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Periodic Activity Report

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Contents

Executive summary

- **project objectives.** The IKINET project aims to study the problem of the transition of the less developed regions in Southern Europe and in the new member countries, to the model of the knowledge economy and how to avoid their exclusion with respect to the most developed regions, which operate at the frontiers of technologies. In fact, nowadays, it is widely accepted that knowledge and learning are at the core of competitiveness, international division of labour and agglomeration and exclusion phenomena. Innovation generates winners and losers at the same time and depends on learning processes and knowledge creation and accumulation. Thus, learning brings about enormous opportunities for growth but also severe threats of exclusion and marginalisation, especially for the economic lagging regions in Southern and Central and Eastern Europe.

- **contractors involved**. Eight contractors are involved: Università di Roma "Tor Vergata" (coordinator), University of Wales Cardiff, Ruhr-Forschungsinstitut für Innovations- und Strukturpolitik – Bochum, Instytut Badań Systemowych – Polska Akademia Nauk – Warszawa, Joanneum Research Forschungsgesellschaft – Graz, Institut National de la Recherche Agronomique – Paris, Universidad Autonoma de Madrid, Applica sprl – Bruxelles. Team coordinators are: R. Cappellin, P. Cooke, R. Wink, S. Walukiewicz, M. Steiner, A. Torre, A. Vazquez Barquero and J. Alfonso, T. Ward.

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- **work performed in the first reporting period:** identification of the regional sectoral clusters to be considered in the 7 regions, identification of the firms belonging to these clusters and to be analyzed in the case studies, elaboration 35 case studies in each of the 7 considered regional clusters, definition of a questionnaire (i.e. questionnaire A) summarizing the results of the case studies and allowing a international comparison, definition of questionnaire C on the structural characteristics of the firms, definition of questionnaire B on the mobility of key technical personnel between the industrial firms, collection of statistical information and economic studies on the regional economy and the sectoral cluster to be considered, collection of harmonized information on economic structural characteristics and innovation factors in the seven considered regions.

RESULTS ACHIEVED

a) Innovation processes in SMEs and in medium technology sectors have very different characteristics than in large firms and in high tech sectors and are characterized by a larger importance of informal and interactive learning processes than by internal R&D activities. The process of innovation in SMEs is driven by intensive interaction between suppliers and customers, due to an higher level of individualisation of new products, services and processes, and it implies very strong interaction with the external local environment, made by an high diversity of private and public, local and non local actors.

b) Innovations in medium technology sectors are driven much more by intensive interaction between clients and suppliers than by the transfer of technology from equipment providers. As a result, a trend of increasing customisation of products, services and processes is widely observed in these sectors.

c) Organizational innovations and the use of modern managerial techniques are of great importance, particularly, in the new member countries and in economic lagging regions of the EU. Moreover, the markets, on which the above sectors operate, are under increasing pressure from safety and environment protection regulations. These regulations combined with standardisation are main drivers of innovations. "Examination knowledge" by certification and safety control agencies is built along long-term processes of developing suitable individual expertise and tools. This examination knowledge, however, depends on awareness, which is often only affected by accidents and safety risks. Furthermore, costs for certification hinder the implementation of innovations, if there are no obvious advantages for OEM (Original Equipment Manufacturers / Large firms) by cost savings or final customers via obvious new characteristics.

d) Medium technology sectors need more problem solving types of knowledge than science based high-tech sectors. Innovations in medium technology sectors have mostly a gradual character and consist mainly in improvement of existing products, services and processes. They are very dependent on individual skills, informal professional codes of communication and tacit knowledge. In particular, tacit knowledge, rather than being defined as a residual concept with respect to codified knowledge, can be classified according to different types of informal linkages between firms, such as the development of the capability to combine different fragments of existing knowledge, to interpret "weak information", to react to external stimula in an automatic way, to learn together with other actors, to share recognition and trust.

e) Organizational changes often play an even greater role than technological change in the process of innovation within SMEs. In particular, the system of subcontracting linkages is undergoing a profound process of structural change. SME in medium technology segments are confronted with new challenges of internationalised markets, as increasing concentration of OEM causes new forms of global and modular sourcing making vertical integration (quasi-integration) of SME inevitable. This integration process causes new needs of SMEs to integrate a broader technological and organisational knowledge base. The process of internationalization of SMEs requires a progressive vertical integration of these latter within a cluster, in order to allow the smooth circulation and combination of complementary tacit knowledge and to increase the pricing power of the clusters, in front of the competition of countries characterized by much lower production costs.

f) SMEs differently from large firms should not be considered individually, but represent a regional complex system, where the turnover, due to births and closures, the changes in the selection of partners are strong and there is an high interaction, due to the grouping of the various SMEs within larger industrial groups and to the existence of rather stable subcontracting arrangements between the various firms. Clusters do not correspond to the traditional local production systems or industrial districts and may have a rather different and evolving nature in the various regions. Clusters of SMEs often can not be defined within a limited local area and have a regional or even interregional reach, as the spread over contiguous regions separated by a rather long distance.

g) Labour mobility is an important means of exchanging knowledge, including through spin-offs by former employees of OEM and leading research organisations. This knowledge exchange, especially in the case of skilled workers ("knowledge workers"), is limited due to loyalty to the firm, reluctance to move geographically and a low rate of international labour mobility.

h) The new characteristics of technological change require an higher and original combination of different technologies and an higher and complex integration of the various sectors. New technological ideas are based on interactive processes between engineering and natural sciences and research in applying sectors. Therefore, fields of application and problem solution describe technological priorities better than sectoral or disciplinary dimensions. Thus, the knowledge base in medium technology sectors becomes increasingly interdisciplinary and inter-sectoral. However, the informal character of the relationships between SMEs may be inadequate for the design and implementation of a long term strategy of the clusters considered.

i) Regional universities and research institutions insure various forms of positive externalities to the sectoral clusters considered. Regional universities and vocational schools are still the most important source for new human capital. Early involvement of SMEs in qualification schemes via traineeships, academic theses and postgraduate research can help to overcome barriers to integration and open up to international qualification elements. The interactions between SMEs and universities are rather strong and diversified, while still being mainly informal. However, cooperation between the research institutions and companies in the medium technology sectors is not as well developed as it is in the case of high technology sectors.

j) The linkages between SMEs in the process of interactive learning within a cluster are often informal, rather chaotic and time-consuming. Interaction may become faster and strategically oriented by the adoption of the methodology of "Territorial Knowledge Management", which allows to transform the flows of tacit knowledge into formal linkages based on the transfer of codified knowledge.

k) The different and evolving institutional framework play a key role in the process of innovation within the clusters considered. A rather diversified typology of institutions play a leading role in defining a long term strategy of innovation of SMEs within the different regions. Institutions and other forms of "social capital" play the role of immaterial infrastructures which organize the knowledge flows between SMEs within the clusters. Institutional solutions to overcome lack of resources by SMEs are regionally specific and influenced by long-term historical and cultural heritage within the region. Furthermore, the existence of key persons ("leaders") and of individual visionary and charismatic skills have a major role in building up the trust in need, joint visions and the results of cooperation. Financial markets offer new instruments for funding SMEs. These instruments, however, require transparency and scale of projects, which intensify forces to look for closer cooperation, while they cannot be achieved by traditional SMEs.

l) Regional, national and European institutions are required in order to promote international forms of cooperation between SMEs both at the regional and at the international level . In fact, the development of international relations requires a more stable framework, than the market mechanisms or even multinational companies and private forms of bottom-up international cooperation may be capable to provide. Without any external support, SMEs in medium technology sectors are often unable to cope with medium-term internationalisation strategies, including new sales markets, knowledge acquisition, recruitment and relocation, and are restricted to short-term a reactive behaviour. Public and private associations can act as intermediaries by organising (or establishing joint participations at) international trade fairs, exchange programs, joint qualification schemes or participation in international funding

programs. The creation of "innovation platforms" may look as a promising solution to the above obstacles.

m) The innovation policy of the European Union could promote the extension of the processes of interactive learning by SMEs at the international or European level. However, EU programs are often not attractive for SMEs due to requirements of co-financing, narrow definitions of sectoral high technologies and non-transparent administrative regulations. Instead, a broader support is needed, aiming to the creation of an European network of regional "innovation platforms", integrating different technological skills according to fields of application and problem solutions and representing the nodes in the interregional and international flows of knowledge between SMEs.

