innovation that is most prevalent in LMT firms receives the least policy support. A main policy recommendation emerging from PILOT is then that this policy shortcoming be rectified. To underline the importance of LMT innovation, the PILOT project recommends that the proposed European Institute of Technology include a unit specifically

8. Development Perspectives of LMT in the European Union

Finally, the following should be emphasised: In spite of the doubtlessly difficult economic situation of LMT industries and the challenges of globalisation and growing competition in the world market, prospects for LMT sectors and companies are not at all bad even in countries with advanced economies. This is true for a number of reasons:

- Firstly, the specific competences which many low-tech companies possess cannot easily be copied by potential competitors because they are deeply embedded in the social system of a company and its local environment, which makes them difficult to transfer and thus fairly inaccessible to competitors (cf. Maskell, 1998). This – paradoxically – applies to standardised products which are usually considered easy to imitate. But such products are often design-intensive and have major potentials for technological upgrading via the use of complex knowledge inputs.
- Secondly, the geographical and social proximity to sales markets and specific customer groups as well as the capabilities of many LMT companies to use and influence these

advantages in a flexible manner, are a further important reason for the relatively favourable development perspectives of such companies. For low-cost competitors from other countries, on the other hand, it is often a time-consuming and difficult task to establish the necessary contacts and to gain the required information.

- Thirdly, a considerable number of low-tech companies are obviously in a position to employ high-tech process technologies systematically and efficiently. Their specific process skills on the one hand, and frequently also their well-established contacts to the manufacturers of such technologies, form the basis for this achievement. Quite evidently the high-tech environment is a central requirement for the development perspectives of low-tech enterprises in this case.

These considerations should lead to a new understanding of the restructuring of the economic landscape of Europe in the first years of the 21st century. The economy does not appear to be undergoing a wholesale structural replacement of “old” sectors with “new” ones, or a substitution of “old” technologies with “new” ones. In fact, this process of change is evolving as a restructuring of sectoral and technological systems, transformed more from within than from without. It is not dominated by industrial activities for which competitive advantage, capability formation and economic change are generated by front line technological knowledge. Rather, it is dominated by what are often wrongly termed low- and medium-tech industries. And it is characterised by a specific combination and continuous re-combination of high and low-tech.

On this note, it has to be emphasised again that industrial innovations are for the most part not based on newly created scientific knowledge. Even where technical change is based on scientific activities, it is not necessarily based on recent ones; innovations stemming from the stock of knowledge and of the solution of practical problem of various types may be more important than the creation of new knowledge. The relationship may, in addition, be the other way around, i.e. technology creating the foundation for scientific knowledge (cf. Kline and Rosenberg, 1986). LMT industries are well placed to play a decisive role for innovations because the contribution of LMT companies is frequently an important precondition both for the innovativeness of value chains – or production systems – and for the design, fabrication and use of a range of high-tech products. As is convincingly shown by Robertson and Patel (2005), the relationships between high-tech and non-high-tech sectors in developed economies are highly symbiotic and the well-being of high-tech firms and industries depends heavily on their ability to sell their outputs to other sectors in developed economies.

Collaboration and networking between companies of different industries at regional, national, and transnational levels are increasingly important determinants of the innovativeness and competitiveness of individual companies. These value chains, *filiales* or clusters include low-tech companies not just as third tier participants in supply chains or as more or less passive recipients of technologically advanced machinery and equipment developed independently of user specifications. Furthermore, the dynamics and efficiency of value chains may crucially depend on the reliability and effectiveness, the capabilities and specific knowledge of their low-tech partners and on their integration into innovation processes in other firms in the cluster, whether low-tech or high-tech.

This focus on the contribution of low-tech industries to the innovativeness of industry as a whole is extremely important in a policy perspective, both at national and regional levels. It is indispensable for developing a proper foundation for the overall growth and performance possibilities of the European economy. Following the above line of argument, the high-tech prospects of many economies are based on the presence of and dynamic interaction with reliable low-tech functions and processes. The significance of low-tech companies as regards innovation policy must ultimately also be seen against the background of the strong and probably increasing international competitive pressure on complex technologies and products. Their market position can by no means be regarded as permanently stable and promising. High technologies and the corresponding know-how can, in the context of global economic integration, diffuse rapidly. And the crucial point is they are also quickly utilisable for innovations, so that the window for realising innovation profits in this sector is in many cases quite small. One instructive example, as experts stress, is that a developing country like China will in some years be one of the largest developers and producers of high-tech products such as mobile phones. Another example is the situation of the high-tech automotive industry in countries like Germany. It is occasionally pointed out that the dependence of German manufacturing on the auto industry provides specialisation advantages but that it also increases the risk of severe damage from competition as highly sophisticated cars are increasingly being produced more cheaply in newly industrialised countries (albeit often by German firms). The policy conclusion to be drawn would therefore be that it is necessary to focus on the industrial innovation chain as a whole, to concentrate more intensely on inter-sectoral connections and to make a point of identifying the potentials of low-tech industries. Most notably, the empirical findings show that there are favourable development potentials for low-tech industries, not least in the high-tech-oriented countries of the European Union.

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POLICY INTEGRATION AND CO-ORDINATION: THEORETICAL, METHODOLOGICAL AND CONCEPTUAL ASPECTS

1 Introduction

The search for better policy coherence has received intensified attention by policy-makers as well as political analysts. Policy challenges such as environmental issues, globalisation, the European integration, the call for sustainable development, increased importance of innovation policy have led to a rethinking of the organisation of political processes. Actors are increasingly aware of the need to find ways to govern interdependencies of different policy areas and sectors and the need of considering important societal goals such as sustainable development or innovation not only in one policy area but to integrate these into other policy areas as well. Administrative fragmentation, departmentalism, and coordination problems are increasingly recognised as reasons for inefficacy and inefficiency of policies.

Within different contexts, policy integration and policy co-ordination have thus become important keywords in political discourses. In the international context, intensified coordination between nation states is demanded for solving global problems such as climate change or the loss of biodiversity. In the context of the EU, policy integration and coordination refers to activities and mechanisms between the single Member States and the institutions of the EU as well as the degree of European integration. On the nation state level policy integration and coordination often stand for horizontal mainstreaming of important issues and goals (sustainable development, innovation, etc.) as well as for vertical adjustments between the nation state and regions or different organisations. On the rural level, policy integration gained importance in the “integrated rural development” concepts of the 1970s. Recently, with the gradual reorientation from the EU Common Agricultural Policy focus on agriculture to rural development, the concept of “integrated rural development” has likewise received new impetus within the EU.

New political and analytical concepts such as governance, policy learning, innovation system approaches, or network theories have additionally contributed to the increasing significance of the concepts of policy integration and co-ordination.

Policy integration and coordination is of high relevance for forest policy as it has manifold interferences with a range of other policy areas and sectors, for example rural development, land use planning, agriculture, regional development, tourism, public infrastructure, environment, nature protection and energy policies. Whether these policies are complementary, mutual beneficiary, duplicating or contradictory depends among others on how goals, actors, instruments and procedures of these policies and sectors are co-ordinated at different levels.

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Also innovation policy is no longer understood to be limited to traditional research and technology policy but is considered to be a policy issue with large interfaces with other policy areas. Within systemic approaches of innovation, innovation policy is understood to be rather a horizontal policy issue that has to be integrated in a range of other policy areas. A number of recent studies and workshops have supported the search for better coherence in the area of innovation policy (Arnold and Boekholt 2003, Boekholt et al. 2002, Edler et al. 2003, Smits et al. 2002). Furthermore, innovation is not any more understood solely as a means for reaching economic growth, strengthening competitiveness and employment. Rather innovation is increasingly understood as a means to contribute to the solution of a range of societal problems and goals, most prominently in environmental protection.

With the “integrated rural development” approach, cross-sectoral co-ordination became a central cornerstone of development strategies for rural areas. Integrated rural development asks for the co-ordination of different policies and sectors (horizontal), different levels of actions (vertical) and the inclusion of all relevant stakeholders of a region (participations). A range of integration aspects are inherent to the concept of integrated rural development, including the integration between economic activities whereas neither agriculture nor industry have any more prevalence, the integration between nature and society, the integration between rural and urban territories and societies, etc. (Sotte 2003, 9f).

This paper serves as a background paper for the COST ACTION E 51 “Integrating innovation and development policies for the forest sector” that runs from 2006-2010. It aims at clarifying the two concepts “policy integration” and “policy coordination” for the use in the context of the COST Action.

In particular the COST Action E 51 deals with two questions:

1. In how far is innovation policy integrated in forest policy, forest sector policy, in rural, regional and sustainable development policies?
2. How, and in how far is policy coordination undertaken between policy actors in the context of innovations of firms in territory-based services and vertical production chains? This includes e.g. forest sector policy, in rural, regional and sustainable development policies, innovation policy, tourism policy, nature conservation policy, energy policy, etc.?

2. Clarifying concepts - policy integration and policy coordination

Both concepts - policy integration and policy co-ordination - are rather elastic and vague and therefore open to multiple interpretations. Various definitions exist and the delineation of the two concepts is not always clear. Besides, a variety of other terms are used (often synonymously) for referring to policy integration and coordination, e.g. policy coherence, policy consistency, joined-up government or holistic government. The following section will provide a clarification of the concepts with regard to their use within the work of the COST Action E51.

2.1 Policy Integration

Several theorists in the fields of public policy and public administration have dealt with concepts such as policy coherence, policy integration and policy coordination.

One of the first academic reference to the term policy integration is found in Underdahl (1980). According to Underdahl's definition:

"A policy is integrated when the consequences for that policy are recognized as decision premises, aggregated into an overall evaluation and incorporated at all policy levels and into all government agencies involved in its execution" (in: Lafferty and Hovden 2003, 8).

Underdahl further formulates three criteria that should be met in order for a policy to be qualified as integrated:

- First, comprehensiveness, including the recognition of a broader scope of policy consequences in terms of time, space, actors and issues,
- Second, aggregation, i.e. a minimal extent to which policy alternatives are evaluated from an overall perspective, and
- Third, consistency, i.e. a minimal extent to which policy penetrates all policy levels and all government agencies. (in: Meijers and Stead 2004, 2).

According to Meijers and Stead (2004, 2) *"policy integration concerns the management of cross-cutting issues in policy-making that transcend the boundaries of established policy fields, and which do not correspond to the institutional responsibilities of individual departments"*

For Meijers and Stead (2004) policy integration thus aims at the development of a joint new policy for the concerned sectors. Policy integration consequently demands more interaction and resources than policy coordination.

Similarly Eggenberger and Partidario (2000) define integration in terms of the establishment of something new: *"integrating in fact means a new entity that is created where new relationships are established, bearing on individual entities that have specific characteristics and specific dynamics but in combination act in a different way"* (in: Persson 2004, 204). Their criteria for integration in contrast is rather oriented towards coordination: *"whenever there are two professionals with different backgrounds looking at the same problem with similar objectives they are integrating. Whenever there are two different topics that need to be tackled together, there is integration"* (in: Persson 2004, 204)

For other authors as well, policy integration is close to policy coordination:

"Policy integration is an activity that links policy actors, organizations, and networks across sector boundaries. Facilitating, supporting, and rewarding processes that cross, expand, or otherwise link policy sector boundaries is a necessary characteristic for intersectoral policy integration." (Shannon and Schmidt 2002, 17).

Briassoulis (2004, 10) defines policy integration in two ways:

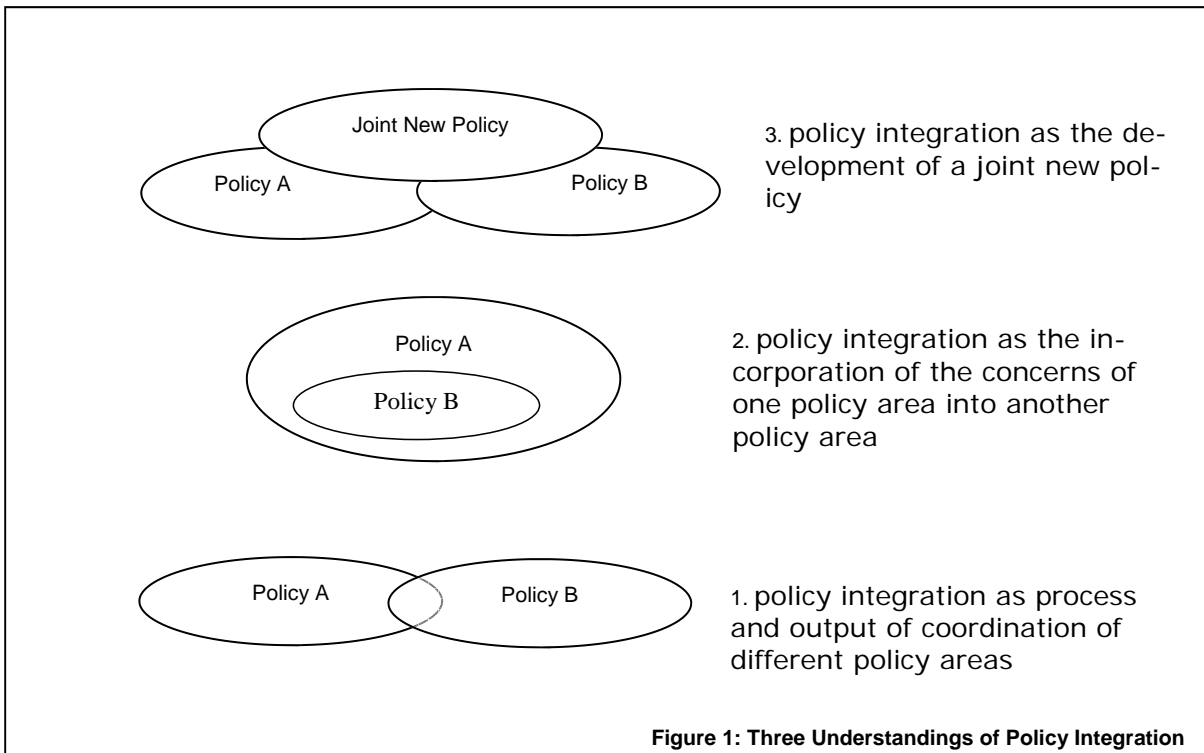
“Policy integration can be conceptualized as a process either of coordinating and blending policies into a unified whole, or of incorporating concerns of one policy into another (output)”.

The latter definition is also defined as asymmetric policy integration – one policy incorporates concerns of another but this is not always met by similar moves in the other policy (Briassoulis 2004, 4).

Similarly Kivimaa and Mickwitz (2006, 730) define policy integration as *“integrating specific policy objectives such as environmental protection or gender equality into other policy sectors”.*

To sum up, no single definition of policy integration exists but three basic conceptualisations of policy integration may be found in the literature (see Figure 1):

1. Policy integration as process and output of policy coordination of different policy areas (Shannon 2002; Eggenberger and Partidario 2000)
2. Policy integration as the incorporation of the concerns of one policy area into another policy area (Briassoulis 2004, Kivimaa and Mickwitz 2006)
3. Policy integration as the development of a joint new policy (Briassoulis 2004, Eggenberger and Partidario 2000, Meijers and Stead 2004).



The concept of policy integration is most often applied and widely analysed in the context of Environmental Policy Integration (EPI). Environmental policy integration has become a normative principle in the EU environmental policy making (Lenschow 2002, 5) and for many

Member States. In general, the concept of sustainable development demands the integration of environmental concerns and objectives into non-environmental sectors.

Collier (1994, 36) defines environmental policy integration broadly as aiming at:

- achieving sustainable development and preventing environmental damage;
- removing contradictions between policies as well as internal inconsistencies;
- realising mutual benefits and making policies mutually supportive.

Lafferty and Hovden (2003, 9) define environmental policy integration as:

“- the incorporation of environmental objectives into all stages of policy-making in non-environmental policy sectors, with a specific recognition of this goals as a guiding principle for planning and execution policy;

accompanied by an attempt to aggregate presumed environmental consequences into an overall evaluation of policy, and a commitment to minimise contradictions between environmental and sectoral policies by giving principles priority to the former over the latter.”

As stated in this definition environmental policy integration includes the prioritisation of the objectives of one policy area, i.e. environmental policy, over the objectives of other policy areas. Environmental objectives should thus overweight sectoral policy objectives.

Is this understanding of Environmental Policy Integration as defined by Lafferty and Hovden (2003) transferable to Innovation Policy Integration (IPI)? Only partly: The first part – the incorporation of objectives into policy-making of other policy areas may be transferred easily. But the principled priority of the objectives of one policy over the objectives of another policy is not suitable for the case of innovation policy integration. This is mainly due to differences in the objectives of the policy areas. While environmental protection is a priority goal in itself, innovation is mainly considered to be a political goal because of its contribution to a range of other societal goals, including employment creation, reaching competitiveness and sustainable development.

Consequently, Mickwitz and Kivimaa's (2007) definition of innovation policy integration bases on the definition by Lafferty and Hovden (2003) but without referring to the principled priority. Consequently, innovation policy integration can be understood as:

“- the incorporation of the objectives to promote decisions to develop, commercialise or adopt innovations into all stages of policy making in non-innovation policy sectors;

Accompanied by an attempt to aggregate anticipated consequences on innovations and their diffusion into an overall evaluation of policy, and a commitment to minimise contradictions between innovation and sectoral policies” (Mickwitz and Kivimaa 2007).

Policy integration in the context of innovation policy is mainly understood and analysed as making “innovation policy from a fragmented into an (integrated) multisectoral innovation policy” (den Hertog, Boekholt et al. 2004). A number of recent studies have analysed attempts and strategies for a more systemic/horizontal innovation policy (for example: Edler, Kuhlmann et al. 2003, Boekholt 2004, Arnold and Boekholt 2003).

Integrated innovation policy in this context implies a more systemic policy where innovation is not only covering the domain of supporting innovation in the economic realm but contributes to solving societal problems more widely (den Hertog, Boekholt et al. 2004, 1). The term horizontal innovation policy is often used in this context. Horizontalisation “could be defined as the degree to which innovation policy is guided by a comprehensive national strategy in which contributions from the various sectors are linked to achieve policy coherence (den Hertog, Boekholt et al. 2004, 3).

2.2 Policy Coordination

The concept of policy coordination is closely linked to and sometimes used synonymously to the concept of policy integration (as shown above).

Very basically, coordination means the adjustment of actions in the case of task interdependencies.

According to Peters (1998, 5), policy coordination refers to “*the need to ensure that the various organisations – public and private - charged with delivering public policy work together and do not produce either redundancy or gaps in services*”. He defines coordination as “*the alignment of tasks and efforts of multiple units in order to achieve a defined goal. Its aim is to create a greater coherence in policy, and to reduce redundancy, lacunae and contradictions within and between policies*” (Peters 1998).