- **expected end results**, **intentions for use and impact. The project aims to:**
  a) identify the key barriers to an efficient operation of knowledge creation and innovation networks not only within regional sectoral clusters but also at the interregional and international level within Europe, with particular reference to the relationships between the most developed regions and the less favoured regions in South Europe and in the EU candidate countries;
  b) improve the indicators considered in the "European Innovation Scoreboard" with a selected set of new key indicators focusing on the structure of knowledge creation and innovation networks;
  c) propose policy options and specific technology transfer measures aiming to enhance the integration within the "European Research/Knowledge Area", not only of higher education and research institutions but also of small and medium sized firms (SMEs) specialised in traditional sectors, through stable and flexible networks enhancing their Europe-wide competitiveness.

- **plan for using and disseminating the knowledge**
  a) May 2006: First Diffusion Workshop, Warsaw, organized by IBS- Polish Academy of Sciences, on: role of SMEs and regional institutions in knowledge creation and international co-operation, presentation of the results of the empirical analysis (WP1).
  b) October 2006: Second Diffusion Workshop, Graz, organized by Joanneum Research, on: role of large firms in international transfers of tacit knowledge, presentation of the results of the theoretical and empirical studies (WP2)
  c) March 2007: Final diffusion conference, Rome, organized by the University of Rome, on: national and European policies for knowledge creation and innovation, presentation of the results of research activities on a quantitative framework for innovation policy evaluation (WP3) and on policy recommendations (WP4).

- **project logo and project public website.**

IKINET

INTERNATIONAL KNOWLEDGE AND INNOVATION NETWORKS
for European Integration, Cohesion and Enlargement

http://www.economia.uniroma2.it/dei/ikinet/

Section 1 – Project objectives and major achievements during the reporting period

The following section of the Periodic Activity Report illustrates the general objectives of the research project.

Second, it undertakes an overview of the state-of-the-art in the field of studies on the territorial flows of knowledge.

Third, it presents the methodology adopted in the research project, with special reference to the objectives for the reporting period and the contractors involved.

Fourth, it presents the results of an harmonized analysis of the seven selected regional innovation systems.

Fifth, it summarizes the results of the case studies elaborated on the industrial and service firms, research and financial organizations and public institutions in the seven selected innovation systems.

Finally, it comments on the most important problems during the period including the corrective actions undertaken.

1. Aims of the research project

The project studies the problem of the transition of the less developed regions: Objective 1 regions and the regions of the candidate countries, to the model of the knowledge economy and how to avoid their exclusion with respect to the most developed regions, which operate at the frontiers of technologies.

It studies the obstacles, which usually hinder the diffusion of "technology spill-overs" outside a specific local economy, and the policies and "soft" infrastructures and institutions which can remove those obstacles.

The project aims to propose policy options to enhance the integration of EU research institutions in an "European Research/Knowledge Area", through stable and flexible networks, and to increase the ability of these latter to support the Europe-wide competitiveness.

1.1 Strategic objectives

The project aims at examining the problems and possible policy actions arising from the perceived need for tighter integration and cohesion within EU countries, as seen from the perspective of a “learning economy”, taking into account the persistent disparities between the developed and the economic lagging regions (particularly Objective 1 regions) in the existing EU as well as the effects of the EU enlargement on interregional disparity patterns.

In fact, nowadays, it is widely accepted that knowledge and learning are at the core of competitiveness, international division of labour and agglomeration and exclusion phenomena. Innovation generates winners and losers at the same time and depends on learning processes and knowledge creation and accumulation. Thus, learning brings about enormous opportunities for growth but also severe threats of exclusion and marginalisation, especially for the economic lagging regions in the EU and Central and Eastern Europe (CEE) regions/countries.

The project analyses the following key policy questions:

- how innovation and learning processes can effectively contribute to economic development when it takes place within clusters and networks;
- how knowledge and innovation networks may extend from local clusters in the most developed regions to the EU economic lagging regions and to the new accessing countries, with a view to maximising the full potential of Europe's knowledge/learning capacity as a whole.

Thus, the project aims to the following objectives:

1. identify the key barriers to an efficient operation of knowledge creation and innovation networks not only within regional sectoral clusters but also at the interregional and international level within Europe, with particular reference to the relationships between the most developed regions and the less favoured regions in South Europe and in the EU candidate countries;
2. improve the indicators considered in the "European Innovation Scoreboard" with a selected set of new key indicators focusing on the structure of knowledge creation and innovation networks;
3. propose policy options and specific technology transfer measures aiming to enhance the integration within the "European Research/Knowledge Area", not only of higher education and research institutions but also of small and medium sized firms (SMEs) specialised in traditional sectors, through stable and flexible networks enhancing their Europe-wide competitiveness.

1.2 Scientific objectives

From a scientific point of view the project aims at a better understanding of the processes offering single regions access to codified knowledge and RTD networks as well as to tacit knowledge and know-how from other (developed) regions.

The EU Lisbon Agenda aims to build up Europe as the most competitive region in the world in 2010. A major part of this strategy to improve competitiveness against North America and Asia is the improvement of the knowledge base. Most instruments and programs, however, still follow a linear, sector-based concept of innovation with a special focus on high technology sectors.

Innovation research shows that successful innovation strategy are based on recursive interactive processes of knowledge generation, examination and commercialisation – focusing on input factors as R&D investments cause risks not to have the capability for successful market introduction.

Furthermore, innovation research stresses the increasing relevance of integrating technologies, which combine knowledge from different scientific disciplines and technological paradigms and link high and medium technology sectors. A closer look to the competitive advantages of European firms and regions reveals the dominant role of medium technology sectors for employment and trade volume.

These sectors are characterised by specific forms of cooperation, knowledge acquisition and exploitation and a high share of SME. These SME now face specific challenges of adjustment to global market processes, as global, modular sourcing strategies by dominant OEM, shortening of

innovation cycles, combination of traditional and high-technology sectors, changes of financial markets in the context of Basle II and increasing relevance of outsourcing and off-shoring strategies.

EU programs so far hardly reach these SME. As a consequence, an increasing knowledge gap between leading and lagging regions and between multinational companies having access to all R&D facilities worldwide and spatially bounded SME threatens to endanger Europe's dominant role in medium technology sectors.

The IKINET project intends to overcome these deficits in research and policy practise so far following three main research steps. Firstly, a better understanding of knowledge creation and exploitation strategies by interactive intra- and inter-organisational learning processes shall be achieved for medium technology sectors. In particular, the characteristics of the knowledge exchanged, the channels and codes of exchange as well as necessary formal and informal within and between organisations are investigated.

The question of proximity has to be addressed as a key aim since theory suggests it is important for knowledge transfer involving face to face interaction. Although many linkages are global not regional nevertheless proximities of many kinds like professional, organisational and relational are important even where geographical proximity is not. In fact much of the most sensitive knowledge interaction appears to have a geographical dimension according to most studies.

The project analyses the networks or the mechanisms of economic integration operating within regional innovation systems or local production clusters and at the international/interregional level. These processes may lead to new and higher forms of integration between industrial and service firms, not only in a commercial or financial perspective but also in sharing knowledge and innovation. The project may thus contribute to a much better understanding of the local and international dimensions of the *"knowledge based society"*.

In particular, the project investigates the key theoretical question of how important spatial proximity is for the sustainability of learning and innovation networks, and how the need for spatial proximity can be made compatible with the need for connectivity, in order to intensify European integration and cohesion and to bridge the gap between highly and low skilled in European economies.

This requires an original theoretical and empirical study of the international/interregional dimension of existing knowledge and innovation networks, where not only information or codified knowledge, as in the collaboration between RTD institutions, but also tacit knowledge, know-how and competencies circulate. In particular, the project aims to investigate how to decrease the "organisational and institutional distance" between the various regions at the international/interregional level, since tacit knowledge and innovation capabilities often are embodied in human capital and individual organisations and institutions.

Additional to the existing scientific literature on networks of firms and individuals within local innovation systems, recent methodologies originally developed to measure and improve performance and capabilities, which have usually not been measured due to their characterisation as "invisible assets" (e.g. "intellectual capital"), will be integrated into the approach of this project. This refers inter alia to methodologies like "knowledge management", "organisational learning", or "balanced scorecards". Besides these approaches from management and organisation studies, further interdisciplinary models on economic and social networks at the local level will be integrated into the theoretical framework. In particular, this theoretical framework shall enable to identify and overcome the obstacles usually hindering the diffusion of "technology spill-overs" outside a specific local economy.

The key aim is to enable territorial knowledge management policy to be better informed about knowledge flows and barriers at regional level so they may intervene to improve the potential for collaborative actions that aim to improve inter-firm knowledge the better to compete in global and other markets.

Secondly, the interplay between the spatially bounded organisation of regional knowledge clusters and international knowledge flows is analysed. Here, existing gaps between regional and national level for SME and ways to overcome these deficits by specific organisations, informal and formal institutional arrangements are investigated.

Finally, the role of European policies in this context will be discussed. Causes for the low impact of the existing instruments in the EU R&D framework program on SME in medium technology sectors are analysed, options to improve the knowledge transfer between R&D intensive firms and research institutes and other firms in medium technology sectors are discussed, and the role of standardisation and regulation is investigated.

A special focus will be laid on economically lagging regions. These regions are particularly endangered of losing access to world market developments, as their traditional competitive advantage – cheaper factor costs – is easily replaced by competitors in Asia and other low-cost countries. If the improvement of the knowledge base is the only chance for Europe to stay competitive – which seems to be the common opinion of researchers and politicians –, then it is inevitable to look for new ways to integrate the lagging regions into European knowledge flows and look for institutional solutions to overcome barriers for SME in lagging regions to leading edge knowledge.

The empirical analysis to be elaborated in the project will allow a ranking of factors affecting the innovation potential of regions based on quantitative indicators. Differently from the indicators actually considered in the "European Innovation Scoreboard" focussing on the endowment of specific stocks or immaterial resources, the empirical analysis will identify the flows, which characterise knowledge and innovation networks at the regional and the international/interregional level. Through this, it will be possible to describe the structural characteristics of knowledge and innovation networks and to measure various factors (such as: international accessibility, receptivity, human capital and openness, social capital, entrepreneurship) affecting interactive learning processes within organisations and institutions and at the interregional and international level.

The theoretical study, elaborated within the project, is not a task for itself, but shall contribute to improved policy recommendations. Successful removal of barriers to interregional knowledge diffusion and learning – thus cohesion – crucially depends on institutional settings. Thus, an essential part of the project will be to consider policy measures in support of such institutions and inquire into the necessary institutional background for the creation and the support of knowledge and innovation networks and the conditions for their extension to Objective 1 regions and the EU candidate countries.

Therefore the key scientific issues to be investigated in the research project are the following:

a) how tacit knowledge circulate at the local level
b) how tacit knowledge circulate at the international level
c) which are the actual most important direct and indirect relations of the firms in the local clusters with firms in other regions and countries
d) how different are these relations with comparable relations at the local level
e) how international relations may be better integrated with local relations
f) how interactive learning processes develop within the selected cluster
g) how interactive learning processes develop or may develop at the international level
h) which obstacles hinder the economic lagging regions (Objective 1) in participating to European knowledge and innovation networks together with the most developed regions
i) which obstacles hinder the extension of cooperation relationships from a regional to an international framework
j) does the geographical distance play a greater role than the organizational (technological) distance between firms in economic lagging and developed regions
k) does the institutional distance or differences in the institutional framework play a great role in hindering relationships between firms in economic lagging and developed regions
l) which instruments may be used at the regional level
m) which instruments may be used by European research and regional policies

The aims of the IKINET project can be summarized as:

- How to avoid **exclusion of economic lagging regions** from the European knowledge economy
- How to promote the **transfer of "tacit knowledge**" in the case of **medium technology sectors**
- How to promote "**interactive learning processes**" in an **international framework**.
- Which is **the role of institutions** in the **European knowledge and innovation networks**

2. The state-of-the-art of studies on the territorial flows of knowledge

2.1 The changing nature of the process of competition

A firm or a region competes on the basis of what they have which is unique in relation to their competitors. Thus, the competitiveness of a region rests on the capability to continuously innovate and diversify its product range rather than in producing the same products at a lower cost than the competitors.

Drawing upon the work of Joseph Schumpeter, learning economy theorists argue that the most significant form of competition is 'quality' rather than price-based competition, especially within an economic environment where the rate of innovation is high (Morgan, 1997[1]; Todtling, 1994[2]).

Innovation is increasingly seen as a way for firms, regions and nations to gain competitiveness in the face of globalization because it enhances the learning abilities of firms and workers (Lundvall and Borras, 1997);

For Morgan, all this interest in innovation has stimulated a debate around the character of contemporary capitalism "where knowledge is the most strategic resource and learning the most important process" (Lundvall, 1994[3]; in ibid).

Maskell (1999, 113)[4] argues, ''a knowledge-based economy is materializing, where the competitive edge of many firms has shifted from static price competition towards dynamic improvement, favoring those who can create knowledge faster than their competitors''.

In a knowledge economy the competitiveness of the firms is determined by the quality of the products and processes, the decrease of decision, production and delivery times of new products, the adoption of technological and organizational innovation in production processes. Thus, it is crucial to develop the competencies and professional skills of the labour force, the intermediate and top managers. In particular, the factors which determine the survival and success of firms are increasingly less the fixed investment and the financial resources and more the know-how, the intangible resources and the distinctive competencies.

2.2 Four different frameworks in the process of knowledge creation

Learning is seen as a key element for the long-term advantage (Teece et al., 1997[5]; Kylaheiko, 1998[6]). In the same way, as knowledge is nationally embedded due to sectoral specialisations as

[1] Morgan, K., 1997. The learning region: institutions innovation and regional renewal. In: Asheim, B., Dunford, M. (Eds.), Regional Studies Special Issue: Regional Futures 31 (5), 491-504.
[2] Todtling, F., 1994. The uneven landscape of innovation poles: local embeddedness and global networks. In: Amin, A., Thrift, N. (Eds.), Globalisation, Institutions and Regional Development in Europe. Oxford University Press, Oxford.
[3] Lundvall, B.A., 1994. The learning economy: challenges to economic theory and policy. Paper presented to the EAEPE Conference, October, Copenhagen.
[4] Maskell, P., 1999. Social Capital, Innovation, and Competitiveness. In: Baron, S., Schuller, T. (Eds.), Social Capital. Critical Perspectives. Oxford University Press, Oxford, pp. 111–123.
[5] Teece, D., Pisano, G., Shuen, A., 1997. Dynamic capabilities and strategic management. Strategic Management Journal 18 (7), 509–533.
[6] Kylaheiko, K., 1998. Making sense of technology: Towards synthesis between neoclassical and evolutionary approaches.International Journal of Production Economics 56–57, 319–332.

well as political and cultural organisations and institutions, knowledge is also regionally embedded as a result of a historically produced territorial division of labour.