Peter further argues that there is a spectrum of coordination options ranging from a minimalist to a maximalist position (see below).

Meijers and Stead (2004) define policy co-ordination as an “*overall state of mutual consistency among different policies*”. The purpose of coordination is to ensure consistency and coherence between the various objectives and elements of a single policy or project, within a set of interacting policies or projects (Meijers and Stead 2004, 3).

Policy coordination may refer to both - a state of being coordinated (degree) and a process of coordinating policies. Basic features of policy coordination are:

- harmonising decisions
 - eliminating redundancies, incoherence and gaps; increasing coherence
 - reducing adverse consequences.
-

Following Peters (1998), the three fundamental modes of coordination are hierarchies/state, markets and networks. Lenschow (2006) additionally identifies a fourth mode – communities.

Within hierarchies/state coordination is carried out top-down and based on formal power and authority (Hogl 2002, Lenschow 2006). The central pattern of interaction is authority, operationalized in administrative orders, rules and planning on the one hand and dominance as the basic control system on the other hand (Verhoest, Peters et al. 2005). In order to achieve policy coordination, authority must extend all the way to the central level of government as there would be no reason for separate organisations to cooperate otherwise (Peters 1998, 18). Effective hierarchy depends on the leadership and political will of the central government as well as on its enforcement capacities and powers. The commitment of organisations or actors at lower levels of the hierarchy to the stated goal is comparatively less important as they can be disciplined from the top (Lenschow 2006).

Markets as coordinating institutions are based on competition, exchange and negotiations between public and private actors. Coordination among the different actors is carried out by price mechanism, incentives and the self-interest (Verhoest, Peters et al. 2005). There are two distinct coordination mechanisms for different situations. First, when actors are differently endowed and pursue different interests. In this situation, government may simulate market exchange situations in offering incentives for certain desired behaviour (e.g. tax reduction, subsidies, trading of permissions or certificates). Inside government there may be other media of exchange that could be used to create a quasi-market situation. For instance, the exchange of information might facilitate mutual accommodation (Lenschow 2006).

Second, when market actors have a common interest in creating a stable environment in order to plan investments and maximise benefits for the longer term. This prospect of future benefits leads market actors to coordinating their activities with others and to negotiate common rules of conduct. Inside organisations (or in interorganisational relations) the establishment of reliable rules of procedure serve the same function, namely to increase task efficiency (Lenschow 2006).

Coordination within networks takes the form of cooperation between public and private actors whose inter-organizational relations are ruled by the acknowledgement of mutual interdependencies, interests, trust and the responsibilities of each actor (Verhoest, Peters et al. 2005). Coordination in networks is characterized by persuasion and learning (Lenschow 2006). Negotiations in networks centre on convincing arguments and ideas (Lenschow 2006). While most cooperative networks grow 'spontaneously' between organizations, governments may create, take over and sustain network-like structures between organizations by e.g. the creation of common information systems, concertation structures, collective decision making structures, or even common partnership-organizations (Verhoest, Peters et al. 2005).

According to Lenschow (2006), members of communities are tied closer together than members in networks. Emotional ties, as opposed to the pragmatic pursuit of common views, may allow for coordination and compromise even at the expense of one's own interest.

However, while the coordination logic of communities may be crucial for establishing or understanding social interaction, it is not a governance mode that will apply very often in matters of policy integration.

2.3 Horizontal and vertical dimension of policy integration and coordination

As became apparent in various definitions, both policy integration and policy coordination may be conceptualized along a horizontal and a vertical dimension. Horizontal policy integration and coordination refer to processes and state between different policy areas or different sectors. Vertical policy integration and coordination refer to processes among different policy levels, e.g. local, regional, national and EU level and different functions, i.e. policy formulation and implementation within a particular sectoral policy.

Horizontal policy integration is also often understood as the extent to which a central authority has developed a comprehensive cross-sectoral strategy for e.g. environmental policy or innovation policy (see for example Lafferty and Hovden 2003). This includes a “ a judicial balancing of the objectives of one policy against other societal goals as a crucial aspect” (Lafferty and Hovden 2003).

Horizontal and vertical policy integration and coordination are mutually dependent. Horizontal policy integration can not become successful if it only occurs on the nation state level but is not implemented by subordinated levels and agencies.

2.4 Differentiating policy integration and co-ordination

As stated earlier the terms policy integration and policy coordination are sometimes used interchangeably. Other authors see differences between the two concepts, esp. concerning a) the level of interaction and b) the output of the activities. According to Meijers and Stead (2004), policy integration requires more inter-sectoral interaction than policy co-ordination. Co-ordination aims at adjusting sectoral policies in order to make them mutually enforcing and consistent, policy integration results in one joint policy for the sectors involved. Co-ordination is about policies of organisations having more or less the same sectoral objectives, while integrated policy-making often departs from a cross-cutting objective not covered by, and on a higher scale than sectoral objectives (e.g. sustainable development).

The following figure 2 describes the relation between co-operation, coordination and policy integration as presented by Meijers and Stead (2004, 5). The figure shows that cooperation and co-ordination are part of the process of policy integration. Altogether policy integration requires more interaction among actors, accessibility and compatibility, leads to more interdependence, needs more formal institutional arrangements, involves more resources, requires stakeholders to give up more autonomy and is more comprehensive in terms of time, space and actors (Meijers and Stead 2004).

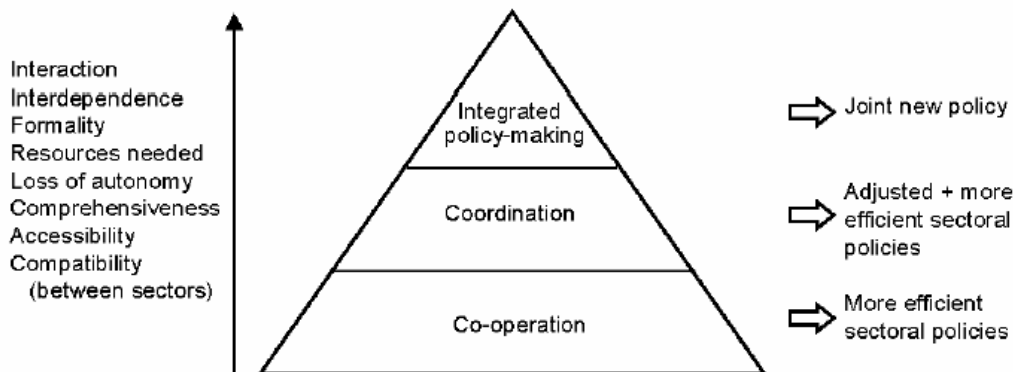


Figure 2: Integrated policy-making, policy co-ordination and co-operation (Meijers and Stead 2004)

In a different conception “policy integration” refers to the goals and objectives of policies while “policy coordination” has a stronger focus on the actors, procedures and instruments.

3 Determining the degree of policy co-ordination and integration

As became already apparent in the previous chapter, both policy integration and policy coordination may either be understood as a process or as a state. While the analysis as a process includes looking at assessment criteria such as procedures, actors’ involvement, etc., the analysis as state means determining the degree of co-ordination or integration taking into account such criteria as the extent of redundancy, the degree of incoherence and the existence of important but still untackled issues (see for example Peters 1998, 296).

When policy integration and coordination are analysed as a state the question would be to what extent two policies are coordinated or integrated. We have already pointed out that policy coordination may be understood as being part of the process of policy integration. Besides many nuances in the degree of policy coordination are thinkable as well. Peters (1998, 10) defines a minimalist and a maximalist level of co-ordination: *“The minimal level might be that at which organizations simply are cognizant of each other’s activities and make an honest effort not to duplicate or interfere. [...] A maximalist definition might be too severe for most scholars and practitioners since it could require much tighter controls over the activities of organizations and some means of enforcing jurisdictional controls over disputed turf, or of demanding that the gaps in services be remedied. A maximalist definition might also require developing substantial uniformity in the standards of treatment across a country [...]. This amount of coordination might also require a level of omniscience and omnipotence that few public sectors possess”.*

The most often applied scale for determining the degree of policy co-ordination is the one developed by Metcalfe (1994, 281) for the intergovernmental coordination for international processes (see figure 3). The scale spans eight levels ranging from independent decision making to establishing and achieving common government priorities.

<p>Level 1 <i>Independence:</i> each department retains autonomy within its own policy area irrespective of spillover effect on associated departments/areas.</p> <p>Level 2 <i>Communication:</i> departments inform one another of activities in their areas via accepted channels of communication.</p> <p>Level 3 <i>Consultation:</i> departments consult one another in the process of formulating their own policies to avoid overlaps and inconsistencies.</p> <p>Level 4 <i>Avoiding divergence in policy:</i> departments actively seek to ensure their policies converge.</p> <p>Level 5 <i>Seeking consensus:</i> departments move beyond simply hiding differences and avoiding overlaps/spillovers to work together constructively through joint committees and teams.</p> <p>Level 6 <i>Conciliation- mediation:</i> central bodies are called in by, or are imposed upon, departments to settle irresolvable disputes.</p> <p>Level 7 <i>Limiting autonomy:</i> parameters are predefined which demarcate what departments can and cannot do in their own policy making areas.</p> <p>Level 8 <i>Establishing and achieving common priorities:</i> the core executive (Cabinet/Prime Minister/Cabinet Committee) sets down and secures at the early stage of the decision cycle, though co-ordinated action, the main lines of policy.</p> <p>Source: (Jordan 2002b, Box 3.1)</p>
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Figure 3: The Metcalfe Scale of Coordination (Source: Russel 2004)

4 Analysing policy integration and coordination

Briassoulis (2004) presents a methodical concept for measuring policy integration, along a number of key dimensions of integration among policies. Operationally, it concerns *simple and cross relationships* among the objects, goals, actors, procedures and instruments of two or more policies (see figure 4). In this model simple and cross relationships between policy objects, goals and objectives, actors and networks, procedures, and instruments are illustrated and analysed as the object of policy integration. Analysing policy integration includes examining whether and how the objects, goals, actors, procedures and instruments of different policy areas (horizontal) or different policy levels (vertical) are interrelated.

The author furthermore distinguishes a number of interrelated and interdependent clusters of dimensions of policy integration:

- substantive (including thematic and conceptual integration)
- analytical (including the temporal and spatial dimension)
- procedural, and
- practical

Based on this model, (Briassoulis 2004) categorises criteria for assessing policy integration in general (see Annex). The more of these criteria are met the higher the achievement of policy integration.

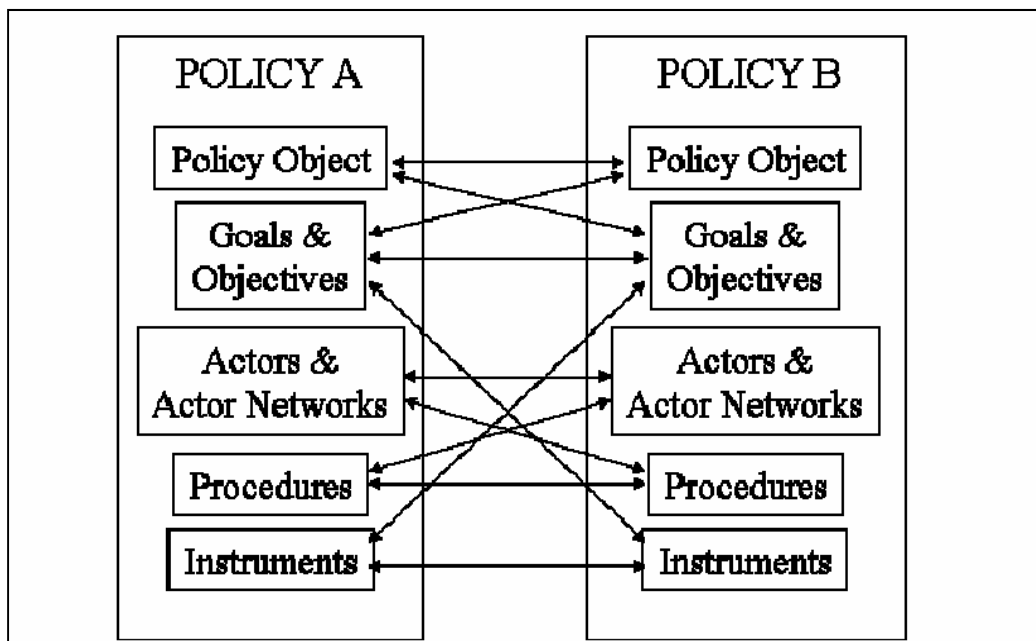


Figure 4: Objects of policy integration (Briassoulis 2004)

Kivimaa and Mickwitz (2006, 732) base their evaluation of environmental policy integration in innovation policy on four criteria:

1. "inclusion" - To what degree are environmental aspects covered in policy documents?
2. "consistency" - The consistency of the environmental aspect in relation to other aspects is used to assess the role policy documents give to the issue of consistency when they address environmental issues.
3. "weighting" - The weighting of the environmental aspect with respect to other aspects is used to assess the importance given to environmental issues in policy documents.
4. "reporting" - What is the importance of feedback for policy consistency and effectiveness?

For their evaluation Kivimaa and Mickwitz (2006, 733) analyse documents at three levels:

- The strategy level: They analyse the content of strategy documents produced and policy inputs, such as people and financial resources allocated to environmental issues.
- The policy instrument level: Evaluation of the objectives of different technology programmes and the allocation of financial resources to different types of programmes.
- The policy outputs of the technology programmes, i.e. the project funding decisions.

One particular relevant dimension in the context of measurement and analysis performed is the overall scope of policy integration or coordination. This includes the scope of the policy object and the geographical scope. The policy object ranges from (policy or innovation) systems as a whole, to portfolios of policies or individual policies, to programmes within these policies and individual projects. The geographical scope ranges from international or supra-national (EU-level) co-ordination to the local and firm levels (Figure 5).

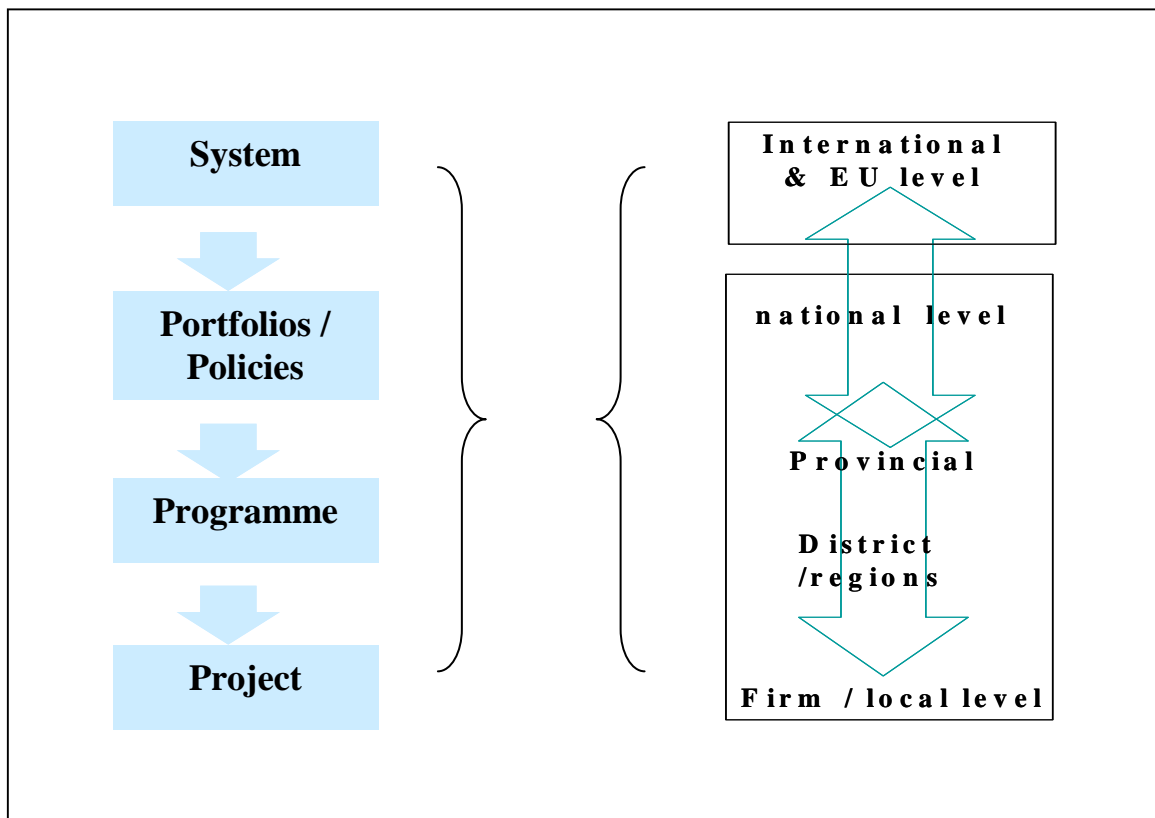


Figure 5: Two dimensions of the scope of policy integration and coordination

Depending on the scope different methods are more or less suitable. For instance, systems analysis will *inter alia* focus on actor structures, interaction patterns and the analysis of bottlenecks, comparative policy analysis and evaluation will be applied for studying innovation policies or programmes.

5 Mechanisms for policy integration and coordination

In relation to policy measures and instruments a considerable number of classifications exist, as do for mechanisms to integrate them. For instance, (Jacob and Volkery 2004) distinguish between two approaches to policy integration a) centralised and b) decentralised. These two different but interrelated approaches refer to the understanding of policy integration as a) the development of a joint new policy and b) the integration of the objectives of one policy into another policy area (see above – chapter 2.1). Decentralised tools for environmental policy integration include for example sectoral environmental strategies, environmental departments in the different sectors, green budgeting, strategic environmental assessment and impact assessment of policy initiatives (Volkery and Jacob forthcoming). National environmental planning, National Sustainable Development Strategies, constitutional provisions to protect the environment, independent institutions for evaluation and monitoring, consultation procedures, veto rights, green cabinets and interdepartmental working groups are among the centralised tools for environmental policy integration (Volkery and Jacob forthcoming).

Besides centralised mechanisms and decentralised mechanisms Jacob and Volkery (2004) distinguish between political strategies and administrative instruments. In relation to innovation policy integration, centralised political strategies would include the National Reform Programmes developed by the EU Member States in the course of the Lisbon process, White Papers on Innovation, the establishment of National Councils for Innovation or similar. An example for a co-ordinated but decentralized implementation mechanism for integrated development are various bottom-up approaches for local and rural development, as, e.g. framed and applied in the EU LEADER.

Arnold and Boekholt (2003) identify four categories of co-ordination mechanisms in the context of research and innovation governance:

- Cross-ministry/agency programmes
- Inter-agency co-operation agreements
- Ad hoc co-ordination
- Use of planning processes and procedures that require co-ordination.