In a methodological perspective, there are different frameworks, within which knowledge may be created and analyzed. These are:

- the individual firm, where different workers, managers and entrepreneurs interact,
- the sector or the market where different firms interact through relations of monetary exchanges, increasingly within an international perspective,
- the institutions, where various private and pubic collective actors (stakeholders) interact in the framework of political relations and aim to modify public norms and regulations, mainly within a national perspective,
- the regions or the territory, where also in a formal and informal way actors belonging to different sectors and having a different institutional nature interact, within the framework of complex regional innovation systems, and adapt their behaviour and strategies.

2.3 A wider concept of knowledge

Whereas information is that part of knowledge that can be easily partitioned and transmitted either through computer networks or in written form, knowledge itself is a much wider concept. Knowledge is often defined as organized information, and information as organized data. Knowledge is a human practice rather than a thing that resides in artifacts. Knowledge may be shared between people, but this involves a process of learning and experience about each other's knowledge. Sometimes this knowledge sharing can be carried out in order to exchange information. But the goal is to render information useful. It is for these reasons that (a) much work is being carried out currently at the OECD and elsewhere in order to improve our understanding of these processes of interaction, and (b) why we tend to differentiate between differing types of knowledge. Thus, codified knowledge and tacit knowledge differ importantly in that the former can be written down (in a patent, drawing, design, formula, etc., and transmitted) while the latter is skill-based, talent-based and experiential. Therefore tacit knowledge is difficult to transfer except through demonstration (learning by doing) or appropriation (hiring the person who has a talent or the experience you want).

Knowledge has to do with the outcome of learning. Learning gives rise to know-how, skills and competencies which are often tacit rather than explicit and which cannot easily be transmitted through telecommunication networks. (Lundvall, 1998, p. 34.)

Following Hayek (1948) and Polanyi (1958), scholars working in the tradition of Austrian economists have pointed out that if a good deal of knowledge, such as the price of gold, can be easily codified and transmitted, much important knowledge is tacit and dependent on the "particular circumstances of time and place," and therefore cannot be acquired by traditional market research procedures or transmitted by advertising or long-distance learning.

In fact, "humans (and other living creatures) 'know things' that they have not acquired as 'information' and which, not having been reduced to symbolic representations (code) are held in forms that are not readily available for communication to others (at least not explicitly as 'information-bearing' messages)". Which simply means that humans have a knowledge of things which is tacit[7].

[7] Among the numerous contributions discussing the tacit aspect of knowledge see Winter (1987), Dosi (1988), Senker (1995), Lundvall (1996), Cohen et al. (1996) and Cowan and Foray (1997).

The main traits of tacit knowledge are that it is difficult to communicate and that it is embedded in the person or in the community. Tacit and explicit knowledge are not fully separate forms of knowledge, but mutual, complementary units.

Because knowledge is not simply data or information, but is rooted in human experience and social context, its management demands that close attention is paid to the people and culture as well as to organizational structure, and information technology (Havens and Knapp, 1999)[8].

According to Cooke the long-established distinction between implicit and explicit knowledge requires breaking apart. This is because the direct transfer of one into another even in geographical proximity is impossible without external intervention, including network and associative involvement. To capture the 'intermediary' role in knowledge transfer and management, the category 'complicit' knowledge is necessitated, standing between the 'implicit' knowledge of the 'exploratory' research scientist and the 'explicit' exploitation/commercialisation knowledge of the innovator or entrepreneur. Thus knowledge moves interactively among implicit, complicit and explicit knowledge experts before becoming commercially useful. Complicit actors are those many in different IPR, investment, transfer, consultancy, mentoring, policy and governance positions.

2.4 The collective nature of knowledge

The key to innovation is people who own the means of innovation — their knowledge — and that they are independent and mobile. Organizations in the knowledge economy are in constant competition for this critical resource. To attract and hold them, companies need to organize themselves to be the place where they feel most appreciated.

Traditionally, knowledge is seen as something belonging to the individual. Individual knowledge is the knowledge each individual has or masters, acquired through education and experience. But this is not all the knowledge an enterprise runs by. Knowledge is also collective (March and Simon, 1958[9]; Nelson and Winter, 1982[10]).

Ducatel's points that organisational learning is a social process and skill development `does not take place at the individual level but amongst groups [which is] a fact that many training programme[s] still seem to ignore' (Ducatel, 1998, p. 19).

The problem here is clear, if knowledge remains private, it can inform private action but not social action. For social action to be possible and for actions to be mutually supporting and collaborative it is necessary that private knowledge becomes public understanding to the requisite degree. The transmission of private knowledge into shared understanding is a socially distributed process and this process must depend on institutions for the sharing and common interpretation of flows of information (Metcalfe J.S., Ramlogan R., 2005).

The intangible or tacit nature of this form of knowledge means that its circulation is highly social and cultural, so that ``tacit knowledge is collective in nature and, because it is wedded to its human and social context, it is more territorially specific than is generally thought'' (Morgan, 1995, p. 8[11]; Lundvall, 1988).

[8] Havens, C., Knapp, E., 1999. Easing into knowledge management. Strategy and Leadership 27 (2), 4–9.
[9] March, J. G., and Simon, H. A. (1958). *Organizations,* Wiley, New York.
[10] Nelson, R. R., and Winter, S. G. (1982). *An Evolutionary Theory of Economic Change,* The Belknap Press of Harvard University Press, Cambridge, MA.
[11] Morgan, K., 1995. The learning region, Institutions, Innovation and Regional Renewal, Papers in Planning Research, 157.

2.5 The combinative nature of the process of knowledge creation

As a consequence of the importance of know-how it is the network or organised market governance structure (see Powell, 1990)[12] that is perceived to best support trust facilitated interactive innovation (Lundvall and Johnson, 1994; Morgan, 1995, 1997; Cooke and Morgan, 1993[13]).

No less an authority than Adam Smith laid the foundations for our discussion when he suggested that the most fundamental aspect of the division of labour is the division of knowledge, and the consequential existence of roundabout and combinatorial ways of producing knowledge (Metcalfe J.S., Ramlogan R., 2005).

The importance of collaborative linkages has been commented on by several scholars in recent years (see OECD, 1992, chapter 3, for a review). Pavitt (1991) showed that one of the reasons large firms engage in basic research was as a way of making links with experts in other institutions to improve their innovative potential (see also Rosenberg, 1990). Thus, innovation is the 'craft of combination', revolving around the combination of various types of knowledge (Lundvall and Johnson, 1994[14]).

2.6 A wider sectoral scope than the so called high-tech sectors

The concept of the knowledge economy has been linked by some to a new IT driven techno-economic paradigm (see, for example, Freeman and Perez, 1988). However, the learning economy is not necessarily a high-tech economy.

According to Lundvall and Borras `the learning potential ... may differ between sectors and technologies but in all sectors there will be niches where the potential for learning is high' (Lundvall and Borras s, 1998, p. 35). Maskell (1996), showed that, in Denmark, learning also took place in traditional low technology sectors, and this still led to growth.

The concept of the "learning economy" means an extension of the range of branches, firm-sizes and regions that can be viewed as innovative, also to include traditional, non R&D intensive branches (e.g. the importance of design in making furniture manufactures competitive and moving them up the value-added chain).

Furthermore, knowledge flows within a distributed knowledge base (Smith, 2000[15]), which more and more substitutes intra-firm (or intramural) knowledge bases (which constitutes the basis for the OECD taxonomy of R&D intensity), taking place between industries with very different degrees of R&D intensity, further weaken the distinction between high-tech and low-tech industries. (e.g. when food and beverage firms produce functional food based on inputs from bio-tech firms).

[12] Powell, W.W., 1990. Neither market nor hierarchy: network forms of organisation. Research in Organisational Behaviour 12, 295-336.
[13] Cooke, P., Morgan, K., 1993. The network paradigm: new departures in corporate and regional development. Environment and Planning D: Society and Space 11, 543-564.
[14] Lundvall, B.A., Johnson, B., 1994. The learning economy. Journal of Industry Studies 1 (2), 23-42.
[15] Smith, K., 2000. What is 'The Knowledge Economy'? Knowledge intensive Industries and Distributed Knowledge Bases. Paper presented at the DRUID Summer Conference on 'The Learning Economy—Firms, Regions and Nation Specific Institutions', Aalborg, Denmark, June 2000.

Thus, the development in the European countries toward the model of the knowledge economy can not be reduced to the development of new high-tech sectors or R&D intensive sectors. Moreover, R&D investments should be integrated by policies which deal with other crucial dimensions of the innovation process. In fact, the new knowledge economy is different from the development of high-tech industries.

2.7 A new model in the process of knowledge creation

Knowledge creation and innovation are the result of an interactive learning process, which requires the creative and intelligent combination of various information and knowledge pieces, the socialization of a wide range of different experiences and competencies and the flexible management of complex roles and workflows of different actors as also the integration of scalable components and the support of complementary services in the solution of specific production problems.
As knowledge will play a dominant role in organisations, not only at the top but at all levels, the day to day work environment should favour learning processes that support, what Kessels[16] tends to describe as the process of 'knowledge productivity'. Knowledge productivity involves signalling, absorbing and processing of relevant information, generating and disseminating new knowledge and applying this knowledge to the improvement and innovation of processes, products and services.

Learning processes support many of the elements in the description of the concept of knowledge productivity (Kessels, 2001). Learning to learn is a competence of universal value and importance. Individuals need this special learning ability to remain abreast of constantly changing working conditions. This applies more than ever when knowledge productivity becomes the main economic drive. Subsequent elaboration of proficiency in learning to learn requires a conceptual basis that focuses on insights into meta-cognitions and self-regulation to support these learning processes.

For their part, recent studies have developed analytical models in order to explicate the changes underway in academic knowledge production. One such model is "new knowledge production" of Gibbons et al. (1994) and Nowotny et al. (2001); another is "entrepreneurial science," posited by Etzkowitz (1996, 1998), Etzkowitz et al. (2000) and Etzkowitz and Leydesdorff (2000).

According to the "new knowledge production" model, a new mode of knowledge production (termed Mode 2) has been developed since the 1940s and has acquired a comparable, if not greater, importance to that of the traditional mode (Mode 1). This new mode's chief characteristics are problem-solving research orientations, the involvement of economical and political actors in the definition of research priorities, the strengthening of transdisciplinarity and the multiplication of research sites outside the university.

According to this model, such practices have become sufficiently widespread that "the capitalisation of knowledge appears to be taking increasing precedence over disinterestedness as a norm of science" (Etzkovitz et al. 2000, p. 315).

Lundvall argues that we ought to expand the range of objects of study beyond the knowledge institutions, such as universities and laboratories, to the more general arena of routinised learning (for example, learning-by-doing or learning-by-using) `which emphasise knowledge creation as a by- product of routine activities' (1998, p. 35).

[16] Kessels JWM. Knowledge productivity and the corporate curriculum. In: Schreinemakers JF, editor. Knowledge management, Organization, competence and methodology. Wu¨rzburg: Ergon Verlag, 1996:168–74.

In a learning economy innovation is understood as an interactive learning process, which is socially and territorially embedded and culturally and institutionally contextualized (Lundvall, 1992[17]). It emphasizes a dynamic approach to innovation rather than the more static approach adopted in the knowledge-based economy, that emphasizes access to a stock of specialised knowledge (Lundvall and Archibugi, 2001[18]).

2.8 The role of institutions in the knowledge economy

In contrast to traditional linear models, modern theorists argue that the process of innovation is highly interactive and is dependent upon social and cultural institutions and conventions (Morgan, 1997, p. 493[19]).

As a consequence of the importance of know-how, it is the network or organised market governance structure (see Powell, 1990)[20] that is perceived to best support trust facilitated interactive innovation (Lundvall and Johnson, 1994; Morgan, 1995, 1997; Cooke and Morgan, 1993[21]).

Knowledge is channeled within networks by formal and informal institutions. In principle, explicit and codified knowledge may be traded on markets. On the contrary, tacit knowledge competencies and skills, can not be transferred effectively through conventional markets and requires non-market allocation: for instance, within the firm, in the context of inter-firm networks or forms of co-operation between private agents and public institutions.

Thus, institutions have a key role in the process of innovation and in the generation and working of "knowledge and learning networks".

Connectivity between the various institutions should be a central concern of policy. Governance of knowledge and innovation networks according to the "Territorial Knowledge Management" approach[22] implies a continuous public investment in the development of technical standards, social norms, and organizational, financial and institutional solutions, which may facilitate the adoption of innovation.

Governance is the challenge of steering and positioning complex organizations. These can be committees, research groups, firms, networks, communities, regions and international agencies. Ultimately, it is a matter of leadership, responsibility and vision when it comes, as it does daily, with technology and society. A requirement is for policy groups to become highly adaptive organizations. It requires becoming effective signal processors, organizations that incorporate learning in their strategy [[23]].

Institutions play a crucial role in innovation networks, since they:

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[17] Lundvall, B.- ° A. (Ed.), 1992. National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning. Pinter, London.
[18] Lundvall, B- ° A., Archibugi, D. (Eds.), 2001. The Globalizing Learning Economy. Oxford University Press, Oxford.
[19] Morgan, K., 1997. The learning region: institutions innovation and regional renewal. In: Asheim, B., Dunford, M. (Eds.), Regional Studies Special Issue: Regional Futures 31 (5), 491-504.
[20] Powell, W.W., 1990. Neither market nor hierarchy: network forms of organisation. Research in Organisational Behaviour 12, 295-336.
[21] Cooke, P., Morgan, K., 1993. The network paradigm: new departures in corporate and regional development. Environment and Planning D: Society and Space 11, 543-564.
[22] Cappellin, R., 2004. Territorial knowledge management: towards a metrics of the cognitive dimension of agglomeration economies, International Journal of Technology Management, Vol. 26, Nos. 2/3/4, 303-325.
[23] de la Mothe J,editor. Science,technology and governance. London: Continuum; 2001.

- reduce transaction and production costs,
- increase trust among economic and social actors,
- improve entrepreneurial capacity,
- increase learning and relational mechanisms,
- reinforce networks and cooperation among the actors.

In a recent book Mokyr (2002)[24] has argued that the industrial revolutions need to be explained by the development, but mostly by the diffusion and use of new knowledge. Thus, it can be considered a coincidence, in a way, that England around 1780 was the first country where sustained economic growth based on the use of newly developed knowledge could be observed. England was by no means the most technologically advanced country, and indeed it used knowledge developed in countries such as France extensively. Mokyr points to the institutions of English society that lowered the costs of communication about new knowledge. The result was that knowledge was much more readily exchanged among savants, among fabricants, and between these two groups. Thus, new knowledge was more easily created, but most importantly existing knowledge was put to good use faster, even if the knowledge would be of a tacit nature (cf. Cowan et al., 2000[25]).

Communication then, in Mokyr's argument, will both broaden and tighten the knowledge base of propositional knowledge, and stimulate the development of techniques ("prescriptive knowledge) "that find an immediate application in society and stimulate economic activity. Central in Mokyr's analysis is his concept of the "access costs" people face when in need of "useful knowledge".

The process of knowledge creation has a local dimension. Learning can be considered as a social process of ongoing development embedded in a specific regional socio-cultural context. As the creation of new knowledge implies an intense process of interaction, the concept of sectoral/geographical clusters deserves special attention. Within clusters, "social capital" and trust relations between local actors can be seen as a conceptualization of the glue that facilitates transactions, cooperation and learning in an uncertain world. Clusters and networks can then be regarded as economic clubs acting to internalize the problems of effective knowledge transmission.