With the increasing recognition of complexity of innovation in practice, innovation policies get more complex and „systemic“ in each policy area, and increasingly use different instrument mix to address these systemic aspects. As Figure 6 shows, single measures by single actors tend to get replaced by multi-measure packages, and further integrated with packages of multiple measures by other actors. Particularly in the context of innovation policies and driven by the rise of innovation system concepts, linkage or bridging measures to connect multiple actors have seen a considerable surge in the last decade. The challenge in policy to integrate measures and actors even further, with a view to arrive at coherent and effective multi-activity programmes and related network measures.

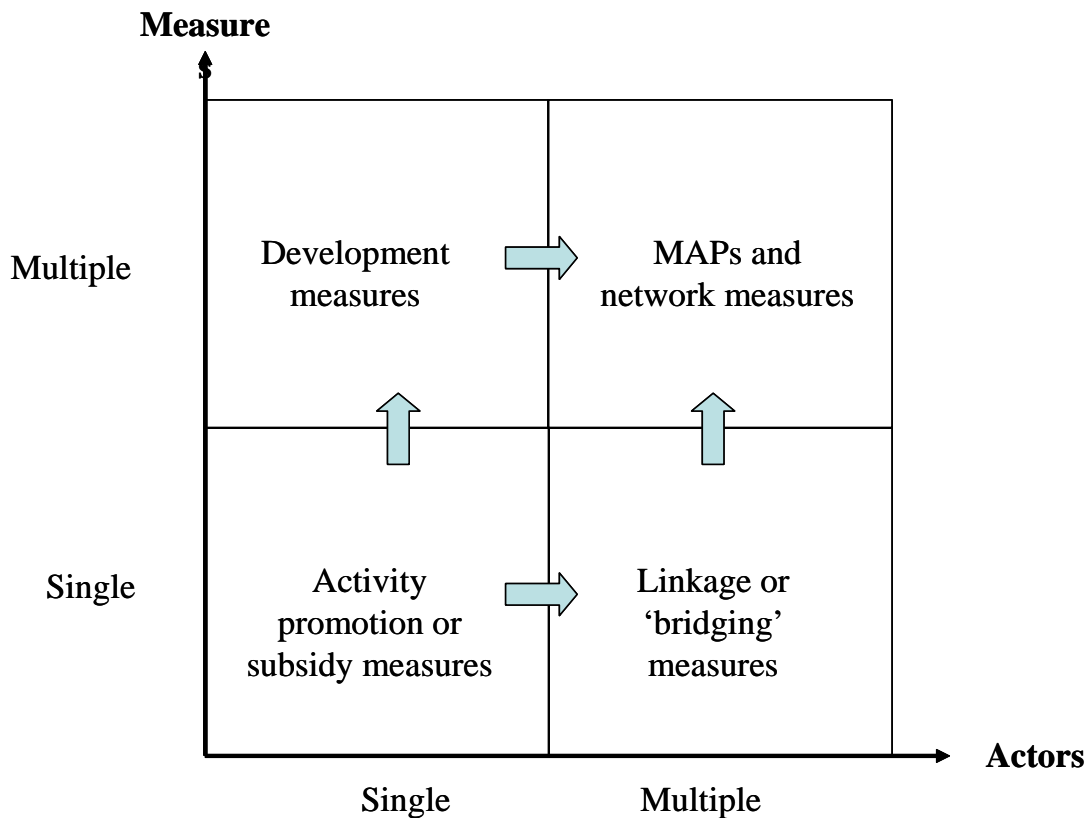


Figure 6: Policy integration - actors and measures instruments (MAP = Multi Activity Programmes; Source: Boeckholt 2004)

6 Factors for success or failure and limits of policy integration and coordination

Persson (2004) on the basis of (Lenschow and Zito 1998) groups the explanatory factors for the success of policy integration into three broad categories:

- a) normative factors,
- b) organisational factors and
- c) procedural factors.

Normative factors refer to values, norms and policy-making and administrative culture that set the general parameters of policy-making (Persson 2004, 28). Normative factors include among others high-level policy commitment and strong and clear leadership, societal backing, policy paradigm and traditions, time perspective and the use of knowledge and science. Policy integration needs high-level political commitment including strong political leadership to be successful. The lack of political will is often identified as a main barrier for better policy integration (Persson 2004). This was also the result of a recent survey among forest administrations in Europe. The lack of high-level policy commitment was identified as the second most important impediment for the integration of innovation policy measures in national forest policy (after the lack of financial resources) (Bauer and Rametsteiner 2006).

Besides support from the top political level, policy integration also needs support from the bottom, i.e. societal backing. A formal overall policy framework for policy integration is identified as an important means to define a strategic perspective and implement policy integration effectively. Such an overall policy framework includes National Reform Programmes in the case of innovation policy or National Sustainable Development Strategies for sustainable development policies (EPI). These programmes and strategies set overall principles that should guide not only single sectoral policies but overall governmental strategy. The factor policy paradigm and tradition refers to the main assumptions on which policy is based, the way in which policy is made and the professional culture among policy-makers. However, ideas, policy paradigms and traditions are rather difficult to change and will take longer times (Persson 2004). Whitelegg (2004) analysed the coordination between innovation and transportation policy and found that interaction between the policy areas is difficult partly due to differences in thinking between the policy areas (experimental versus stability). Each policy area does not make allowances for the differences in thinking and instead believes the other one should change (Whitelegg 2004, 5). Further, a lack of long-term perspective in policy-making is generally identified as a hindering factor for successful policy integration.

Organisational factors for policy integration include the general government architecture, interaction of actors within and outside government, power structures, resource allocation and budgeting, and capacity (Persson 2004, 29). A main reason for the lack of policy coherence is seen in sectoral compartmentalisation/departmentalisation and institutional fragmentation within government. Departmentalisation leads to a competition between sector departments regarding resources thus hindering policy integration and coordination. Besides sectoral fragmentation also federal, i.e. vertical, division of functions may impede better policy coherence. Collier (1994, 245) states that policy integration generally is easier in centralised countries. Strategies to overcome these impediments include institutional reforms such as a) the integration of departments and functions, b) the establishment of new institutions (e.g. National Innovation Councils in the case of Innovation Policy Integration), c) the assignment of existing institutions with a new mandate, responsibility and accountability (Persson 2004, 30). Other mechanisms to increase coordination and communication include inter-ministerial committees and task forces, networks schemes, regular circulation of staff between sector departments (Persson 2004, 30f). Another frequently mentioned tool is the budgeting process (see also chapter 5).

Procedural factors include strategies and action plans and systematic assessment procedures (Persson 2004). The development of a sector strategy refers to the integration of policy objectives of one policy into other policy areas. Further, evaluation and assessment procedures have become important tools in Environmental Policy Integration (e.g. environmental impact assessment). The rules of decision-making may also be adapted to increase coordination among different actors. The rules include the right to set formal agendas, the right to develop policy proposals and the timing of participation by different departments and agencies (Persson 2004, 32).

Lenschow and Zito (1998) in (Persson 2004) identify the factor 'policy frames' as the most important factor influencing the success of Environmental Policy Integration.

Lenschow (2002) identifies three dimensions of factors for Environmental Policy Integration: actors, ideas and institutions. Factors concerning the actors in the policy-making process include their policy preferences, their power and influence in the decision-making process, the political commitment of sectoral policy-makers and the existence of political leadership (from above) or pressure or mobilization of societal actors (Lenschow 2002, 16f). Lenschow further states that "it is helpful to consider policy interests as embedded in a frame of reference, which prestructures the thinking within a policy sector..." (see 'policy frames' above) The acceptance of certain ideas (for example sustainable development or systemic innovation approach), the relative persuasiveness of the causal story and the spread and stability of policy ideas have strong influence on the opportunities for successful policy integration (Lenschow 2002, 17). The more changes depart from traditional practices and involve larger institutional changes the more difficult it will be (Lenschow 2002,18).

Finally, policy integration and co-ordination although highly aspired have their limits. The main limits are related to aspects of democracy, trade offs and costs. As decision-making power is ever more decentralised there is a danger of loss of democracy (Persson 2004). The accountability for actions and policies might decrease with an increasing number of actors involved (Persson 2004):

Further, coordination and cooperation are often seen as an additional burden as they imply an increase in complexity and additional uncertainty by many actors. On the one side more information has to be processed and on the other side coordination is not free from hidden strategic motivations of the actors involved and can thus lead to the loss of ground. Additionally, coordination and cooperation require additional resources without creating a compensating gain (trade-offs). The decreasing resource endowment might lower the incentive to engage in cooperations and coordinate (Ohler, Polt et al. 2004, 47)

According to Underdahl (1980, 165) perfect policy integration may not be desirable from a cost-effectiveness perspective. "Policy integration should be pursued up to the point where marginal cost of integration efforts equals marginal gain from policy improvement and no further" (Underdahl,1980 in: Persson 2004).

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THE CONCEPT OF “REGIONAL GOVERNANCE” AND THE PROMOTION OF SUSTAINABLE RURAL DEVELOPMENT PROCESSES IN GERMANY

Insights from the implementation of “Active Regions” and “LEADER+”

1 Introduction

The term “Governance” and its resonance in political science have been reflected in the discussion on modern regional policy for some time now. On the one hand, the term „Regional Governance“ is used to analyse new forms of political coordination on the regional state-level adequately. On the other hand, hidden behind the term “Regional Governance” lie also scientific and political demands as to how regional policy can be effectively and efficiently shaped. “Regional Governance” is even understood to be a kind of healer of various fundamental challenges to political steering in a modern state (it is seen as bringing the answer to problems like the globalisation, existing democratic deficiencies, etc.). Even if there is no lack of normative claims calling for “Regional Governance”, analyses of its implementation are still rare.

This paper focuses on this and will, after an introduction discussing “Regional Governance”, first examine how the concept of “Regional Governance” is represented by political programmes involved in supporting rural areas to facilitate sustainable regional development (do the support programmes and their guidelines correspond to the standards set for “Regional Governance”?) as it is the case that rural areas, due to their political problem structure, seem to present “perfect” fields of application for concepts of “Regional Governance” in a particular manner. The central question of this text will then be if the concept of “Regional Governance” is “only” a normative claim, or if it can actually be supported by political funding programmes to become a strong support to sustainable regional development. This text bases on the results of various current and completed research projects, all of which, in different ways, are concerned with the meaning of “Regional Governance” regarding rural area support policies in Germany.²

With the help of a concrete regional political support programme, namely the EU-Common Initiative LEADER+, the question of how far the standards of Regional Governance actually have any form of significance in their political implementation process will be critically put. The relation between the supported networks of rural partnerships and the traditional structures of the representative political system at local and regional level (Governance vs. Government) presents the main focus. As a conclusion to this paper, the concept of Regional Governance will be positioned critically within the discourse on the connection between examinations of Government and Governance.

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² In detail I am referring to multiple research projects on regional policy for rural areas which the Institute of Forest Policy and Nature Conservation has been carrying out since 2001. First the completed “Nature conservation and regional development” project carried out on behalf of the BMVEL (Böcher/Krott 2004), then the follow up project for the elaboration of guidelines for integrated rural development, also carried out on behalf of the BMVEL (Böcher/Elbe/Garrelts 2004, Böcher 2005a) as well as the accompanying research to the current “Regionen Aktiv” model project: The University of Göttingen, the Fern University in Hagen, SPRINT GbR and the OAR Regional Consulting GmbH are, together, scientifically accompanying the implementation of the support programme until the end of 2006.

I, as a whole support the theory that there can be, at least within regional policy, no “either or” between the Governance and Government perspectives. Both complement each other in practice (regional policy only works through mixing hierarchic top-down coordination and bottom up processes): Regional Governance seems to still need forms of hierarchic coordination to be implemented successfully.

2 Characteristics of „Regional Governance”

Similarly to other policy fields in which political coordination problems arise, an increased use of the term “Governance” has, in the past few years, also come to be observed within regional policy. The term “Regional Governance” thereby signifies a set of different characteristics, which, together, constitute a new form of regional policy which seems to be able to support sustainable regional development (Benz et al. 2000, Benz and Fürst 2002).

Analogous to other fields of politics, this increased use of the term goes hand in hand with the realisation that earlier political coordination procedures are no longer able to solve regional problem situations adequately due to altered general conditions. Fürst (2004: 46) gives globalisation, the rise of the neo-liberal paradigm, the state’s financial crisis and the increasing meticulous organisation of society combined with the corresponding fragmentation of societal coordination as examples of such altered general conditions.

One especially observes the boundaries/limits of state-hierarchical intervention abilities within regional policy; Müller (1998) points out that structural regional particularities on which complex institutional arrangements always have a great influence locally can hardly ever be coordinated “from above”, neither by means of rights nor money. This diagnosis has become much clearer recently due to the more heated public debate about the problems caused by the development of former East Germany.

The financial support (which has for most parts taken on an indiscriminative character) of the five new federal states since 1990 has not brought the long awaited and expected upswing. Many funds have flowed into unnecessary investment which have not made any kind of sustainable contribution to the economic development of the new Federal States whatsoever (an example of this can be seen in the discussion in the SPIEGEL magazine entitled “Jammertal Ost” (The pitiful East) , DER SPIEGEL 39/2004). The development of a regional structural politic solely through the use of funding is no longer a viable recipe; it cannot in any case be maintained much longer due to the omnipresent financial crisis. Such phenomena have for a long time made it so that alternative political funding concepts for regional policy which are adequate for the present general conditions are discussed. In short, especially within the German discussion, everyone is talking about *Regional Governance*.

So what does Regional Governance actually mean? It is important for further discussion to first emphasize that Regional Governance is nowadays used in normative as well as analytical ways. Regional Governance is first and foremost a definition for a modern form of regional policy which stands out due to the following factors (see Benz/Fürst 2003; Wiechmann/von Löwis/Müller 2005, 16 ff.; Fürst 2004; Diller 2004, Knieling 2004 as well as Böcher 2003 and Böcher 2005b):

a) Increase of the importance of the region as political coordination level

Regional Governance enhances self responsibility of a region as a level of political coordination and decisions and implies an increase in the self steering abilities of regions. Political responsibility concerning important decisions regarding regional development should be left up to regional actors. This regional form of self steering touches upon the principles of free will, non formal institutionalisation and inter-sectorality (cooperation between politics, administration, citizens and economic and social partners) (Fürst 2004:48). The endogenous potential of a region and the knowledge of regional actors about immediate living circumstances should be enhanced due to this. An improved coordination of land use and a better impact of funding programmes should be achieved through the transition to the "regionalisation" of regional policy. Modern regional policy should stimulate self help and cooperative self steering processes and in doing so actively involve the regional population in political steering processes (Benz/Kilper/Fürst/Rehfeld 1999, Knieling 2004). In terms of Regional Governance, regional development is seen to be not so much of a sovereign state steering task as a management function oriented towards coming to negotiated agreements (Müller 1998, 33). "Region" in a political scientific context, should be seen as a social context in which the mobilisation of collaborative efforts and democratic self organisation take place.

Ideally, alterations in constellations of actors take place through the dynamic inclusion of new actors in political processes. Regional policy represents a subsidiary and cooperative form of politics which may be able to provide an answer to the challenges presented by the modern state and to the loss of its central steering functions at the regional level.

b) Replacement of the territorial principle by the functional principle

Political responsibility for regions is no longer solely defined by administrative levels and borders (e.g. governmental districts), but rather also by the concept of Regional Governance which understands a region to be a dynamic area of cooperation for actors which is formed due to the density of social relations between regional actors (Böcher 2003). Through this, the dynamic area of cooperation is able to fulfil different tasks on which the regional actors mainly decide themselves (for example as an economic, tourist or nature protection region, von Löwis/Wiechmann/Müller 2005: 16). The regional actors themselves make the decision about their specific opinion on the possible criteria pertaining to the separation of a region. In order to do this, they must design models and development concepts as well as thematic development focuses independently and as a basic course of action.

c) Intersectoral cooperation through weakly institutionalised regional networks and partnerships

The potential of networks and cooperation between regional actors is central to the concept of Regional Governance (Benz 1996, Fürst/Schubert 1998, Fürst 2002, Diller 2002, Benz/Fürst 2003, von Löwis/Wiechmann, Müller 2005). The cooperation encompasses the horizontal level on the one hand (partnerships at regional level) and the vertical level on the other (partnerships between the region and higher political levels, which can for example clearly be seen in the EU structural policy's partnership principle).³

Regional duties should also be fulfilled outside of traditional democratic institutions on the

³ One must however observe that the federal states are acting as partner regions within the EU structural policy's partnership principle, whereas within the rural development policy described here, the regions are smaller than the federal states.

local and regional level through the cooperation of all relevant public and private actors in a region. The persons and groups which are linked by regional political networks should ideally stand out through a horizontal cooperation aimed at dealing with factual issues and which does not contain any form of distinctive hierarchy. Partnerships, trust and consent as well as a common vision or goal for fundamental regional political aims between participants ensure the necessary motivation in order to be able to be involved in solving regional problems (Fürst/Schubert 1998, Rehfeld 1998, Ray 2000, Moseley 2003). Cooperation between politics, economics, social actors and science (Fürst/Schubert 1998, 353) is required during the complex restructuring processes in the regions. Regional networks only demonstrate their full potential if the members fully trust each other, see each other as partners and orient their problem solving processes towards learning (Benz/Fürst 2002). Cooperation and networks in particular demonstrate the potential for Regional Governance due to the following qualities:

- Networks can be understood as being de-hierarchised producers of political coordination. Networks are able to take on the steering functions of the state and to produce political results which can no longer be generated by interventions by the central state if higher steering fails.
- Networks are based principally on social contacts and communication relations which, in manageable spatial contexts, are made easier by the proximity of the actors to each other. Common experiences in regions, common areas of competence and regional identities avail the stabilisation of cooperation and the building up of trust. Communication and the exchange of information, which are important prerequisites for innovation and learning, become closer within networks.
- Ways in which collective goods can be produced most effectively are often discussed in modern political theory and the potential presented by networks and social relationships of trust is, also in this context, more and more highlighted. Braun (1999, 260) sees self coordination as an efficient form of coordination, in comparison to hierarchy and market, for obtaining collective goods. This speaks in favour of a non centrally coordinated regional cooperation of actors through Regional Governance. This presents a very interesting aspect with regard to regional policy, within which the improvement of the regional socio-economical and ecological conditions of life is the collective good of the regional actors.

d) Hierarchical steering of incentives through various instruments and forms

The fact that more often than not, regional cooperation in the sense of Regional Governance does not come about naturally, and that it must usually first be initiated, is problematic (Knieling/Fürst/Danielzyk 2001). Different instruments which may act as potential incentives in building regional cooperation must then come into play. Within this context, Benz discusses “the hierarchical steering of incentives” (Benz 2000 153), which refers to the always important hierarchical potential of the State when initiating regional cooperation. This kind of incentive steering can be fulfilled through different forms: Higher state-levels often use competition as an instrument in order to identify regions as promising a successful development of Regional Governance (Elbe and Meyer 2005).