To this degree, clusters and networks are a substitute both for formal markets and for hierarchical integration. Clusters represent subtle and differentiated "institutions" for co-operation and interactive learning.

The spatial patterns of innovation and the related geographical dimension of economic and social development have witnessed a renewed and increasing interest in the literature [26, 27], but attention is to be focused on the ability to build social capital, including interactive learning, local externalities, and networks among institutions [28]. This focus on relational assets is part of the ''institutional turn'' in regional development studies as a result of the relative failure of classical approaches, which sought to privilege either ''state-led'' or ''market-driven'' processes regardless of time, space, and milieu.

Uncertainty is high in its production (i.e., research),but this drops rapidly as it is diffused. There is considerable social leakage in the transmission of knowledge. There are also considerable spill-over effects which result in secondary benefits of proximity to the source of knowledge production, such

[24] Mokyr, J., 2002. The Gifts of Athena – Historical Origins of the Knowledge Economy. Princeton UP, Princeton, NJ.
[25] Cowan, R., David, P., Foray, D., 2000. The explicit economics of knowledge codification and tacitness. Industrial and Corporate Change 9, 211–253.
[26] P. Cooke, K. Morgan, The Associational Economy, Oxford Univ. Press, Oxford, 1998.
[27] M. Storper, The Regional World—Territorial World in a Global Economy, Guilford Press, New York, 1998.
[28] G.M.P. Swann, M.J. Prevezer, D.K. Stout, The Dynamics of Industrial Clustering, Oxford Univ. Press, Oxford, 1998.

as the development of high technology clusters, the attraction and retention of skilled workers, the attraction of investment, and the spinning off of new firms, jobs, and industries.

2.9 A new understanding of clustering

The concept of supporting regional or industrial clustering has become a major policy strategy in most industrialised countries. Clusters are often defined as "geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries and associated institutions in a particular field that compete but also cooperate".[29] This emphasis of cluster analysis has certainly changed in recent years. The original concentration on the usefulness of the predominantly Porterian cluster model as a concept of "regional competitiveness" has received several criticisms, which point to many fundamental conceptual, theoretical and empirical questions and imply that a "much more cautious and circumspect use of the notion" may be necessary.[30] It was also argued that ideas arising from quite different conceptual approaches – sometimes complementary, sometimes contradictory – were included in the discussion of (industrial) clustering.[31]

The recent renaissance of interest in clusters by policy and science has focussed more on their functions as institutions for knowledge management and organizational learning emphasizing the organic-evolutionary dimension. Growth of the knowledge base depends on intended and unintended individual processing of experiences, i.e. 'learning', while the interpretation, transfer and use of experiences is influenced by interaction between individuals and between organizations. Thus, formal or informal institutional arrangements are needed to connect the microeconomic level of individuals and firms with the meso-level of joint interactive capabilities.

2.10 Emergence of theoretical concepts on clusters and learning

In fact, this basic need was already outlined by Alfred Marshall:[32] Economic success of firms depends of an increasing specialization and of the development of a more efficient organization of industrial production relying on material linkages, technological spill-overs and labour market pooling effects. The new element of Marshall's idea lay in the dynamic complementarity of this system of interdependent economic units: Up to then efficiency raising specialization rested either on scale effects of the single production units or on external comparative advantages. Marshall points to the organic-evolutionary character of independent decision-making units, i.e. these effects exist also without a hierarchical command or control structure.[33]

In the middle of the 1990s concepts of learning were integrated into these theories of regional development and cluster analysis: the "learning region" interpreted the region as a focal point of a

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[29] Porter, M.E. (1990), The competitive advantage of nations, MacMillan, London. Porter, M.E. (2000), Location, competition and economic development: local clusters in a world economy, Economic Development Quarterly, 14, 15-34.

[30] Martin, R.L.; Sunley, P. (2003), Deconstructing Clusters: Chaotic Concept of Policy Panacea?, Journal of Economic Geography, 3, 5-35, and to further empirical investigations Rosenthal, S.; Strange, W.C. (2004): Evidence on the nature and sources of agglomeration economics, in: Henderson, J.V.; Thisse, J.-F. (eds.): Handbook of Urban and Regional Economics, Vol. 4.

[31] Gordon, I.R. and McCann, P. (2000), Industrial clusters: complexes, agglomeration and/or social networks?, Urban Studies, 37: 513-532.

[32] Marshall A. (1890/1920), Principles of Economics, The Royal Economic Society, Mac Millan, London.

[33] Such "organic systems" have already been discussed in List, F. (1841), Das nationale System der politischen Ökonomie, published in English in 1885 as The National System of Political Economy, Longman, London and were implemented in 1848 by Ferdinand von Steinbeis in the kingdom of Württemberg.

general "learning economy". "The challenge of 'learning regions' is to increase the innovative capability of SME-based industrial agglomerations through the economic logic by which milieu foster innovation."[34] This meant an additional quality of interaction within regional clusters in their emphasis on horizontal cooperation and deliberate interactive processes of developing new perspectives: "Such 'learning regions' would be in a much better position than 'traditional' industrial districts to avoid a 'lock-in' of development caused by localized path-dependency".[35]

Different concepts help to understand the prerequisites for such interaction processes. Lundvall's concept of innovation systems refers to a common institutional infrastructure enabling learning an inter-organizational cooperation and communication process at the supra-firm level with an automatic recombination of knowledge leading – more or less automatically – to increased innovation.[36] The concept of collective learning is closely connected with interactive learning yet more focussed on industrial districts and clusters stressing the need of organizational, institutional and social proximity of all participants.[37] This club-like character of the networks proposes a stronger territorial focus: territoriality guarantees the opportunity for frequent contact, but it also permits and supports the existence of a common language and code of understanding. These territorial perspectives include different units of operation that interact when a system of information is formed, and are therefore compatible with the concepts of triple-helix.

Despite all theoretical efforts, a unified model of clusters enabling collective learning processes is still missing. Basic questions particularly refer to the necessary institutional settings on different spatial levels.

2.11 Clusters as challenges to territorial management

Originally, most of organizational learning models refer to structures, strategies and metrics to maximise the contribution of human competences, knowledge and skills to a single company's value.[38] These firm-based perspectives, however, have to be linked to processes of inter-organisational knowledge management. Firms might profit differently and via different channels from regional knowledge spillovers dependent on their organisational skills, existing absorptive capacities and embeddedness within the region.[39] The integration into clusters shall help organisations to get access to tacit elements of knowledge otherwise not available via communication and becomes more important with increasing quality and exclusiveness of knowledge. Even codified knowledge, however, can be spatially bounded, if "sticky" elements as skills, experiences and institutional embeddedness are bounded to a region and can only be fragmentally transferred. Recent studies intended to monitor also these intangible assets of regional

[34] Storper, M. (1995), The resurgence of regional economies ten years later: the region as a nexus of untraded interdependencies, European Urban & Regional Studies, 2, 3: 191-221.

[35] Asheim, B. (1996), Industrial districts as 'learning regions': a condition for prosperity?, European Planning Studies, 4, 379-400.

[36] Lundvall, B.-Å. (1988), Innovation as an interactive process: from userproducer interaction to the national system of innovation, in: Dosi, G., Freeman, C., Silverberg, G., Soete, L. (eds.), Technical Change and Economic Theory, Frances Pinter, London, pp. 349-369.

[37] Lorenz, E. and Lazaric, N. (1998), The Economics of Trust and Learning, Edward Elgar.

[38] Duranton, G.; Puga, D. (2004): Micro-foundations of urban agglomeration economies, in: Henderson, J.V.; Thisse, J.-F. (eds.): Handbook of Urban and Regional Economics, Vol. 4 on deficits in cluster theory to include firm-based organizational processes.