Financial incentives flow into a region in the form of funds if a region conforms to the special criteria of the competition and build up cooperation and networks. Diller (2004), in this context, talks about Regional Governance being in “the shadow of the hierarchy”. This reflects the important function the state and its hierarchical potential hold, in obligating regional actors to enter into cooperation and agreement with each other.

At the regional level, the regional management plays a crucial role for the establishment of cooperation and the evolvement of Regional Governance. Regional management forms the organizational and steering core at the centre of Regional Governance. Within regional management, the main task is to organise cooperation and netting processes and to identify and integrate the relevant actors. A further task is also to net regional developments vertically by, for example, serving, for higher fund providers, as an interface to the developments within a region (Auel 2002).

Evaluation also seems to be an important instrument within the discussion about Regional Governance and the “shadow of hierarchy” (Böcher 2005b). For higher state levels they fulfil the aim of guaranteeing the observation of certain minimum standards, *despite* subsidiarity and regional self-coordination. *Within* a region, evaluations can help estimating the success of the region’s own efforts of cooperation and at the same time, be able to steer and coordinate an efficient deployment of resources. The growing meaning of evaluations within EU structural politics is self evident. Since 1988, the EU has been using evaluations as an institutional part of their programme and has been obligating member states to carry out evaluations on the basis of EU criteria, in order to guarantee the successful implementation of the EU regional policy.

e) Conclusion

The most important characteristics of Regional Governance developed in the text above can be summarised as follows:

Characteristics of Regional Governance	
Increase in significance of the region as a level of self-coordination	<ul style="list-style-type: none"> • Non-central self coordination • Free will principle • Use of endogenous potentials
Replacement of the territorial principle by the functional principle	<ul style="list-style-type: none"> • „Region“ determined by density of social relations • Function of a region is central, not (just) geographical or administrative delimitation
Intersectoral cooperation through weakly institutionalised regional networks and partnerships.	<ul style="list-style-type: none"> • Networks and cooperation through private and public actors • Joint visions • Development of regional development concepts • Intersectoral collaboration
Steering of incentives through various instruments and forms	<ul style="list-style-type: none"> • Competition as an instrument to identify and support „best practices“ • Financial incentives through funds with preconditions • Steering through regional management as organizational core • Increase of the importance of evaluations

own depiction

These central characteristics of Regional Governance show that the concept is relatively imprecise since it comprises many different organizational principles known from other contexts (Fürst 2003: 443). Attempts to define the concept often tend to lie rather at a normative than at an empirical-analytical level. On the one hand, Regional Governance can be used as an analytical framework to measure regional policy as an empirical phenomenon on the criteria given by Regional Governance. On the other hand, the description of Regional Governance seems nearly always to include a normative perspective: Regional Governance is described – without enough critical reflection – as worthwhile, although not enough empirical experience concerning success and practical problems with Regional Governance and its impacts on sustainable regional development has been gathered.

Two trends can therefore be distinguished within the research carried out on Regional Governance: Firstly, many authors tend to mix analytical and normative aspects instead of separating them, secondly, there are still not enough critical empirical studies on the effects of Regional Governance in the practice of regional policy with special regard to the relationship between Regional Governance and the traditionally relevant institutions of regional government.

These aspects will therefore be focussed on in the following: First I will point out the important role of Regional Governance, especially in sustainable regional development programmes like „Active Regions“ and „LEADER+“. The principles of both programmes will be analysed using the criteria on Regional Governance to show their practical relevance empirically. In a next step a critical reflection of the aims and realisation of Regional Governance is given based on a completed research project on the implementation of the EU common initiative LEADER+ in six German regions.

3 Sustainable regional development through Regional Governance? Regional Governance in the funding programmes “Active Regions” and “Leader+”

For quite some time now the debate on Regional Governance has been demonstrating a strong effect on rural development policy: this seem to be an adequate field for the implementation of Regional Governance. This is caused by the far reaching structural changes in rural areas, and by the fact that the challenges of the modern state manifest themselves very strongly in rural regions: The reduced importance of agriculture as central source of income has caused an increased unemployment rate in many rural areas, followed by a migration of the younger and more highly educated part of the population. Scandals (such as the BSE-crisis) and international competition have caused a change in the public demand of quality standards for agricultural products and put a stronger competitive pressure on agricultural. The role of agriculture is shifting form the mere production

of food to multifunctionality including nature conservation and cultural functions (Knickel 2002). Under these conditions smaller agricultural holdings have no chance of securing their existence „only“ with the production of food. Rural areas therefore have to make use of other potentials for development, e.g. their recreational value for the urban population or the natural beauty of their region as touristic value. The discussion also focuses on the demand for *sustainable* regional development, which harmonizes the ecological functions of a region with the economic and social needs of the population (Bergmann 2000).

Political support programmes and measures are beginning to be put in place and are providing incentives for Regional Governance to achieve processes of sustainable rural development: The German funding programme „Active regions“ as well as the EU common initiative LEADER+. The German federal government, as part of its national sustainability strategy, has started the “Active Regions” (Regionen aktiv – Land gestaltet Zukunft) model project in which 18 German regions should develop examples of sustainable regional development by formulating individual development strategies and by establishing new forms of regional cooperation. The EU common initiative LEADER+ has been supporting (through funding) local project groups in 148 rural regions in Germany, aiming to realise innovative pilot strategies for sustainable regional development since 2000. Both funding programmes represent some kind of a “pilot strategy”. In 2004 even central parts of the Regional Governance idea (regional management as facilitator of sustainable rural development, regional development concepts as guiding framework for a regional development strategy) became part of the German agricultural mainstream policy programme „Improvement of the agricultural structure and coast protection”. Due to this, at present the representation of Regional Governance in German funding programmes seems to switch over from a model strategy to become a part of mainstream policies for rural areas. To support this, the BMVEL (German Ministry for Consumer Protection, Food, and Agriculture) recently edited a manual of integrated rural development which exemplifies the philosophy of rural development with the criteria of Regional Governance (Böcher 2005b).

a) Principles of „Active Regions”

For the BMVEL the concept of “Active Regions” is an example of „good governance“ in regional development (BMVEL 2004: 8). With „Active Regions“ it aims to contribute to an efficient and goal oriented development of rural areas, based on cooperative problem-solving and regional distribution of decisions and responsibilities (BMVEL 2004: 8). In 2001 a competition took place in which 206 German regions applied with their visions for a specific strategy of sustainable regional development. These visions contained a „definition“ of their region, visionary goals and details of how to establish regional partnerships (BMVEL 2004: 10). In a second round of the competition, an independent jury chose 33 regions

which were invited to prepare regional development concepts (RDC). All regions had to orientate their visions and their RDC to the goals of „Active Regions“ as formulated by the BMVEL. Finally in March 2002 18 regions were chosen and the funding began. In total, until December 2005, 45 mio. € will be spent on regional management and regional development projects. The concept of “Active Regions” is closely related to Regional Governance: The Decision-making actor in the regions is the so called regional partnership, a network of regional actors, which assesses and chooses projects and advises in strategic decisions. The regional partnership is meant to represent all relevant social groups, public and private actors, local government and administration. Important for the steering of the regional development process is regional management, which can be financed up to 100% by „Active Regions” until the end of 2005 before it has to be co-financed by other sources. The function of the regional management is to build up a network between the most important regional actors, carry out public relations work, coordinate actions with other regions and support actors in the application process. The regional partnerships are supported by administrative partners which guarantee the legal conformity of grants etc. In addition to the regional structures, a federal project office was implemented to support the steering and implementation of “Active Regions” and to advise regional actors during workshops and network meetings. Besides the competition principle in the selection of regions, other external incentives should excite a competition between the regions in order to initiate „best practices“. Seven particularly successful regions were identified through a compulsory self evaluation method during the half-time evaluation which included success factors and compulsory progress reports and an external scientific assessment. Additional funds of 100,000€ each were granted to the seven regions. Further funds could be obtained in 2004 with the formulation, concretisation and operationalisation of goals for regional development.

b) Principles of LEADER+

The EU common initiative LEADER+, which has been in operation since 2000, in its programme both refers to the state of the regional policy debate and formulates strong guidelines, that must be adhered to during implementation in European regions (EU-Commission 2000): LEADER+ should be realised as an integrated, area-specific approach and as a pilot project. Local actors should be mobilised to develop their region together in „horizontal partnerships“, decentralisation potentials should be used and cooperation between regions should be supported through networking. All rural areas can be supported with LEADER+ funds. To prevent non discriminative support, the EU orders that the regions submit themselves to a rigorous selection competition between applicants. The goal is to support the most promising regional development concepts. The German federal states, representing the responsible political level for the implementation of LEADER+ had to report the number of regions they wanted to support and factually justify this number to the EU Commission. Within these regions so called „Local Action Groups“ (LAG) had to be established representing the regional actors and their interests. Within a region, the LAG should be the decision-making institution concerning all LEADER+-related decisions. These groups should be open to all citizens. Actors representing the

regional or local government and administration may make up only 50% of the LAG members. These LAGs have broad competencies: It is their duty to formulate a homogenous regional development concept (RDC), which will serve as an application for support to the appropriate state administration office and as an institutional framework and model for all projects to be realised. The LAG also select those regional development projects which are actually to be funded by the EU. Furthermore, importance is laid on a modern understanding of „regions“: The EU commission explicitly refers to the possibility that if a higher regional coherence is linked to it, one should be able to differentiate the LEADER+ regions from administrative units within the EU. Actors in rural areas should define a vision of development for their region collectively by means of regional development concepts. The pilot strategies formulated within the regional development concepts must correspond to those standards defined by the EU Commission in its guidelines (EU-Commission 2000, 14.2). LEADER +, like „Active Regions“, demonstrates a regionalised strategy for achieving sustainable development of rural areas which supports with financial incentives the self-coordinated formulation of solution strategies in rural areas. LEADER+ also has a system of evaluations, which should be primarily carried out analogous to the evaluation principles of the EU structural policy. LEADER+ also asks of the regional actors that they self evaluate in order to assess their own work.

Hahne (2004) sums up the main principles of Leader + as follows:

- Area related approach: search for a specific regional path of development on the basis of regional development potentials.
- Bottom up elaborated regional concept of development
- Local partnership between private and public actors
- Innovation: new answers to existing and future oriented questions
- Networking: Collaboration of independent actors for a common goal
- Sector overlapping integration
- Interterritorial cooperation

c) Regional Governance in “Active Regions” and LEADER+

It is made clear even by the short introduction of the principles of the two support programmes that they present good examples (at least in their programmes) for the relevance in practice of the concept of Regional Governance in current German regional policy. The following overview relates the two support programmes to the elaborated characteristics of Regional Governance:

Regional Governance in “Active Regions” and LEADER+		
Aspects of Regional Governance	“Active Regions”	LEADER+
Increase in significance of the region as level of political coordination		
Non-central self steering	yes	yes
Free will principle	yes	yes
Use of endogenous potentials	yes	yes
From a territorial to a functional principle		
„Region“ is determined by the density of social relations	yes, actors define their regions themselves	yes, actors define their regions themselves
Functions of a region at the core, not geographical or administrative criteria	yes, regional actors define specific regional guiding principles and fields of action	yes, regional actors define specific regional guiding principles and fields of action
Intersectoral cooperation in weakly institutionalised regional networks and partnerships		
Networks and cooperation of public and private actors	Regional partnership	Local Action Groups
Common visions and guiding principles	Region had to formulate RDC to define Visions and guiding principles	Region had to formulate RDC to define Visions and guiding principles
Intersectoral cooperation	obligatory	obligatory
Steering of incentives through different instruments and forms		
Competitions for the identification and support of „best practices“	selective competition	selective competition
Financial incentives through condition-bound funds	yes	yes
Regional management as organisational core of steering	yes	yes
Increased importance of evaluations	yes, obligatory self-evaluation and scientific assessment	yes, obligatory external evaluation and demand of self-evaluation

Own depiction

One can see that both “Active Regions” and LEADER+ reflect all of the key aspects of Regional Governance. The EU’s and Germany’s regional policy for rural regions seems to have reached the state of the art (or the state of scientific term trends). The importance of Regional Governance for practical politics can be shown by the given examples. It can also be seen that the normative ideal of governance is mostly reflected in the programmatic level of specific programmes of regional development. No statement can be made on their importance for the practical implementation in regional policy. What is left of Regional Governance on the level of the practical implementation in the region? What is the relationship between normative aims of Regional Governance and their empirical characteristics?

In order to answer these questions, in the following chapter I will present some of the central results of a research project in which policy studies in six LEADER+ regions were carried out and which allows for the discussion of some conclusions for possible problems of the Regional Governance perspective.

4 Regional Governance in practice: Some aspects of the implementation of the EU common initiative LEADER+

Based on the most important results of a research project carried out at the University of Göttingen, which analysed the success factors and the implementation process of sustainable regional development in six LEADER+ regions, some examples of possible difficulties in the practical implementation should be discussed. They will show the tensions between normative aims, formulated in Regional Governance and the respective programme conditions and the empirical reality. Although the experiences of six model regions are certainly not representative of the whole implementation of LEADER+ in Germany, they can serve as examples of possible practical difficulties for Regional Governance with high relevance also beyond these regions (about LEADER+ in general see e.g. Hahne 2004).

The EU common initiative LEADER+ is based on the experiences of two prior support periods (LEADER and LEADER II) and will run from 2000 to 2006. The LEADER-guidelines stated by the EU commission (EU-Commission 2000) have been operationalised in the state programs of the German federal states. These explicated the contents and conditions which applications of rural regions had to meet. LEADER+ gives support with the LAG regional networks of actors, who first have to formulate a coherent development concept (RDC) based on the LEADER-Principles, which they had to present in an competition with other interested regions at the federal state level. At the moment, LEADER+ is supporting 148 German regions with a budget of up to 247 mio. €. In this chapter I have shown that LEADER+ can serve as a perfect example for the practical relevance of Regional Governance – programmatically. But now the more important question arises, how does the practical realisation of the political implementation of LEADER+ correspond to the criteria of Regional Governance?

a) Some problematic aspects

The democratic legitimacy of regional governance

According to EU Conditions, on the one hand state actors (local government, administration) may not make up the majority of the members of the LAG – the basic decision board in the centre of the LEADER+ implementation. On the other hand, the EU funds have to be co-financed from state funds to be made use of at all.

Conflicts in regional and local politics can be observed: On the one hand, local politicians are interested in bringing EU financial support to the region through co-financing. On the other hand, they fear a loss of decision control of democratically legitimated organs in the distribution of funds due to the aforementioned LAG structure. This type of conflict with the institutions of Regional Governance is to be observed in almost all of the analysed regions. In one region the local parliament discussed the democratic legitimacy in detail and bound further activities of the LAG to the condition that the majority of the parliament votes for an implementation of LEADER+. This shows a problem of voluntary actor cooperation with low institutionalisation, as propagated by both of the concept of Regional Governance and LEADER+: on the one hand they have no clear democratic legitimacy but on the other hand they can make important decisions, in the case of LEADER+ about the distribution of several

Mio. Euro support funds in a region. The democratically legitimized institutions and actors of regional *government* are usually sceptical about the support of actor networks, as they want to stabilise their own power and do not see enough democratic legitimacy in the LAG networks.

They see their power endangered from two sides: from the EU, which, with LEADER+, is forming new institutions and which can bind budget funds, but on the other hand from the LAG themselves, who can take important decisions even against elected politicians and the local administration. One possibility to react on the deficit of legitimacy would be to configure the LAG in such a way that they were open to all interested actors and citizens and that they represent all important regional actors as balanced as possible. In the implementation one can see that in some cases these conditions are not always met. The development process and the access to the LAG is not always open to the participation of new actors. On the contrary, there often exist regional actor networks from other contexts, which have no interest in including new actors in the process. Strong interests play a major role in these distributional conflicts, where the inclusion of new actors can endanger the realisation of own goals. The following anonymous quote from an interview with an agricultural actor in one of the six model regions demonstrates this problem: *“Certainly the BUND (German friends of the earth) expressed interest in participating. But we don’t want it to join. Because in fact we cannot work well with nature protection organisations.”*

Regional self-coordination versus hierarchical demonstrations of power

In order for projects to actually be financed by LEADER+ funds, the LAG must first agree on their content. In order to do so, the LAG applies, within the context of their RDC, various assessment criteria which have been approved by the appropriate federal states. According to the EU, the aim is to approve only those projects which correspond to the EU guidelines and fit into a previously approved regional development concept. In order to then access funding, the projects must be, as a second step, examined by the authorisation agency and be deemed to conform to EU laws. The close examination against the EU guidelines for LEADER+ and other relevant EU stipulations (grant laws etc) comes to the fore here, although there exists no standardised mode of operation. In fact, in each of the federal states, the authorisation agencies are represented by different departments and levels. Here it is a certain experience that in some cases it is the authorisation agency and not always the LAG who actually decides about the projects and funds.

When funds flow, conflicts about their distribution arise: e.g. on the island of Rügen (a LEADER+-region) organisations who want to carry out projects within LEADER+ made contact with the authorisation agency directly, to hand in their application as soon as possible without contacting the LAG (not at all in the way defined by the EU).

A constant factor of insecurity is the question of co-financing: In the light of the drastic fiscal problems suffered by the parishes, districts and federal states, whether co-financing can be expected remains an open question for LEADER+. Co-finances based on parliamentary decisions are an important power factor for local politicians regarding the LAG: it can be used if the LAG's decisions do not meet the expectations of the political boards. The implementation

of development projects only seems to be a result only from the discussions of regional actors within the LAG. With the required co-financing from state budgets and a conformity assessment (with a certain leeway) the implementation can rather be seen as the result of conflicts and cooperation between Regional Governance and government.

b) Positive impacts of LEADER+

Despite the possible important problems described above, it has to be highlighted that LEADER+ definitely can play an important role to initiate processes of sustainable rural development: In the research project we have found many positive effects of LEADER+ some of them should now be summed up in short:

Establishment of new forms of cooperation and participation

In all of the six regions new forms of participation processes can be observed. Due to strong incentives resulting from the available funds and the EU's LEADER+-guidelines the regions organised the participation of different actors and citizens in an innovative manner. It seems also that "weaker" interests like women, youth or nature protection – in spite of all possible problems described above - get better chances to be involved also due to the EU-guidelines which prescribe a broad participation of all regional actors. Therefore actors especially representing the aims of sustainability like nature protection or environmental NGOs cannot longer be excluded from the regional development process. In one of the regions a representative from the WWF was elected as the chairman of the LAG, although there have been strong conflicts between nature protection and tourism. It seems that the special design of LEADER+ supports such in principle weak actors to become more important within regional networks.

Support of innovative intersectoral development projects

Another important point is that LEADER+ supports only integrative projects which can lead to creative processes of finding innovative project ideas. In one of the regions nature protection actors designed a project in which emigrants from Russia should be integrated into regional social structures by using methods of nature education. The existing social problems between the rural inhabitants and the emigrants were tried to be overcome by the help of nature protection. In other regions nature protection actors designed projects in cooperation with tourism, where tourists should be attracted by special nature-related events or special natural attractions. In one region's forest a cultural alley was installed consisting of different "stations" with different wooden art objects. This alley is now a successful tourist attraction also leading to positive economic effects. Such projects in which nature protection helps to gain effects which are not normally the core of nature protection are very helpful to strengthen the general role of nature protection within regional development: Different actors see that natural goods can be a strong resource also for the social and economic development of rural regions and that a sustainable use of these goods may lead to a sustainable regional development which does not have to be in contradiction to economic development.

These possible positive effects of LEADER+ result from the special design of the funding programme and the necessary combination of top-down steering through hierarchical incentives (LEADER+-guidelines, the available funds etc) and self-coordination on the regional level. It seems that LEADER+ is a good example for a successful combination of hierarchical incentives and self-coordination.

c) Conclusion: LEADER+ and Regional Governance

With a view to the discussions about Regional Governance as a concept with high potentials for regional policy, the principles of LEADER+ can be highlighted as a very innovative approach to support sustainable regional development. Nevertheless, the results of our research project show some possible gaps between LEADER+ ideals and their political realisation. The practical implementation of Regional Governance particularly faces problems as a result of the tense relationship between the supported network structures of regional partnerships and the traditional structures of the representative political system and local level (governance and government). The inappropriate democratic legitimacy of the LAG seems to weaken the governance structures in LEADER+. Nevertheless, the EU's hierarchical steering strengthens regional governance, as it gives an incentive, through financial means, for government and administration on a local level, to participate in LEADER+ despite their reservations and conflicts. Through its organisational prescriptions it also supports the involvement of weaker actors like nature protection, the organisation of creative processes of participation, and the design of innovative project ideas which have to integrate different sectoral interests. In the six regions we have investigated, such innovative projects lead to a change of understanding in the role of nature protection for regional development as well as a strengthening of the general concept of *sustainable* regional development in the regions.

5 Conclusions

The term Regional Governance is currently a buzz word in the discussion on regional policy and how to initiate processes auf sustainable regional development. The transfer of responsibility, decentralisation and self-coordination seem to be promising attempts for successful regional planning, which have by now been reflected in the concepts of important support programmes for rural areas such as LEADER+ and "Active Regions". It seems to be a problem that Regional Governance is often used (sometimes unconsciously) in a normative way, formulating certain claims for regional policy with no consideration of their practical implementation. One also notices that, with a strongly normative use of the term fundamental problems – such as the possible lack of democratic legitimacy of the postulated weakly institutionalised networks or the different power potentials of actors within – receive too little attention. There is therefore still a high need for research on the effects of Regional Governance in practice.

This contribution has shown that this concept is in any case suitable for analysing the principles of political funding programmes - here it can be shown that Regional Governance plays an important role in relationship to programmes supporting strategies for sustainable regional development. It can also be shown (here with LEADER+ as an example), how the regional praxis of political implementation of Regional Governance can be considered. The

criteria serve as measure for identifying regional political problems. It also became clear that in regional political practice tensions develop mostly between the relevant institutions of the existing traditional governmental structures and new forms of Regional Governance.

The example of these two funding programmes shows that there is no “either-or” decision possible between “governance” and “government”, actually they complement each other in practice: Regional policy, as represented in LEADER+ and “Active Regions”, also work only – as has been shown – in a combination of hierarchical top-down-steering (government) and a bottom-up approach (governance). Regional cooperation still needs an incentive from outside, e.g. support programs. So the level of how such programmes are able to really stimulate processes of sustainable rural development is still to a certain degree dependent on the institutions and actors representing regional government. So, in LEADER+ as well as in “Active Regions” the strong representatives of “government”, the EU-commission and the BMVEL, make sure that Regional Governance begins with the hierarchical steering of incentives. On the regional level itself these processes lead to conflicts with established structures and institutions of the political system. This leads to the question of how these representatives of government can be adequately integrated in the process of Regional Governance as a precondition for really achieving sustainable rural development by Regional Governance.

Regional Governance seems then to be more than a normative claim, if it is supported by political funding programmes which steer through hierarchical incentives. In such a case, Regional Governance is supported by funding programmes and can support processes of sustainable regional development. It seems that both, LEADER+ and “Active Regions”, are good examples for political funding programmes representing such a successful combination of regional government and governance.

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INNOVATION AS A SOURCE OF COMPETITIVE ADVANTAGE IN WOOD PRODUCTS MANUFACTURING INDUSTRIES

Approaches to competitive advantage and innovation concepts for the single firm and the value chain

Abstract

The competitive structure of an industry provided an earlier explanation for profit differentials between industries. Later research revealed that profit differentials significantly relate to individual firm behaviour. By strategic positioning itself a firm responds to forces in its business environment. A business strategy is defined in terms of products, markets, customer target and core competencies. Instead of the strategic alignment of its business and related strengths, building-up resources that allow flexible adjustment is a suitable strategy to sustain competitive advantage in a turbulent business environment. Managerial superiority in combining and coordinating complex sets of specialized skills and organisational capabilities across business functions is the basis for competitive advantage when assets, skills and technologies are equally appropriable. In saturated and competitive markets innovative capability as the ability to create new customer value and to proactively stay ahead of competitors decides about competitive advantage. Innovative capabilities have to cover besides technological capabilities also aspects of management and organisation in order to move from technological chance to innovation. The innovative capabilities of an organisation are embedded in its resource base, its internal organisational structure and operational and managerial routines; they extend also to organising and managing external linkages. Whereas the concept of capability offers a competence-based approach to innovation, sectoral surveys have been confined to innovation as an output of innovation activities. Only lately addressed by the Oslo Manual the knowledge about the role for innovation of non-technological capabilities is still limited and non-comprehensive. In the object approach applied there is now extended scope for organisational and managerial methods and marketing practices. In developing marketing innovation around Kotler's 4 P's of marketing mix, marketing is characterized in the Oslo Manual mainly as a selling function. Perceiving its integrative function transforms marketing into an integral part instead of a separate and final stage of the innovation process and recognises innovative structures and the capability to implement a customer-led demand-pull type of innovation process as the key for innovation performance of firms operating in mature industries and saturated markets. The wood products manufacturing industries are technological mature and scarce of technological opportunities. Innovation strategy is characterised by the risk-avoiding exploitation of existing instead of exploration of new technological opportunities in niche markets. There is insufficient competence in driving customer-focused product development. Shifting towards customer- and market-oriented business concepts increases information-intensity and the significance of the marketing function. Cross-industrial network-facilitating policies and organisations of the innovation system as gatekeepers assist in technology diffusion. Development and commercialisation of

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innovation occur across business networks of various structure, where innovation activities are dispersed among network members. Network arrangements are committed to the alignment of business activities along a collective business model, to the collective implementation of a customer solution or the configuration and management of supplier relationships. The configuration of network relationships has an impact on innovative capabilities of the participating members.

1 Industry structure, business strategy, resources and competencies as sources of competitive advantage

a) Industrial organisation and the business strategy approach

An early explanation for the differences in business performance across firms of different industries can be found in industrial organisation (IO) theory, a strand of economic theory concerned with the competition between firms and the evolution of market structure. Based on the finding that differences in business performance across firms are smaller than differences across industries the conclusion was that it is mainly industry structure – and less firm behaviour (conduct) – what determines business profits (Davies and Lam 2001 ref. Schmalensee 1985). In the traditional IO approach structure is determined as competitive structure of an industry in terms of the number and size of firms (or market concentration), and performance based on oligopolistic market power. Later research provided evidence that profit differentials are caused not only by size but also by differences in firms' voluntary strategic behaviour.

Adopting the IO approach to the firm's strategic business planning process Porter (1980, 1985) suggests to put focus on the attractiveness of an industry as a business environment measured in terms of profitability. Porter elaborated the analysis of the competitive structure of an *industry* to five forces as the main attributes explaining cross-industry differences in long-run average profitability: the intensity of rivalry among incumbent firms, the threat of new entry and substitutes, and the power of buyers and suppliers (op. cit.). Porter suggests this five forces model as a general analytical framework for the firm's sophisticated strategic business planning process and the subsequent decision about its business strategy. He suggests generic strategies defined in response to industry forces in order to achieve competitive advantage (CA) (Collis and Montgomery 1995).

In a marketing-oriented approach to strategic positioning the firm determines its business strategy by making decisions concerning its products, target customer groups, *core competencies* and the geographical limits of its market (Ansoff 1965, Hansen and Juslin 2002, 2005). With respect to products and customers a business strategy includes a description of the basic customer needs served, related technologies and the degree of customization as the basis for differentiation against its competitors. The combination of product, customer and market area strategies along with the appropriate core competencies leads to CA and determines the firm's strategic positioning into its business environment.

b) The resource-based approach

It is immediately plausible that successful strategies of firms providing a CA must be endowed with the ability to control resources that allow them to do so (Penrose 1959, Foss 1997). Therefore resources, not equally available to all firms, should constitute the precondition for a firm to yield a superior rent as compared to rivals. But this implicates also that the set of strategic options a firm can pursue is restricted by the resources the firm has at its disposal. This may be a major restriction in a quickly changing business environment and under conditions of restricted access to (superior rent yielding) valuable and scarce resources. In the view that it is valuable and scarce resources as stocks of assets and capabilities that provide a sustainable CA to firms, most important resources are those that accumulate slowly over time. Accordingly scarceness-related asymmetries in the stock of resources between firms prevent that successful strategies are quickly imitated and superior rents eroded by competition. In a dynamic business environment and under these preconditions of accumulative resources it is intuitive not to align firm resources to a preselected strategy but to adjust business strategy to the resources that provide a firm with a CA (Collis and Montgomery 1995). Furthermore building-up a resource base that allows a firm to flexibly adjust itself to change is a viable strategy for safeguarding CA in a dynamic business environment.

c) The competence-based approach

In the *competence-based approach* it is the firm's managerial superiority in identifying, developing and co-ordinating specialised and complementary resources into cost efficient and – with respect to customer value - effective business processes that is in the core of CA. Managerial superiority is related to the ability to combine and co-ordinate complex sets of capabilities across business functions (Javidan 1998). Competence more specifically is related to the co-ordination of specialized skills of individuals and groups into organisational routines and are embedded in organizational design, managerial mechanisms, social behaviour and values. Competence is differentiated into individual and social skills the latter being subdivided into generic and firm-specific capabilities. Capabilities relate to the ability to utilise resources including human resources and related individual skills. Different kinds of capabilities may be especially relevant in a different industrial context, such as in high-tech or low-tech industries, or for a specific business strategy (Korhonen and Niemelä 2005).

Competences required for customization and differentiation strategies relate to identifying customer wishes and offering customized products and services; for commodity and cost leadership strategies the competence required relates to process and material technologies. A well-known brand or marketing channel can be a special competence. Special competences of a firm may relate to work flow management residing in organising, co-ordinating and supervising production processes. A high quality standard may require special competencies in human resource management. A competence may relate also to *external processes* linking the firm's supply chain to its customers. Here, CA may be based on the firm's competence to create, manage and develop sub-contracting, production sharing and supplier networks.

Core competences are a complex difficult-to-imitate set of organisationally embedded capabilities. Tacit knowledge, the ability of collective learning and organisational capabilities are essential for core competencies. In contrast to operational knowledge necessary to accomplish specific tasks and the basic functions of the firm - which both are basic requirements for a firm to operate in an industry - it is superior managerial competence residing either in the top management or being dispersed across different organisational levels and business functions of the firm that as a core competence differentiates the firm from its competitors and provide it with a CA. Managerial competences are most likely a source of CA because of their complexity, tacitness and the restrictions these properties impose on imitation. (Korhonen and Niemelä 2005).

2 Innovative capabilities of the firm

a) Innovative capabilities, organisational structures and managerial practices

Innovative capabilities are defined as the firm's capabilities to generate customer value by developing and introducing to the market new products and services or reducing the costs induced by the value creation process. The innovative capabilities of a firm rely besides on resources also on effective organisational structures and managerial practices. In all respects the firm's innovation system is embedded in the firm's resource base, management system and organisational structures. Innovations are initiated and developed mostly within the scope of ongoing continuous business routines, although as a special case innovations may proceed within distinct development projects or be spontaneously initiated by an individual.

Operational routines are important not also for the operational efficiency but for the innovativeness of the firm as well. In fact, operational routines are core competencies of a firm enabling it to exploit the economics of repetition and learning. Operational routines, however, may be also major rigidities in adapting to radical change in the business environment. The capability to address rapid change relies on the firm's capabilities in sourcing and integrating of new competencies and in the reconfiguration of its business processes. *Dynamic capabilities* in this sense denote the ability of an organisation to adapt to a rapidly changing business environment (Grant 2002). In a special sense (Katzy et al. 2003 ref. Teece 1995) – the meaning of dynamic capabilities is refined to the capability to innovate in the sense of the firm's ability to rapidly and routinely integrate the product or solution development process into the firm's productive base to ensure the new product is rapidly entering the market. Dynamic capabilities are conceived here in a *Schumpeterian* perspective as the capabilities that enable the firm to innovate and make that innovation profitable over and over again (Katzy et al. 2003 ref. Nelson 1991).

Depending on the dynamics of the firm's business environment its innovative capabilities may rely either more on dynamic or operational capabilities. Adopting organisational structures and managerial models new to the firm – that is, *organisational and managerial innovation* - may assist in improving the innovativeness of a firm. In a stable business environment the patterns

of innovative capabilities are routine processes focusing on continuously and incrementally developing operational capabilities, whereas in a dynamic business environment there is less formal patterns and the processes are more experimental (Korhonen and Niemelä 2005).

b) Innovative capabilities and marketing function

With respect to innovative capabilities the role of marketing changes remarkably depending on whether it is perceived as a pure selling function or as a marketing function that is embedded in the firm's management system and organisational structure. Marketing considerations are a major part of the innovation process starting with the development of a basic product and resulting in customized end-use applications. The role of marketing in its narrow sense as a selling function is restricted to providing the distribution channel as the outlet for the firm's products and related information to the market. In this sense a decision to choose a new or organise in a new way its distribution channel may emerge as the consequence of the firm's decision to introduce its products to a new market. In case of a pure substitute for non-differentiated standard products the emphasis in the innovation process is on technological implementation. The product application is to be used by known end users for known needs and therefore there is no need to reorganise the marketing of the new product. In order to make a standard product available to a large number of end users it is usually distributed via intermediaries such as wholesalers and importers.

Perceiving marketing as an integrative function rather than providing solely a factory's selling outlet revises and enlarges the role of the marketing function in the innovation process and transforms it into an integral part instead of a separate and final stage of the innovation process. Marketing thereby rises into a position as a major constituent of the innovative capabilities of the firm. In the case that the innovation process is designed for customer applications the firm's innovation system has to reflect the importance of collaborative forms of supplier end-user relationships, where the marketing function has a integrative role. The firm's marketing channel has to provide the innovative firm with direct contacts to its product users and must be designed to deal with inputs from customers that contribute to the innovation process. Therefore to support the innovation process market communication and market information as marketing function must be adequately configured. This type of innovation process may be denoted as the demand pull type. It may characterise the innovation process as a whole or its final part in case that the innovation process is starting with the development of a basic product and resulting in customized end-use applications.

Unless the new product application is to be used by known end users for known needs the innovation process has to cover also considerations about how to reorganise *marketing* for the new product. A marketing innovation responds to this need. The governance structure of the marketing channel – either characterized as market relationship, contractual relationship, partnership or vertical integration – is a decisive determinant of innovation capabilities with respect to access to information about the ultimate customer, incentives and willingness to risk sharing of market channel participants.

To conclude: The innovative capability of a firm relies on its innovative system, which is embedded in the firm's resource base, management system, organisational structures and business routines. The preconditions for innovativeness, therefore, can not be captured by focusing on R&D activities, alone. Capabilities residing inside the firm that are important for its innovativeness are related especially to knowledge management, human resource management, forms of work organisation, individual and organisational skills. Cross-company cooperation and external relations between companies and supportive regional networks are of special importance. This is valid for high-tech and low-tech industries alike (Hirsch-Kreinsen 2006, Hirsch-Kreinsen et al. 2006). Special capabilities in exploiting existing technologies as well as capabilities required for adopting, combining and employing high-tech technologies are important for innovativeness especially in low-tech industries.. Market success in saturated markets requires actively developing the demand for a new product for increasingly sophisticated customer needs and therefore marketing must be perceived as an integrative function configurating all firm activities oriented towards the creation of customer value (Hansen and Juslin 2002, 2005). Perceiving marketing as an integrative function revises the role of the marketing function in the innovation process and makes it a major constituent of the innovative capabilities of the firm.

c) Innovative capabilities, business environment and institutional framework

The description of an innovation process can rarely be reduced to firm internal activities pursued by the firm in isolation from its business environment. A most important dimension concerns the manifold interactions between the firm and different actors such as customers, suppliers and competitors, R&D, financing organizations and government agencies. Therefore an evaluation of innovative capabilities and innovation activities must pay attention to activities and structures connecting the firm with its business environment in terms of supply chain integration, customer-focused business strategies and R&D co-operation. Other dimensions shaping the intensity and focus of innovation activities of a firm are technological opportunities, appropriability conditions and market competition as well as the institutional framework the firm and its business environment is embedded in.

Technological opportunities of the firm in a narrow sense correlate with the firm's technological knowledge base and the firm's access to external technological knowledge. In a broader sense technological opportunities are determined by the access to market information as the source of innovative ideas as well as by facilitating and impeding factors related to the firm's institutional environment, such as technological and commercial infrastructure, legislation, regulations and standardization. Technological opportunities are determined by the role played by customers and suppliers as providers of innovative ideas, developments in the sciences and the advancement in equipment and instrumentation originating from other industries, as well as the extent to which a firm can rely on knowledge inputs from universities, research institutes or other "bridging institutions" (Klevorick et al. 1995).