[39] Giuliani, E. (2005): The structure of cluster knowledge networks: uneven and selective, not pervasive and collective, Copenhagen; Druid Discussion Paper 05-11.

networks including structural capital (such as organizational routines, data bases, procedures) and relational capital (cooperation with political decision makers and other networks).[40]
Due to restrictions of their spatial mobility, SME might face specific challenges approaching the knowledge from other regions.[41]

This recent development in the interpretation and analysis shifted the emphasis from material links to immaterial knowledge flows within clusters and pointed to the need for connectivity between the different agents for knowledge creation and diffusion. The analysis of institutional issues includes formal and informal norms of knowledge interaction as well as the integration of specific intermediaries acting as boundary spanning organisations.[42] These services do not necessarily be provided by specific (private, public, public-private) organisations. Standardisation in value chains or transfers of experiences from consultancy services can also be important sources for regional knowledge interaction.[43] The latter processes, however, might create further barriers for SMEs by defining specific technological skills or investments. In most cases, regions still lack necessary systemic linkages to generate, examine and commercialise new knowledge within actual regional innovation systems, a deficit restricting their innovative potential. This then leads to further questions concerning to what degree clusters are to be regarded as non-market devices by which firms seek to coordinate their activities with other firms and knowledge-generating institutions.[44]
Ongoing learning processes between firms and within clusters stress the importance of institutional arrangements for the generation of knowledge and learning networks which are not available in the markets and can fulfil additional functions such as to reduce the uncertainty about the experiential knowledge of others and to increase the incentives for medium and long term investments into diffusion channels. Clusters as a specific expression of learning processes can then be regarded as a kind of Coasean institutions that try to integrate the positive external effects of innovation and technological knowledge.

2.12 Clusters and openness to transnational and evolutionary processes

The ambiguous results of cluster policies in Europe so far are closely related to critical issues of cluster design as institutional settings, emergence and evolution with time and openness.[45] For the research objectives of IKINET, this means further causes to take a closer look on institutional solutions to get access to international knowledge within the case studies and to derive more general conclusions on suitable institutional models for European regions.

Most studies on clusters refer to the benefits of clustering and geographical proximity compared to other forms of proximity without considering the dimension of time – emergence, adjustment, change, decline – to explain why clusters exist at a certain place on a certain time.[46] Cluster benefits

[40] Grasenick, K., Ploder, M. (2002), Intangible Asset Measurement and Organisational Learning: The Integration of Intangible Asset Monitors in Management Processes, in: Neely, A., Walters, A. (eds.), Performance Measurement and Management: Research and Action, Centre for Business Performance, Cranfield, pp. 235-242.
[41] Asheim, B.; Isaksen, A. (2002): SMEs and the regional dimension of innovation, in: Asheim, B.; Isaksen, A.; Nauwelaers, C.; Tödtling, F. (eds.): Regional innovation policy for small-medium enterprises, Cheltenham, 21-46.
[42] Cooke, P. (2004): Regional innovation barriers and the rise of boundary crossing institutions, in: Wink, R. (ed.): Academia-Business Links. European policies and lessons learnt. Houndmills, 223-242; Gertler, M.S.; Wolfe, D.A. (2004): Local social knowledge management: Community actors, institutions and multilevel governance in regional foresight exercises, Futures, 36, 45-65.
[43] Muller, E.; Zenker, A. (2001): Business services as actors of knowledge transformation: the role of KIBS in regional and national innovation systems, Research Policy, 30, 1501-1516.
[44] Gertler, M.S.; Wolfe, D.A. (2004): Local social knowledge management: Community actors, institutions and multilevel governance in regional foresight exercises, Futures, 36, 45-65.
[45] Tunzelmann, N. v. (2004): Network alignment in the catching-up economies of Europe, in: McGowan, F.; Radosevic, S.; Tunzelmann, N.V. (eds.): The emerging industrial structure of the wider Europe, New York.
[46] Boschma, R.A. (2005): Proximity and innovation: a critical assessment, Regional Studies, 39, 61-73.

like social control and common cognitive patterns by frequent face-to-face (F2F) contacts inevitably require common norms, routines and experiences, which might be rooted in the history of the region, the profession or the sector.[47] Simultaneously, such long-term processes restrict the adjustment capabilities of regions to structural changes (capabilities to "unlearn"), as new policies and formal institutions cannot provide the same boundary spanning services like common identities (senses of belonging) and informal norms derived from history.[48] Furthermore, the increasing need for "horizontal integration" to integrative technologies – interdisciplinary and combinative use of new findings – makes it harder to stick to common routines and professional norms. Brenner offers a theoretical model of cluster emergence and evolution based on critical masses of firms deciding whether another stage within the evolutionary cluster process can be achieved.[49] Open questions, however, still refer to the determinants to reach the critical masses and the role of long-term historical processes.

Close to the issue of institutional and cognitive deadlocks in clusters due to historical processes is the aspect of openness in clusters to knowledge outside the cluster.[50] Firms search in clusters for complementary knowledge assets and try to avoid sharing of knowledge with direct competitors. On the contrary, close cognitive patterns cause lacks of diversity in knowledge and risks of losing access to global knowledge pipelines with cutting-edge findings.[51] Thus, many authors call for differentiation of proximity needs according to innovation cycles and sectoral specificities.[52] As medium-technology sectors are typically driven by analytical skills based on single-case problem solutions, interregional transfer of new knowledge might cause more problems than in more science-based high-technology sectors, where more abstract knowledge is important.[53] IKINET will be able to analyse prerequisites for a virtuous combination between the use of geographical proximity to include SME into knowledge chains and other forms of proximity by networks to extend the spatial scope of knowledge interaction, improvement, examination and exploitation to lagging regions in Eastern and Southern European countries.

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47 Iammarino, S. (2005): An evolutionary integrated view of regional innovation systems: concepts, measures, and historical perspectives, European Planning Studies, 13, 497-519.

48 Steiner, M. (1990), Good and Bad Regions?, Built Environment, Vol. 11, No. 8, pp. 483-498; Hassink, R. (2005): How to unlock regional economies from path dependencies? From learning region to learning cluster, European Planning Studies, 13, 521-535 on old-industrialised regions.

49 Brenner, T. (2004): Local Industrial Cluster: Existence, Emergence, and Evolution, London.

50 Cappellin, R.; Steiner, M. (2004): Enlarging the scale of knowledge and innovation networks: theoretical perspectives, methodological approaches, and policy issues, in: Wink, R. (ed.): Academia-business links. European policy strategies and lessons learnt, Houndmills, 321-352.

51 Bathelt, H.; Malmberg, A.; Maskell, P. (2004): Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation, Progress in Human Geography, 28, 31-56.

52 Gallaud, D.; Torre, A. (2004): Geographical proximity and circulation of knowledge through inter-firm cooperation, in: Wink, R. (ed.): Academia-Business Links. European policy strategies and lessons learnt, Houndmills, Basingstoke, 137-157.

53 Fontes, M. (2005): Distant networking: The knowledge acquisition strategies of "out-cluster" biotechnology firms, European Planning Studies, 13, 899-920.

3. The methodology of research

This section of the Activity Report aims to illustrate the methodology adopted in the research project, with special reference to the objectives for the reporting period and the contractors involved,

3.1 The structure of the project

As indicated in the Annex I of the contract, the project consists in the following activities:

- undertake an original and extensive empirical analysis on the factors working on the knowledge and innovation processes, which may bring a substantial contribution to the improvement of the "European Innovation Scoreboard" (WP1),
- analyse the characteristics of knowledge and innovation networks, by considering different geographical levels and different spatial typologies such as: metropolitan regions, developed industrial regions, industrial re-conversion regions, economic lagging regions (Objective 1 regions), transition economies in Central and Eastern European candidate countries, etc., focusing on the differences and interaction among these areas (WP2);
- bring an original contribution to theoretical models on factors affecting and characterising knowledge and innovation processes, with specific focus on the problems of identifying the geographical scope of these factors (local, regional, national, continental framework) and of managing the interface between knowledge and innovation networks on the regional and interregional/international level (WP2);
- design a quantitative methodology (e.g. "Matrix INT – Instruments and Needs of Technology"), making it possible to use the metrics indicated above for the evaluation of the gap between demand and supply of technology transfer instruments aimed to meet the above mentioned goals in different regions and types of firms (WP3);
- address the key issue of the governance of knowledge and innovation networks and identify policy guidelines for EU cohesion policies and European innovation policies in the perspective of the EU enlargement (WP4).