In mature industries, such as the wood products manufacturing industries, technological opportunities offered to firms in terms of radically new products are small. Developing radically new product technologies is economically infeasible except for large firms. Instead of radically

new products, technological innovation is directed towards product differentiation and customization. Product innovation with respect to product architecture supports both product differentiation and customization strategies. Although inferior to an integral architecture that allows to customize a product to satisfy particular customer needs, modular product systems consisting of standardized components are an important means to reduce the costs of product differentiation while offering customer value by mass customization. The markets for wood products can be characterized as saturated with overall growth being slow. The major business opportunities in these markets are offered by market segmentation and product customization regarding the core product but also purchasing conditions and customer support.

Appropriability conditions as the possibilities or restrictions in protecting innovations from imitation can either inhibit or facilitate the exploitation of technological opportunities. Appropriability conditions might simply relate to market domination and barriers to entry (Teece 1986, Foss 1997). Other means of appropriation relate to product characteristics such as complexity, design or trademarks (Palmborg 2001). Weak appropriability coupled with competition and the absence of technological opportunities explains the low degree of novelty of products and the low priority of product innovation in an industry (Palmborg 2001). Patenting may be a means to safeguard the innovator's profits from innovation but may also have adverse effects through the isolation from competition. In a more fundamental sense, appropriability conditions depend on the nature of the knowledge base in terms of the degree that knowledge is tacit or codified, or specific versus generic due to frequent knowledge spillovers (Malerba and Orsenigo 1997). Technological opportunities and appropriability conditions jointly determine a firm's incentive to spend on R&D compared to other knowledge-creating activities.

Customers and suppliers have a most pronounced position as a source and implementation environment for innovation. Close contacts to customers are important in order to further develop a product and to find new product applications. In case of a new product for a new market collaborative agreements with agents operating in the target market may facilitate market entry, transfer of knowledge and skills and may enable partners to share fixed costs and risks. The role of a supplier might be of crucial importance for the innovation process not only as a provider of a new and more versatile technology but also as an active partner in development and case specific adjustment of process technology. A supplier may be the provider of an innovative idea or a new technological solution already in an early development stage or in the later production start-up stage of the innovation process. Complementary products can facilitate or (in their absence) impede market adoption of a new product. Both the core product as well as complementary products and services are necessary to be in place in order that the new product as part of a new problem solution is competitive in the target market. Only then it is able to provide its full customer value necessary to economically outperform the competing solution. This might require special arrangements with suppliers of complementary products. In the wood products manufacturing industries suppliers of machinery and equipment are frequently a direct link between the development of process technology and the development of a new or improved product. In the process of moving from pilot production to a full scale industrial manufacturing method the contribution made by a machine or equipment supplier might be crucial for the success of the innovation process.

3 Innovation concepts and typologies – the object approach to innovation

a) Innovation concepts and typologies

Innovation denotes the successful introduction of novelties to the market. A distinction is usually made between *innovation as an output of innovation activities* and those activities itself. Innovation can be understood as the first economic utilisation of new products or processes. New may mean new to an industry, market or society or new to an organisation or individual, irrespective of whether or not it has been introduced by others before (Rametsteiner 2000). Schumpeter (1935) (ref. Rametsteiner 2000) defines innovation broadly as a discontinuously occurring implementation of new combinations of means of production. *Nelson and Winter (1977)* (ref. Rametsteiner 2000) define technological innovation as a non-trivial change in products and processes, where there are no previous experiences. According to Schumpeter (1935) (ref. Rametsteiner 2000), four types of business innovation have to be distinguished:

- product innovation as the introduction of a new product or a new quality of a product
- process innovation as the introduction of a new production or procedural method
- marketing innovation as the opening-up of a new market or a new resource
- organisational innovations as the implementation of reorganisation.

In their report to the OECD on supporting firms' technological capabilities Arnold and Thuriaux (1997) confine "innovation" to technology in a way which is relevant to industrial and economic development. Beyond the knowledge associated with acquiring and manipulating new processes and products technological capabilities include also aspects of management and organisation, or "soft technology", such as continuous improvement and lean production. These capabilities are admitted necessary for moving from technological chance to innovation.

As to their role and importance for innovation performance conclusions about non-engineering "soft" managerial capabilities are, however, rather limited due to the lack of hypotheses and empirical evidence. The Oslo Manual (OECD 2005), which is the standard EC reference for large scale surveys examining innovation in the business sector, has acknowledged the importance of "soft" technologies as it recently expanded the concepts of innovation by *organisational and managerial types of innovation*. The manual accounts now also for networking capabilities as external linkages, which are an important determinant of technological capabilities especially for small firms. The innovation classification scheme applied in the OECD-initiated large cross-European innovation surveys (CIS) is based on the aforementioned Schumpeterian types of innovation, which are further refined into a larger number of categories and definitions of innovation activities. The latest (third) edition of the Oslo Manual (OECD 2005) has an expanded coverage of knowledge flows and the role of linkages in the innovation process. In its latest edition it thoroughly addresses innovation in less R&D-intensive, so-called low-tech industries. Based on the Schumpeterian categories the Oslo Manual (OECD 2005) distinguishes the following four basic types of innovation:

- A *product innovation* is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics.
- A *process innovation* is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software.
- A *marketing innovation* is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.
- An *organizational innovation* is the implementation of a new organizational method in the firm's business practices, workplace organization or external relations.

An *innovative product* is categorised by its degree of novelty, which is basically a judgement about the changes in the underlying knowledge base. The attribute of *radicality* of a product innovation has been related to the expansion, *incrementality* to the exploitation of the firm's knowledge base. Classifying products as "new to the market" may indicate whether the firm is at the technological frontier within a specific product niche. "New to the market" does not necessarily mean a technological novelty, but it usually requires modifying of existing products in some degree and more generally marketing and organisational changes (Palmberg 2001). Before a novel technological finding providing potential for product innovation is introduced to the market it has to traverse all phases of the innovation process, which includes product development and commercialisation, possibly covering also complementary products, services and marketing. A new product has usually to be compatible with a technological and commercial platform built earlier with respect to technical norms, standards and production system.

A *process innovation* may be a technological or organisational innovation. A *technological process innovation* is the creation or adoption of a new or significantly improved production technology. It may be a new method of managing material or information flows between subsequent steps of a value-adding process. The Oslo Manual (OECD 2005) relates *organisational innovation* to the implementation of a new organisational method. This can be a change in business practices, in workplace organisation or in the firm's external relations. A new business practice involves the implementation of new methods for organising routines and procedures for the conduct of work. Innovation in workplace organisation involves the implementation of new methods for distributing responsibilities and decision making among employees for the division of work within and between firm activities. Organisational innovations may be related to the adoption of a new production management system or concept, for example continuous flow production system, flexible manufacturing system, computer-aided product development and manufacturing system, JiT production management concept.

Reengineering is the radical redesign of an organization's, or supply or value chain processes. Rather than reorganizing processes within special functions, like production, accounting or

marketing, business reengineering is concerned with complete processes from materials acquisition to production, to marketing and distribution. Business reengineering may intend to implement new production or supply chain management principles such as lean production. Organisational innovation in a firm's external relations involves the implementation of new ways of organising relations with other firms or public institutions, such as the establishment of new types of collaboration with research organisations and customers, or new methods in supply chain management, and the outsourcing or subcontracting of business activities. An organisational innovation can be a key source for increased productivity and innovative capabilities. Technological innovation activities increasingly become a multi-organisational phenomena, which is dependent on new efficient forms of *interorganisational coordination in operational or innovation processes*.

The Oslo Manual (OECD 2005) develops the concept of *market innovation* around Kotler's 4P's of marketing mix. A marketing innovation may be understood as a marketing practice new to the firm as a means to get access to new customers. It may relate to changes in the marketing channel or the way the company manages its customer relations. Market channels should be able to transmit the information flows and material flows between manufacturer and its clients required to implement the business. Opening-up a new marketing channel may require strategic marketing agreements with partners. Those may be providers of complementary products and services, distributors or retailers. A marketing innovation may be "launched" by a new product: in the start-up stage of the new business a new marketing strategy which is different from the current business may be necessary to be developed. A marketing innovation may be related also to marketing a present product to a new market. A new marketing practice may involve organisational innovation in the sense that it requires reorganising the company's existing sales activities.

Innovations of different types may occur concurrently and interdependently. A process innovation may be an integrated part of a product innovation. An organisational change may be triggered by a technological innovation within or outside the boundaries of the single firm. An organisational structure may be rendered obsolete by a technological innovation, which may have a substantial effect on working patterns and production network relations. Earlier editions of the Oslo Manual (OECD 2005) distinguish between technological and organisational innovation categories but do not deal with the concurrent occurrence and interrelatedness of different types of innovation. The latest edition draws attention also to combinations of innovations, such as product and process innovations, product and marketing innovations, process and organizational innovations.

b) Innovation in multi-firm business networks

Vertical cooperative networks are arrangements that connect firms or their specific value-adding activities vertically along a particular value chain. A network may be characterised by various governance structures interconnecting suppliers, manufacturers and distributors of the value chain. *Horizontal networks* connect firms in particular functional areas such as research, sourcing, production, logistics or marketing. A cooperative *production and supplier network* vertically along a value chain may focus on supply chain management, that is on the

coordination of upstream and downstream value adding activities and on the overall efficiency of these activities in terms of costs, logistics or quality performance. Process innovation in supplier networks is a means to enhance the cost and logistical efficiency of network activities. The notion of *value network* characterises a production and supplier network by its strategic focus on activities that provide and enhance customer value. It implements a common business strategy by a cooperative business model. In value network management *product innovation* and related R&D activities are of pivotal concern for cooperation (TEKES, SARA - Value networks in construction, 2003-2007, Schienstock and Hämäläinen 2001).

A networking arrangement that enhances the innovative capabilities of participating firms can be conceived as an organisational innovation. Innovation concerning network configuration may have an impact on operational business performance, may improve knowledge transfer or learning processes or may be related to the implementation of a strategic networking model. An organisational innovation may concern especially the configuration of supplier network relationships by implementing lean principles or a just-in-time production system.

A distinction that the Oslo Manual does not make is the one between *modular, architectural and system innovations*, which denote categories of technological product innovation, which are different in the extent and complexity of the implicated network change (Henderson and Clark 1990). Network change means that skills, competences and responsibilities of the network participants are rendered obsolete by the technological change and therefore has to be adapted or replaced. Accommodating to the change may exceed the innovative capabilities of network members and may result in the exit and the replacement of network members. A main idea is that a radical innovation may be modular and therefore minor with respect to its network impacts. Modularity refers to the physical product architecture and related organisational production network structures. A modular architecture is one in which modules implement one or a few functional elements of the product. An integral architecture is one in which a single part implements many of the product's functional elements, and where the interactions between parts are not well-defined and incidental (Ulrich and Eppinger 1995).

A modular innovation does not cause any network change if the interfaces in the product architecture are properly defined. It only changes the elements that constitute a product, whereas the linkage pattern between elements remains unchanged. Technically, such innovations might be radical. The diffusion of a radical modular innovation inside a value network depends on the adaptability of the module in the network. Well-defined module interfaces are sufficient to make adaptability possible for the other partners in the value chain. *An architectural innovation* has a *limited network effect* at least on some associated network participants. Architectural innovation changes some specifications in the module interface. Adaptation of architectural innovations can exclude participation of some established firms unless they change their knowledge base. A shift in the interaction between module interfaces may cause major difficulties in adopting an architectural innovation among the established firms in the current value network. *A system innovation* implies *fundamental network changes* in the way of a replacement of participating firms or in the knowledge or processes they apply. A system innovation implicates multiple interdependent innovations in the network in order to implement the new functions and renew the network's knowledge (Goverse et al. 2001).

4. Innovation, strategies and sources of competitive advantage in wood products manufacturing industries

a) Innovation patterns

Wood products manufacturing industries are low-tech industries of technological maturity and minor technological opportunities. Innovation patterns are characterized as “a spectrum that is, on the one hand, bounded by „incremental“ innovation and, on the other hand, by “architectural” innovation” (Hirsch-Kreinsen 2006). Firms exploit existing technologies instead of exploring new technologies through radical innovation (Palmberg 2001). Incremental innovations restrict themselves to advancing given technological concepts step-by-step, for instance, by improving the individual components of a specific product design or manufacturing process.

The innovation process is typically of the technology-push type. The lack of immediate contact with the end user is a general obstacle for customer-led innovation processes. Small firms in low-tech industries are characterised by *supplier-dominance* regarding their technological opportunities (Kautonen and Tiainen 2000 in Kautonen and Kolehmainen 2001). The role of specialized suppliers is important for the acquisition of sophisticated process technologies, production inputs and related knowledge diffusion and R&D collaboration. R&D intensities are low (Palmberg 2001).

Product architecture is of importance, because of product differentiation with a large number of product variants in order to reduce product complexity (Hirsch-Kreinsen 2006). A modular product architecture reduces product complexity and production cost through modular production systems. Customer management under customer-focused strategies needs innovation in IC-, flexible manufacturing and logistics-related technologies (Bloch 2005).

b) Strategies and scope for competitive advantage through innovation

CA of firms in wood products industries resides in well functioning production and logistical processes. Process development is supported by the know-how of sophisticated suppliers of business services (KIBS) and technology. Process development is important for improving product quality. Raw material recovery and operational unit costs are important parameters in business strategy. An extensive share of production consists of bulk products sold to the market via intermediaries. In view of increasing competition from low-cost countries there is an emerging need for strategy change towards stronger customer focus. The future challenge is to develop operational efficiency within the scope of customer-focused strategies.

There is only limited scope for product innovation due to the maturity and low-complexity of products. Tacit, application-oriented knowledge and learning-by-doing are important sources for innovation. Although there is no sign indicating revolutionary technological break-throughs, there might exist pockets of demand for innovative products. Risk-avoiding behaviour excludes explorative innovation strategies. Efficient production methods are the main source

to uphold short-run profitability. Complementary activities such as branding, market channel control, promotion and proprietary product standards are important for fending-off competition.

Product policies are characterized by technical product improvement and differentiation rather than product diversification and innovation. The implementation of a customer-led demand-pull type of innovation processes is hampered by non-adequate marketing channels. There is a shortage of suppliers capable to drive customer-focused product development and a limited ability of small firms for reacting to market changes. Small firms do not dispose of marketing competencies. Collaborative supplier networks are required to gain access to markets of value-added products.

To conclude: Low R&D intensity excludes the exploration of technological opportunities offered by niche markets. The question is how to encourage firms to get committed to radical, science-based innovation and to apply new technologies. In the prevailing business environment there are few incentives to set aside resources for the development of completely new products and business areas. Developing customer-supplier relationships and supply chain management is of top priority. Technology diffusion supports innovation and should be fostered by network-facilitating policies across industries. Gatekeepers are important in their role as intermediaries between scientific institutions and firms.

Shifting towards customer- and market-oriented business concepts (Hansen and Juslin 2002, 2005) increases the information-intensiveness of business processes. Technological opportunities therefore rely increasingly on external suppliers of information systems and knowledge on how to apply and customize them to match customer needs (Kautonen and Tiainen 2000 in Kautonen and Kolehmainen 2001). Large *scale-intensive* firms especially in basis wood products manufacturing will continue to rely on technological competencies in conceptualizing, implementing and running cost-efficiently complex production systems.

Entering new markets in prefabricated timber frame construction – presently a *niche market* for wood products in many European countries - requires the development of new products and related core design concepts, industrialized manufacturing methods, improved supply chain performance, best practice building systems and procurement schemes. R&D in structural wood materials is essential to meet the challenge posed by concrete and steel. Challenges lie also in business networks with developers as lead companies and SMEs as partners of their production networks. Technical change in shifting building construction towards off-site timber frame construction systems implies organisational change in related production networks, which does not only comprise the construction products' production system, but also the building design and on-site construction processes.

5 Summary and discussion

Innovation is a fundamental determinant of value creation in business companies and economic growth. Therefore, the measurement of innovation has been a significant concern both for business companies and governments. Traditionally, attempts to measure innovation have adopted a *macroeconomic approach*, as they have been largely based on broad

surveys. In social research it is not always clear that researchers and their subjects are talking about the same thing. Innovation is an example of this. Innovation in the context of economic growth theory denotes an outward shift of the technological frontier. It is the first introduction of a new technological product or process that indicates a shift has happened, whereas subsequent moves by competitors exploit the new growth potential. A firm that by introducing a product or process is only responding to a competitor's innovation allows its competitors to take risks it is not willing to take and therefore is innovative only in a restricted sense. In the case that a firm adopts an innovation that is new to the firm but not new to the market the phenomenon basically is not that of creation but of diffusion of innovation. In policy approaches and firm-level surveys innovation in the widest sense comprises the adoption of technological novelties by the firm irrespective of the technological vintage it represents. This broader view of innovation is justified if the policy concerned focuses on ways to make lagging sectors more progressive in terms of productivity and other manifestations of technological progress (Bóia 2003).

The definition of a novelty as innovation is not necessarily consistent with the perceptions of innovation held by a firm manager. The OECD definition of innovation defines a novelty on three levels: new to the world, new to a nation, and new to the firm. A firm manager, however, would rather consider a novelty as innovation, if the firm is the first to sell a new product in its market or to be the first among its competitors to apply a new process. This definition would identify innovation against the background of the market as a firm's relevant business environment. By defining innovation as the first introduction to the market reference is made to the Schumpeterian innovator although in practice the first to bring a radical innovation to the market is often not the firm that ultimately captures the economic rent.

The macroeconomic approach to innovation within the theory of evolutionary economics provides insight in its role in economic change. One major idea in the evolutionary view of industrial development is the product life cycle that is initiated by radical innovation in relation to the development of a core design of a product. A radical innovation differs from incremental innovation in its impact on the competitive structure and composition of an industry (Nygaard 2004 ref. Abernathy and Utterback 1978, Abernathy and Clark 1985). After a core design has been established, innovative capabilities of firms focus on modular and incremental improvements. High tech and low tech industries show different patterns of innovation because they reside on the opposite ends of the product life.

Theories bridging the gap between the macroeconomic approach to innovation and managerial science are the resource- or competence-based views of the firm. The resource-based view of the sources of CA stresses the ability to acquire and control resources as a limitation for the firm's strategic options and business performance. In the *competence-based view* a firm's managerial superiority is reflected in core competences concerning the configuration and management of operational processes (Korhonen and Niemelä 2005).

An empirical approach to core competencies is difficult because of their complexity. Core competencies, however, are built-up from generic capabilities that can be observed more easily and therefore have been used in empirical research (see Korhonen and Niemelä (2005)

for an analysis of capabilities as sources of CA in the wood industry). *Capabilities offer a competence-based approach to innovation*. Capabilities not easily appropriated by competitors may be those that allow the firm to stay ahead of its competitors by *protecting* the company from imitation. More appropriate for innovation research is to confine the search for capabilities to those that give a company the ability to *proactively* stay ahead of its competitors (Korhonen and Niemelä 2005). This kind of capabilities can be titled as *innovative capabilities*. Dodgson and Bessant (1996) (ref. Arnold and Thuriaux 1997) describe innovative capabilities as those that capture features of firms as a pool of resources and capabilities managed to define and develop new competencies.

Although *strategic management science* provides explanatory approaches for the role and nature of capabilities as the source of CA, there seems to exist no comprehensive view of capabilities as the basis for innovation performance of the firm. This is the case especially with respect to so called "soft technology" - that is, capabilities relevant in different aspects of business management and organisation (Arnold and Thuriaux 1997). It remains the task of empirical research to detect and categorize the capabilities that account for innovation performance, for example by focusing on business firms considered as forerunners in developing and implementing a new business strategy or representing operational excellency.

In *sectoral surveys of innovation* instead of capabilities underlying innovation focus has been put on innovation in terms of *output of innovation activities*. In collecting quantitative data on innovation the *object approach* is concerned with the output of innovation activities instead of dealing with approximations based on aggregate measures of innovation activities such as R&D or patents as in the *subject approach*. The object approach is applicable for radical innovation, it can not handle observations about incremental innovation. The object approach is adopted in comprehensive EC innovation surveys based on the OECD's Oslo Manual (2005) as standard reference. The guidelines make a distinction between four basic types of innovation, that are referred to as the Schumpeterian taxonomy of innovation although in these terms only vaguely defined by Schumpeter himself (Lemola and Palmberg 1999).

The practical applications of the definitions for these types of innovation is not without problems. A process innovation, for example, may significantly improve technical product properties, and therefore be interrelated with a product innovation. In practice the distinction between goods and services or services and marketing may be scattered: does a company sell a good with a service or a service with a good. For a firm that produces and sells goods, the introduction of e-commerce for the first time is a marketing innovation in product placement, but it may be also a service to customers if providing product information. Fundamentally, companies are creating 'solutions', they do not sell a product or a service, but a 'package' or 'system' of closely linked goods and services. (Salazar and Holbrook 2003). With respect to marketing innovation small businesses can be expected not to follow a detailed marketing plan defined by the 4P's or to engage in formal marketing activity (Deacon and Corp 2004).

Organisational innovations can be intended to directly increase a firm's cost performance but also to indirectly increase performance by improving the firm's innovative capability. In the

second respect the definition may as well refer to the structural forms and management practices of organisations that improve their capability to create and adopt product and process innovations as to managerial decisions about how to enhance collective learning and knowledge creating capabilities. These decisions deal with the role of values, culture and organisational forms such as work group and project team in knowledge creation, knowledge sharing and knowledge transfer. The way in that organisational structure and related innovative capabilities are relevant to firms is likely to vary among industries. It is likely to play an important role for the innovative capability of firms in high-tech industries, while the cost performance considerations will receive more attention in mature industries.

The *Oslo Manual* defines as the unit of analysis the single innovative firm, which is a formally organised autonomous business unit, although it recognizes the existence of enterprises, which are business networks vertically along value chains with less formal governance structures. Development and commercialisation of innovation takes place increasingly across business networks of this kind, where innovation activities are dispersed between network members (Tomlinson 2000). Consequentially also the question of innovative capability is more meaningful to be addressed collectively rather than on the level of a single firm. Therefore in applying the Schumpeterian taxonomy to innovation case studies the question should be of an integrated analytical approach towards a differentiated treatment of technological, organisational and marketing aspects of an innovation process within the scope of the unit of analysis, normally a single business firm, but most relevantly also multiple firms along a value chain.

Within the scope of an *innovation case study* approach product innovation may be retained as the innovation type of main interest and marketing and organisational innovations be treated as preconditions for their commercialisation. This idea acknowledges that marketing competencies are an important precondition for the market access of new products. Market research and contacts with customers play a crucial role in product and process development through demand-led innovation, as linkages between the demand and supply sides in general are important for innovation activities to be technically and commercially successful (Salazar and Holbrook 2003).

The object approach of collecting data on the output of innovation activities may be applicable as a first attempt to map innovative capabilities: technological capabilities may be expected to dominate in process and product innovations, whereas marketing and organisational innovations are indicators of innovative capabilities in business management and organisation. More comprehensive conclusions about the degree of innovative capabilities of firms can be made from observations on the implementation of combinations of types of innovation, which demand special competencies in organising and co-ordinating multi-functional innovation activities. In a particular case this could be a new application for new customers, whereas in the case where a product simply substitutes for an existing product the innovation process may be rather simple without much consideration about organisational changes or marketing (Bloch 2005, Kairi 2005).

Finally some remarks about innovation in low-tech industries. The wood products manufacturing industries are classified as low-tech industries. The classification refers to their low R&D-intensities in terms of internal (intramural) R&D activities (OECD Science and technology indicators, ref. Georghiou et al. 2003). Low R&D intensities indicate limited technological opportunities and easiness of product imitation. The classification as a low-tech industry, however, does not mean that there is no or few innovative potential, but rather that R&D is not an important means of knowledge and value creation. "Low-tech" characterises more the sources and process of knowledge creation and innovation, than innovation potential and performance in terms of innovation new-to-the-firm or new-to-the-industry. Equally important as internal knowledge creation are knowledge flows across organisations and across industries. New knowledge embodied in capital – that is, machinery and equipment – or intermediate inputs, or disembodied in knowledge intensive business services (KIBS), education and training are important for innovation in these industries (Georghiou et al. 2003).

The characterisation as low-tech industries alone, however, does not sufficiently catch the differences in innovation patterns within these industries that exist between firms of different size and in different value chains. In the basic wood products manufacturing industries (primary wood processing) sawmilling unlike EWP manufacturing is being dominated by small and medium sized enterprises. The secondary wood processing industries as the supplier of "remanufactured structural wood products" in many cases are being split up into a large number of small firms and a small number of large firms with a dominant share of the industry's gross output. Large firms have a dominant share of gross output in sawmilling, EWP and timber structures. These firms can be characterised as commodity suppliers and process specialists with CA in process engineering technologies. The competitiveness of these industries depends on continuous incremental innovation, where new processes often are the source of product innovations (Georghiou et al. 2003). Whereas large companies are focused on operational efficiency, customer-oriented business models are typically strategies of small companies. Small firms are more diversified in innovation activities that support this strategic option (Wagner and Hansen 2005). Knowledge about marketing practices to better reach customers is the key for CA and enhanced value creation for value chains of small companies and customer relations are crucial for the success of their customer-led demand-pull type of innovation activities.

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INNOVATIONS IN FOREST— BASED VALUE CHAIN FIRMS

The Finnish Approach for the discussion

1. Abstract

Forest sector has been among the key industries in Finland from the mid 1800's. Export of forest products has been expanded among the major product groups until now. The relative position of technology innovations behind competitive advantages has remained strong parallel with those from economics of scale. The dominant position of pulp and paper industry as the major source of incomes among forest sector companies has been challenged by the rapid increase of electronic communication. The identification of the forest sector knowledge base has been enlarged by including the forest cluster as a source of knowledge base. Finland has been active in the recent European effort towards new innovative solutions in forest cluster (Finnish Forest Cluster...2007). Traditional forest sector has been considered low tech industry but the supporting elements towards expanded knowledge base has been actively promoted, mainly through national programs covering regional, rural and sustainable development issues. The expansion of knowledge base constitute a potential but also a challenge to forest sector enterprises especially to the SMEs. The roles of innovation capacity of the companies and the innovation environment supporting it are crucial in this process.

There are several national, regional and local policy documents effecting to the formulation of the innovation environment of SMEs in practical level. There does not exist one extensive innovation policy document, instead the innovation policy is included into several different policy documents and programmes. It can be identified various different policies from different industry sectors effecting to the innovation in forest based sectors. In addition even though the framework and guidelines of the policy documents are stipulated in the national and EU levels, the regional priorities have a strong role in directing the innovation system at the regional level. When all this is combined to the SME's often unique requirements for regional innovation systems (see e.g. Kautonen 2006), the innovation environment, as a whole, can appear in very different and sometimes complex way to the companies. The situation is especially complex for companies operating in the interface of different sectors (e.g. food products from nature or nature tourism) or that are small or microsize conglomerates.

The more integrated co-operation between different policy sectors as well as the key actors is needed, even though there has been made significant progress related to this in Finland

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during the last years. For example the national Rural Policy Programme has a wide horizontal approach and the recent Programme on 'sub-regionalisation of business services' aims to better integrate existing services. However, there are still problems in providing truly demand driven public services to enhance the development of rural SMEs.

This paper demonstrates the current innovation system of small rural company in the forest sector from the entrepreneur's perspective. In addition the paper summarise accordingly the dimensions of the Finnish innovation policy and introduces the main national policy instruments effecting to the innovation environment of rural SMEs in the forest sector.

2. Innovation systems and related policies

Pekka Ollonqvist and Hilikka Vihinen

Finland was among the first in early 1990s to adopt concepts like "national innovation system" and "cluster policies" into the national policy design to a substantial extent, and since then successfully utilized a systemic perspective in research and innovation policy design. A new national industrial strategy was launched by the Government of Finland in the early 1990's. The strategy was aimed among other things to adopt modern industrial policy thinking. The strategy formulation applied Porter's competitiveness model making a clear distinction to the old industrial policy relying on direct firm subsidies as well as regional and sector subventions. The redefined industrial policy strategy was in line with the ideas put forward by the Finnish Science and Technology Policy Council (the co-ordinating actor within the innovation policy field in Finland) in its review in 1990. (Koch et.al.2003). The concept of a national innovation system was introduced into Finnish policy allowing a broad and systematic approach to policy making through comprising the major factors influencing the development and utilisation of new knowledge and know-how into the agenda (Schienstock and Hämäläinen 2001). The new policy agenda was aimed to facilitate quantity and quality of resources to be introduced and important institutional changes were carried out to implement the new policy agenda by piloting the polytechnic system and its establishment on a permanent basis.

Finnish innovation policy has been characterized by rapid increase in both public and private research funding. In 1991 R&D expenditure accounted for 2.1 per cent of GDP, whereas in 2001 the figure was 3.4 per cent of GDP. The increase is mainly explained by increased R&D investments in the business sector. The additional research appropriation programme by Finnish government expanded R&D outlays FIM 1.5 billion (around € 250 million) between 1997 and 1999. For the review proposal 2003, The Science and Technology Policy Council highlighted three main sectors for the development of funding: a) education, the development of research careers and broad-based increases in researched knowledge, b) strengthening of social and technological innovation and c) expert development of innovation (Lemola 2001).

Government explicitly recognised private investors, business angels and venture capital corporations potential to transmit near-to-market information to help in commercialization of innovations. The venture capital markets are relatively underdeveloped although improving from the late 1990s on (Seed capital...2002).

At the moment the enterprise sector stands for the majority of the R&D expenditures in Finland — in the recent years the private sector has covered over 70 per cent of all R&D inputs (Tekes 2007). This means that a large part of new knowledge and new technologies is produced outside academia or other public research organisations. To be able to fully utilize all national potential the extension and strengthening of networks of co-operation between innovation actors is seen as one of the key questions in the development of science, technology and innovation policies. The development of connections between companies, research institutions, universities and other educational institutions is an explicit objective of various national innovation policy instruments. Usually these measures are co-financed by public agencies and participating organizations or companies.

The policies significantly effecting to the innovation systems of companies especially in rural areas are regional and rural policies. The framework of Finnish regional and rural policies is based on the general legal-institutional setting within which both private and public actors perform. The actual regional and rural policy measures and programmes in Finland are currently combinations of national and EU co-financed programmes and measures. The policies and programmes define the frames for targeting the development funds in practical level. In general the emphasis is on promoting balanced territorial development by leveraging the assets of these areas and encouraging local initiatives and capabilities rather than pursuing a subsidy-type approach, dispensed in a top-down fashion.

During the programming period 2000-2006, Finland had two EU Objective 1 areas (regions lagging behind) and two EU Objective 2 areas (areas facing structural difficulties). Among the other Community initiatives, which have relevance for the forest sector include in particular the Leader+ rural development programme.

Many Finnish regional policy measures are focused on the 'hub logic' of a whole region, recognising the validity of enhancing the role of small and medium-sized urban centres. The 'logic of expertise and specialisation' concentrated in these centres for the benefit of a wider area, represents a strong feature of regional policies. Although Finnish innovation policy in the broader sense does not have direct territorial aims, the issue of how significant parts of the territory and population of Finland can benefit from innovative environments and processes is a topical question there too.

Main concrete short-term tools in implementing regional development policies are fixed-term special programmes such as the *Centre of Expertise Programme*, the *Regional Centre Programme* (to sustain small and medium-sized cities and foster inter-municipal co-operation), the *Rural Policy Programme*, and the *Island Development Programme*. Most recently, a Programme on 'sub-regionalisation of business services' was launched under the responsibility of the Ministry of Trade and Industry to establish a network of at least 50 regional business service points.

2.1 Centre of expertise programme

Anssi Niskanen

In this national programme the aim is to establish centres of expertise, which seek success through exploiting local excellence and growth potential. This approach is based on the current view that the competitiveness of regions is dependent on specialisation and the ability to innovate in the selected areas of business. During the last Centre of Expertise Programme there were 22 centres of expertise covering 45 fields of expertise, which have been appointed for the period of 2003–2006. 18 of the centres were regional and 4 were networks.

The task of the centers of expertise is to use internationally competitive sectoral based knowledge and high level skills as a resource for business activities, the creation of new jobs and regional development. Among the 18 regional centers of expertise in 2003-2006, three of them have included forest sector business in their programme relating to paper industry, processes in forest industry and wood technology. In addition to the regional centres of expertise, one national network centre of expertise called PUUOSKE was focusing on business development in wood product industries. PUUOSKE's aim was to be an umbrella organisation for Finnish research in the field of wood products and provide customised, high-quality expertise for different research and development projects.(PUUOSKE 2006) However, it can be evaluated that in regional and local level the potential of PUUOSKE was not been able to use in full. In the new centers of expertise programme there were no network types of centers included.

In the new Centre of Expertise Programme 2007-2013 there has been approved at this point 21 regional centres of expertise and 13 nationally significant cluster centres of expertise (Valtioneuvoston Tiedote 402/2006). One of the cluster based centres of expertise, Forest Industry Future, is directly focused on forest sector. Regional centre of expertise on future energy technologies and cluster based center of expertise on living and housing have also close connection to the forest sector.

2.3. Regional centre programme 2001-2006

Anssi Niskanen

In addition to Centre of Expertise Programme, which highlights internationally competitive sectoral based expertise, there is also the Regional Centre Programme for promoting networking based more on regions than any sector of industries. This programme is a governmental special programme in accordance with the Regional Development Act. Its objective is to establish network of regional centres covering every region/province for the development of the strengths, specialisation and cooperation of urban regions. 34 regional centers were accepted for the previous programme in 2001, covering well all the significant and economically coherent urban regions in Finland. Government funding is mainly used for supporting networking and co-ordination between different actors responsible for regional and local development. Support for projects and actions are mainly available through other programmes. Regional centre programme's second phase 2007-2010 is focusing especially

on knowledge development and innovations to support regional livelihoods and specialization. Altogether 34 regions were accepted for the new programme in November 2006 (Aluekeskusohjelma 2006).

It appears that the regional centre programme has increased co-operation and networking in the regions, but at the same also the number of strategies and bureaucracy. According to the Mid-Term Evaluation (Alueiden kehittäminen 9/2004) of the programme, the regional growth impact has been fairly restricted, while the programme has also had an unintended effect of regional polarization. The danger in pursuing 'cities as generators of growth' is that the innovation potential of rural enterprises may be neglected. However, according to the evaluation, the value added of the regional centre programme has been the highest in smaller urban centres (e.g. Raahe in Northern Ostrobothnia region and Kauhajoki in Southern Ostrobothnia region), where the regional centre programme has also included special measures for the rural areas of the programme region. Impacts on livelihoods are indirect, achievable through more focused and shared work between different programmes and actors in the regions. Contribution to forest sector depends on how well it is represented in the programmes connected to the regional centre programme.

2.4. Rural Policy Programme

Hilkka Vihinen

The aim of the Finnish national rural policy programme is to draw attention to the rural impacts of central government decisions and to develop and implement measures targeted for improving the viability and livelihoods in rural areas.

The Finnish Rural Policy has a horizontal approach to rural development. In the main strategy of the current Rural Policy Programme in force (Viable countryside – our joint responsibility 2004), forests constitute a production factor and a source of livelihood for the rural residents. This means that the wood products sector, utilisation of wood energy and sectors based multiple use of forests (tourism, non-wood forest products) are important development fields in terms of the viability of the countryside. Forests have great potential for the rural policy, which has not yet been utilised in full, e.g. according to the rural policy programme, high-quality wood should be processed more and further locally and regionally.

The role of innovation (both technological and organisational) and services targeted to enterprises has become more central also in regional development through cluster-type approaches, although the instruments to translate this into practice remain scattered. Finnish innovation system also in regional level is based on the 'triple helix' interaction model of government, industry and universities.

A special tool of rural policy in Finland is theme and work groups under the Rural Policy Committee. Some of these groups are temporary while some work for longer periods of time. There are regularly 10-15 theme groups working in important and current rural development

issues. One of these groups is the theme group called 'Wood Finland', which work in the regions is intense in particular with small and medium size enterprises and in networking.

2.5. Programmes allocating EU structural funds to SME development

Anssi Niskanen

The most important programmes allocating the EU structural funds targeted to development activities of SMEs are the Objective one and two programmes and the Regional Rural Development Programme.

2.5.1. Objective one and two programmes

Objective one and two programmes define along with other regional and national policies the priority of allocating the support funds. Each region defines its own strategies and priorities within national Objective one and two programmes. Objective one regions (2000-2006) in Finland were Eastern Finland (sub-regions Kainuu, North Savo, South Savo and North Karelia) and Northern Finland (including Lapland, Koillismaa, Oulunkaari, Nivala-Haapajärvi areas in Keskipohjanmaa, Saarijärvi and Viitasaari). Forest sector has been selected to the group of strategically most important sectors in all four sub-regions of Eastern Finland included in objective one programme (Itä-Suomen tavoite 1 –ohjelman... 2004).

In the sub-regions of Northern Finland objective one areas, forest cluster (especially wood processing industries) has been one of the largest receivers of Objective one support. The only major exception has been Lapland, where tourism and experience production has received majority of the Objective one support (Pohjois-Suomen tavoite 1 –ohjelman...2004).

Objective two regions (2000-2006) in Finland were Southern Finland (including South Karelia, Itä-Uusimaa, Kanta-Häme, Kymenlaakso, Uusimaa and Varsinais-Suomi) and Western Finland (including sub-areas in Satakunta, Central Finland, Pirkanmaa, Ostrobothnia, Southern Ostrobothnia, Central Ostrobothnia and Northern Ostrobothnia). In Southern Finland, forest cluster does not belong to the core industrial clusters as in many of the objective one sub-regions in Northern and Eastern Finland. The regions where forest cluster is among the most important industrial clusters were Päijät-Häme – wood industries, South Karelia – mechanical wood processing and Kymenlaakso – fiber techniques. It is notable that the forest cluster or forest sector industries has not been mentioned as one of the core areas for future development in a number of sub-regions in Southern Finland (Tavoite 2 ohjelma Etelä-Suomi...2004).

In Western Finland the wood industry has been mentioned as one of the core areas for future development in the following areas: Central Finland, Ostrobothnia, Southern Ostrobothnia, Central Ostrobothnia and Northern Ostrobothnia. Central Finland has been traditionally strong in wood processing industries and forest cluster, whereas the other three regions have been strong in primary production, especially in agriculture, but also have significant small wood processing industry e.g. furniture industry (Tavoite 2 ohjelma Länsi-Suomi ...2004).

New objective one and two programmes for 2007-2013 aim for the development of regional competitiveness, employment and welfare. The programmes are seen as national instruments in supporting EU Lisbon strategy. It is not yet precisely known how forest sector will be included in the objective one and two programmes for 2007-2013.

2.5.2. Regional rural development programme

Regional rural development programme (part of EU structural funds) is implemented in the rural areas of Southern and Western Finland, which are not eligible for Objective one support. Regional rural development programme ALMA (called ELMA in 2006 till the beginning of new EU programme period in 2007) is aimed for developing and making businesses more versatile in rural areas that are not eligible for programme 1 support. There is no information (as now) on how forest sector has been integrated and what initiatives has been supported in the forest sector by the ALMA –programme. However, the sector has received support via ALMA programme as support targeted to enterprise development in general, developing multiple use of forests etc.

2.5.3 Special programmes to support rural development

As a special programmes influencing on practical, grass root level the services and resources offered to rural SMEs there can be mentioned Leader + and POMO programmes

LEADER+ (Community initiative) supports local small-scale rural development initiatives like the establishment or development of small-scale businesses, organisation of courses, community development initiatives and small-scale product development and marketing.

POMO+ programme aims for strengthening the attractiveness of rural areas and the competitiveness of rural businesses to increase the viability of rural areas. Especially pilot projects and innovative activities are supported. POMO+ is funded directly by Finnish government (no EU funding).

3. The key actors of the innovation system of rural SMEs

Miika Kajanus, Pekka Ollonqvist

The key agency for new technology-oriented policy on national level is Tekes, which aims to coordinate the direction of public subsidies to new entrepreneurship and innovation management. They took the concept of technology programmes into their service and instrument portfolio that was intended to lay background to the development financing. Programme approach, towards integrating scientific and technology knowledge produced by public institutions available to commercial industry firms, became a common norm. Technology programme of Tekes has strengthened co-operation and interaction between different parts of the national innovation system during the last 10-15 years. Typically Tekes operates with larger companies even though via different kind of special projects they have been trying to focus also to smaller companies.

Traditionally the production and innovation system in Finland was characterized by strong national orientation and by strong influence of large nationwide corporations (Kautonen 2006). The development of regional dimensions of Finnish innovation policy was mainly motivated by the regional policy of EU, which Finland joined in 1995. The fundamental transformation of the Finnish economy in the beginning of the 90's opened up new opportunities for economic restructuring of actors and development activities also at the regional level (Jääskeläinen 2006). The establishment of the new Employment and Economic Development Centres (TE-Keskus), with main task to develop regional economies in a systemic way, has also strengthened the regional dimension. The Centres of Expertise Programme, the Programme of Regional Centres and the recent introduction of Universities of Applied Sciences (former polytechnics) with strong regional orientation into the Finnish education system underline the increased regional focus of Finnish innovation policy and the role of regional key actors.

In a Finnish context a region is usually understood as the administrative region overseen by regional councils and Employment and Economic Development Centres, or as daily labour migration areas. However, from the point of view of a enterprise, both are limited. Kautonen (2006) presents the key elements of the RIS approach on the firm level as the four main elements of the general innovation environment: market, industry, technology and geography. Beyond these are institutions that are focal, consisting of a wide range of formal and informal, created and emergent, and other type of institutions. To innovate, in addition to its internal resources and competences, a firm usually needs external resources and competences (technology), usually acquired from its innovation environment via several channels: from market or production chains, new personnel from region, nation or from outboard, or by creating co-operative relationship (external innovation networks). And all these aspects have their geographical implications being in a certain spatial relation to a firm. (Kautonen 2006).

Usually in Finland the regional infrastructure in science and technology related to forest sector, consists of HEI (High Education Institutes), different kind of sectoral research units (e.g. Technical Research Centres of Finland (VTT), Finnish Forest Research Institute (METLA), Agriculture Research Institute of Finland (MTT)) and number of educational training and consultant institutes. As intermediating institutions and actors, there are a dense of science parks and incubators, regional venture capital and other institutional arrangements like advisory organisations to facilitate innovation activities, depending of the circumstances of the region. Some of the most important actors especially concerning forest sector are The Employment and Economic Development Centres, Forestry Centres (The Finnish Regional Forestry Network) and Forest Management Associations.

Probably the most important of these for rural SMEs is The Employment and Economic Development Centre (EED Centre). These are units in which The Ministry of Trade and Industry, the Ministry of Agriculture and Forestry, and the Ministry of Labour have jointly combined their regional forces. There are fifteen centres countrywide providing a comprehensive range of advisory and development services for businesses, entrepreneurs, and private individuals. The EED Centers are typically divided into different departments like Economic and Enterprise services, Services for Farming and Fisheries and Employment services. Also the services of the National Technology Agency of Finland (Tekes) are also regionally available via EED Centres. The Employment and Economic Development Centre is

regionally a significant specialist and contributor of EU funding.

The regional councils define the regional policy priorities in each region. Some structural funds are also allocated via regional councils, mainly for different development projects. In addition the regional councils allocate the region's own funding to the development activities.

4. Case study of the entrepreneurship approach to the innovation system and policies

Anne Matilainen

As presented in previous chapters, there are several different policies, policy instruments as well as actors related to the innovation environment of rural SMEs. The regional priorities have a strong role in directing the elements of the national innovation system on regional level (Kautonen 2006). Therefore this system often shows its face in very different and sometime complex way to the companies on practical level. Despite of the horizontal approach e.g. in Rural Policy Programme, in many cases the policies still appear to practical level very much as sectoral orientated and not very integrated, which is not always a very demand driven starting point. Especially complex the situation is for companies operating in the interface of different sectors (e.g. NWFP) or which are small or microsize conglomerates. The best way to demonstrate this is to try to describe the innovation system as a whole (NIS, RIS and SIS) and as it looks like from the perspective of the entrepreneur.

In Southern Ostrobothnia region the furniture industry has traditionally had a very significant role and it is the main source of livelihood for many rural municipalities. Most of the companies are small, medium and even micro size. Typical problems in these companies are the lack of innovations in marketing concepts, customer orientation and supply chains. There has been a clear need to enhance the innovation system of the sector in order to survive in the global markets.

For its importance the wood processing sector is highlighted in regional programmes, strategies and development actions in Southern Ostrobothnia. There is e.g. a regional co-ordinator for the wood processing sector in regional Employment and Economic Development Center to promote the networking in the sector as well as to co-ordinate the development activities. There have also been other attempts to centralise the development activities in order to rationalize and maximize the services targeted to wood processing companies.

The company in this case study was a microsize wood processing company manufacturing furnitures and furniture components. It is located in Southern Ostrobothia employing 3 employees in addition to the entrepreneur. To be able to follow the role of different actors the resources needed for the innovation process were divided into human resources and financial resources i.e. process of obtaining the information needed for the innovation and the process of raising the financial resources needed to proceed with the idea. In this case, as typically, the first "information source" for the entrepreneur was someone from his social environment. i.e. the owner's family. Family members or the owner of the co-operation enterprise are in many cases the actors the microentrepreneurs test their ideas with before starting to look for further external expertise (see e.g. Matilainen and Zimmerbauer 2005). The next information

source in this case was the local trade promoter, who as the entrepreneur mentioned usually has the latest knowledge of the on-going activities, potential financing sources or other experts within the region e.g. in the regional EED center or in Nikkarikeskus (centralized development services for furniture sector). In this case there were on-going development initiatives in Nikkarikeskus, which offered some suitable services to proceed with the idea as well as contact information for the further assistance.

Nikkarikeskus is a result of one of the most important public projects enhancing the development of small furniture companies in Southern Ostrobothnia. It is a physical building locating in Suupohja sub-region, into which there have been collected together different regional actors in the furniture sector offering development, education and research services to the enterprises. In 1997 a group of furniture manufactures in the area and the Municipality of Jurva decided to start a project leading to the building and coordination of a national centre of expertise in furniture. The idea was to create an organization for improving marketing skills, product development and training. The process was started with the project funding and the planning process and project plan were developed by the Suupohja Regional Development Centre. One of the driving forces behind the development was Pohjanmaan Huonekaluteollisuuden Kehittämiskeskus Oy (The Development Centre of Furniture Industry in Ostrobothnia), which is a coalition of furniture manufacturers. The Development Centre had an important role in setting up the project objectives and targets.

As a result of the project in June 2001 the Municipality of Jurva together with some other furniture producing municipalities in the area founded the Pohjanmaan Nikkarikeskus Oy providing the facilities for centralizing the services targeted to furniture sector. The organisations located in the Nikkarikeskus are universities and polytechnics, adult education institutes, trade promoters of the surrounding municipalities and private companies all offering services tailored especially to the needs of wood processing companies in the region. The most of the actual services provided by Nikkarikeskus are currently based on different kind of project funding. Nikkarikeskus has, however, developed to one of the most important national actors and as a supervisor of the interests of furniture industry. By centralizing the innovation services the Suupohja sub-region and Southern Ostrobothnia region have managed to get national visibility to the sector and attract top knowledge on region. The concept has got also positive feedback from the entrepreneurs.

In addition to human resources (knowledge) the case company got from Nikkarikeskus, for this innovation case there was critical to find some kind of funding coming outside of the company. As mentioned in previous chapters probably the most important actor allocating financial public support to rural SMEs and microenterprisers regionally is the Employment and Economic Development Centre. Since the financing of the Centre's different departments is administrated via different ministries, they all have their own special focuses and division of labour. Sometimes in practical level this causes gaps in the services provided to rural SMEs. The two most significant departments providing grants and public support to rural SMEs are Economic and Enterprise services (regional services of the Ministry of Trade and Industry) and Services for Farming and Fisheries department (regional services of the Ministry of Agriculture and Forestry). According to the regulations of the previous programme period

(2000-2006) the case company was not eligible to get a support via Economic and Enterprise services, due to the fact that this department does not support companies employing less than 10 persons. The department of Services for Farming and Fisheries is more focused on microenterprises, but they require the connection to the agriculture from the companies, which was not possible in this case. However, in this case the Leader + funding, allocated to Local Action Groups via EED Centre, Services for Farming and Fisheries department was able to be used to provide the critical financial support to proceed with the innovation. The funding was available again due to the fact that the importance of the furniture sector was prioritised in the programme of local action group, Suupohjan Kehittämisyhdistys ry. Even though the funds are financially administrated by EED Centre, the priorities of LAGs stipulate strongly the focusing of the funds.

When studying the influence of different kind of policy programmes to the innovation process of our case company, at first it can be stated that the innovation was enabled largely due to the regional prioritisation of the national programmes in Southern Ostrobothnia region and Suupohja sub-region. Concerning the access to the human resources i.e. needed knowledge and expertise the Nikkarikeskus had a significant role. The establishment and development of Nikkarikeskus can be estimated to have been influenced by many regional policies and strategies, due to the importance of the furniture sector in regional level. Namely the most important ones have been Regional Development Plans 2020 (published in 1999) and 2030 (published in 2005) of Southern Ostrobothnia, which include also a special development plan for wood based cluster. In addition semi-regional development plans of Suupohja semi-region as well as Jurva municipality have had a big role.

Concerning financial resources, again the regional prioritising has influenced largely to the availability of e.g. the EU structural funds via Objective two programme and Regional rural Development Programme as well as via Leader + Programme. In addition to direct investment funding to the company, the Nikkarikeskus has also utilised widely different kind of structural funds as well as regional development funds. Distribution of these funds is typically closely tied to the priorities of regional and local development plans. E.g. in national level, the wood based entrepreneurship strategies and development plans, have not highlighted SME size furniture industry in same respect than it has done on regional level, which is mainly due to it's minor national role in the whole wood based industry sector. Due to this in some other region than Southern Ostrobothnia, there might not have been similar kind of resources (human or financial) available for the innovation process.

5. Conclusions

Based on this case the *policies can be estimated to have significant influence* to the business development and innovation system. However, activity on innovations depends mainly on enterprises and the local business atmosphere. Policies can at best help to develop the operational environment and preconditions. The role of different kind of public support systems seems to be quite important and not just from the financial point of view. *The actual influence of the policy efforts is nevertheless hard to measure or even identify* since sometimes the role of public support can be e.g. in creating possibilities for networking and the

results are not seen immediately. The easiest way to estimate role of the policies is to focus to study on public services, but this is not the only or probably not even the best way to verify the influence of policies.

National policies are filtered to the regional and local level modified according to the regional and local priorities. Therefore, when trying to estimate the influence of the policies in practice *the both national and regional levels have to be reviewed.* As Kautonen (2006) has stated, the regional innovation systems can be seen as unique for each enterprise. The same region may represent totally different kind of innovation environment for different type of companies. Also *the gamut of the policies influencing business development is extremely wide* including policies from different sectors and levels. There does not exist one extensive innovation policy document, instead the innovation policy is included into several different policy documents and programmes. It can be identified various different policies from different industry sectors effecting to the innovation in forest based sector. The situation is especially complex for companies operating in the interface of different sectors (e.g. food products from nature or nature tourism) or that are small or microsize conglomerates.

The horisontal integration is needed both in national policy level as well as in practical local level. Jääskeläinen (2006) notes, that separation of the national policies under several different ministries and their administration channels is one of the main impeding factor of the regional business policy in Finland. He proposes several ways to make policy more coordinated at regional level mainly based on co-operation between key organisations and key persons. This has been noticed also in national level and there have been made significant progress related to this e.g. by having wide horizontal approach in national Rural Policy Programme as well as with a recent Programme on 'sub-regionalisation of business services' in which the aim is to establish a network of at least 50 regional business service points providing services with so called "one service point principle". *However, there are still problems in providing truly demand driven public services to enhance the development of rural SMEs:* how to tailor actions suitable to the individual companies at the practical level when in practise the innovation system for the each company is quite unique and even more, how to promote the companies to learn to benefit the most from the possibilities offered.

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Vennesland, Birger¹

NATURE BASED TOURISM AND INNOVATION

The concept of innovation is grounded in the idea of producing a physical product within the industrial sector. When Schumpeter (1934) introduced the term “entrepreneur”, this was linked to the production of “shipping goods” (Kilkenny 1998). A shipping good is a product that is shipped out of a region to be sold in a market somewhere else than where it was produced. On the other hand, a shopping good (Kilkenny 1998) is a product that must be consumed where it was produced. Nature based tourism may be characterized as a shopping good. An experience of nature, or the landscape, can only be realised where the interesting element of nature is to be found. The consumer has to travel to the place where the experience can be had. Transporting nature to market is not possible. During the 1980s and the 1990s the development of tourism in general increased rapidly. The term innovation has been used to describe much of this development. But how well can we adapt the traditional industrial understanding of innovation in the service sector?

No unified “theory of innovation” exists (Grønhaug & Kaufmann, 1988). From Webster’s Dictionary (ref) we might distinguish between the act of innovation and a change effected by innovation. The act of innovation implies an introduction of something new. A change in customs is an example of an effect of innovation. However, there is a consensus on the point that innovations represent something new. In the world of economists we assume that an innovation has to be useful, or at least meant to be useful. The novelty dimension is related to whether the innovation is objectively new or subjectively new. A new patent created by an inventor represent an objectively new innovation. A product or production perceived as new by an individual or other unit of adoption represent something subjectively new. Most of the innovation processes in nature based tourism contribute something subjectively new. Much less is objectively new.

Studies in many countries demonstrate very clearly that the tourism sector is dominated by micro and small enterprises, and that most of them are owned and operated by a single person or family (Hjalager 2002). Enterprises offering a nature based service – or product – are mostly located in the countryside. Straight forward competition is triggering innovation. However when located in sparse populated areas the need to collaborate and stay together (social capital) are important as well (Vennesland, 2004). Very often we see that these firms see each other as competitors rather than colleagues within a geographical area. This is important as we know that trust among enterprises is most important to create innovations.

The difficulties of measuring or understanding the innovation processes within a family owned business offering a nature based services, can be illustrated by the case study of Troll Mountain (Weiss et al., 2006).

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Troll Mountain AS is a private company offering outdoor adventure activities. Tim Davis and his wife Gjertrud Forgard founded Troll Mountain in 1993 as a limited company. Tim has a professional background as an officer in the English army. His background in physical activity was important when planning the business of Troll Mountain. The innovation was to adapt well-known products to local facilities; to connect adventure packages and local nature.

The main actor is the owner and innovator in the firm, Tim. Neighbours and local communities were important as they provided land and services for his business. Important inspiration and ideas to develop new products and information on international markets were provided by the "European outdoor life" network with important collaborators from Germany and Austria. Troll Mountain cooperates with a private land owner from whom they rent a climbing rock, and with Agder Energy who manages a check dam controlling the flow of water in the river which is used for rafting and other water sport activities.

The main fostering factors were successful cooperation with neighbours and the hydroelectric power company. Troll Mountain has organised its activities in two different municipalities. There is a problematic relationship with one of the municipalities. The local public service does not want this kind of business in the region. The other municipality is helpful and knows the value of the activities for them. They want to be identified with the image of Troll Mountain. A lack of cooperation among businesses and with public actors is seen as a restraining factor when it comes to the creation of a common strategy of tourism activity within the area. Tim Davis knows about many landowners who offer their own products without any willingness to cooperate within the same geographical area. The most important area of cooperation would be in case of tourist accommodation, adventures and culture.

The story of Troll Mountain illustrated very well the fact that factors like trust and networks facilitate innovation. It is not always easy for small family owned firms operating in nature based tourism to encounter these favourable conditions.

We should broaden our understanding of innovation when it comes to the development of nature based tourism. Outputs from nature based tourism businesses differ widely. There is a need to discuss various definitions of innovation linked to the many types of actors as well as products and services produced in the sector. We also need to look at a framework of understanding that distinguishes between various definitions of innovation in the service sector.

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