3.2 The design of the empirical analysis in work-package 1

The first year of research was devoted to the elaboration of "WP1: Design of the empirical analysis"

The selection of the firms, organizations and institutions to be considered in the empirical analysis has required the selection of a sectoral cluster, which had a relevant role in the regional economy to be considered and would we characterized by an high importance of "medium-tech" technologies and of small and medium size enterprises (SME), since they represent the key focus of research in the IKINET project. That has led to focus on the mechanical technology and industry.

Most innovation studies focus on high-tech sectors. The medium tech sectors are less studied, although they represent a very large component of European industry. The selection of the mechanical industry is also justified by the high number of people with a great diversity of knowledge capabilities working in it, making it more important to look for inclusion, lifelong learning and knowledge diffusion than in the often-analysed high-tech sectors.

After a long and in-depth analysis and various contacts with managers of the leading firms and of major public institutions, in order to secure their active collaboration to the research investigation, the following seven sectoral clusters have been chosen:

- Campania region (IT): Aeronautic cluster
- Wales region (UK): Aeronautic cluster
- Hamburg region (DE): Aeronautic cluster
- Slaskie region (PL): Mining Machinery cluster
- Steiermark region(AT): Automotive cluster
- Ile de France region (FR): Optics cluster
- Madrid region (ES): Aeronautic cluster

The empirical analysis is based on the methodology of case studies. The case studies to be performed in this project have two main key functions.

First, they provide essential information on the learning and innovative activities of the selected firms and – as such – they constitute the basis for original research. The relevance and the methodology of case studies are well established in the literature. They generate both qualitative and quantitative information on firms, which could not be accessible without interviews.

Second, in the case of this particular project, they serve another fundamental role, that is to say to provide the background and the context for the construction of the questionnaire and the interpretation of the results.

The elaboration of the case studies consists in an in-depth analysis of the firm, organizations and institutions considered. On the base of this analysis it has been possible to elaborate three different questionnaires:

a) a qualitative analysis of the economic performance, innovation, regional and international links of the firms (A),
b) a quantitative analysis of the firms external relationships (B),
c) a quantitative analysis of the firms internal characteristics (C).

Questionnaire A has been completed in the first reporting period. Work on questionnaire C has started in the first reporting period and will be completed in the first three months of the second reporting period. Questionnaire C has been designed in the first reporting period and will be submitted to the firms during the second reporting period.

It was agreed that the research effort demanded by the elaboration of the qualitative section had to be larger than the research effort required by the other quantitative sections.

Therefore, the final report of each case study will be composed by a qualitative section and by three appendices respectively referring to the three questionnaires mentioned above. These reports will be completed at the end of the WP1.

The case studies have been elaborated through several in-depth interviews to the various managers responsible for the various sectors of activity within the considered firm, such as for example: president, managers for purchasing and supply chain, research and development, human resources, international marketing, etc..

In particular the first round of interviews with the firms and the discussion of the above indicated issues and identification of new and emerging issues has allowed to design and define the structure

of the three questionnaire indicated above, which for being completed have required a second round of interviews.

Therefore, the methodology of research adopted in the IKINET project has been based on a **bottom-up or inductive approach**, rather than on a limited set of predefined hypothesis, that would have hindered the identification of changes and innovation, which by their very nature can not be anticipated.

The interviews to the various economic actors have followed a rather detailed and well defined list of issues in order to insure the homogeneity in the approach and priorities to be investigated in the various regions and sectors. This list of issues has been regularly extended during the elaboration of the case studies, in order to include new emerging issues and to secure a comparability of the study to be carried by the various national research partners.

These issues can be grouped into the following five major themes:
1. Key issues in the firm recent performance and factor of competitiveness
2. Innovation history and knowledge creation processes within the firm
3. Organizational characteristics of the firms, competencies and management of human resources
4. The relationships with local firms and service organizations and public institutions
5. The relationships with firms and service organizations and public institutions in a interregional and international framework,

The methodology of the case studies is finalized to collect key original information and to identify new emerging issues to be elaborated and investigated in the second year of research (in particular: WP2), when the theoretical analysis will be carried out on the four main scientific topics to be considered in the IKINET project:
- geographical agglomeration within clusters and the development of the local networks model,
- interactive learning and the process of knowledge creation,
- the role of institutions and social capital in knowledge creation,
- openness as a factor of innovation and development.

As the major aim of the analysis in the IKINET project is the description of the key nodes in innovation and knowledge networks, the decisions on choosing the firms and organisations to be considered has been based on the prior identification of key stakeholders or gatekeepers in these networks within the regional innovation systems to be considered.

In most cases, knowledge and innovation networks have a rather hierarchical structure and are built of different layers. Thus, a limited number of firms/organisations actually influence the evolution of an overall regional network. A limited number of firms/organisations/institutions (35) have been investigated. In fact, the aim of the empirical analysis was not to measure the average level of innovation potential in an overall sector or region, but rather to identify the structure of knowledge and innovation networks within one single sector and region. Thus, the choice of the actors to be considered has aimed to identify the “core” of the local cluster or those firms or actors which are most closely related than the other firms or actors.

The 35 actors, on which a case study has been elaborated, have been chosen in order to represent the following sectors:
1) industrial firms: n. 15
2) research institutions: n. 5
3) business services: n. 5
4) financial institutions: n. 5
5) public institutions: n. 5

The relationships between these 35 units in the knowledge and innovation network characterizing the selected sectoral clusters can be described as in figure 1.

The empirical analysis elaborated in the project has allowed to define the actual form of the network and the types of links between specific nodes for each individual sectoral cluster. That has also allowed to build a matrix representing the (n*n) relationships between the (n) selected firms.

A key role in the research design has be represented by the selection of the leader firms, defined as medium-large national firms performing the role of leaders in the supplier networks. Thus, the leader firm had to correspond, as much as possible, to the following key characteristics:
- medium – large size,
- innovative,
- export oriented,
- possibly locally owned,
- highly embedded in the respective territory and willing to collaborate to the research.

The other industrial firms: mainly SMEs, have been chosen according to a "snowball method" [54], according to which the leader firm and/or the other contacted firms has been asked to name some or all of their ties to other actors. That has allowed to proceed downhill and uphill and to identify key clients and suppliers, which could be interviewed. In particular, the industrial SMEs have then been chosen in order to represent the following types of firms:
- Smithian based highly integrated in the supply chain
- Marshallian firms characterized by tight subcontracting relations within the industrial cluster,
- Schumpeterian or high innovative firms,
- foreign owned firms having key role in developing the international economic integration of the regional innovation system to be considered,
- isolated SMEs.

The empirical analysis elaborated in the project has allowed to define the actual form of the network and the types of links between specific nodes for each individual sectoral cluster. That has also allowed to build a matrix representing the (n*n) relationships between the (n) selected firms.

A key role in the research design has be represented by the selection of the leader firms, defined as medium-large national firms performing the role of leaders in the supplier networks. Thus, the leader firm had to correspond, as much as possible, to the following key characteristics:
- medium – large size,
- innovative,
- export oriented,
- possibly locally owned,
- highly embedded in the respective territory and willing to collaborate to the research.

The results of the interviews have been summarized in the 35 case studies elaborated in each of the seven regional clusters considered and the main findings are synthetically illustrated in this report.

[54] Hanneman, R.A. (2001), Introduction to Social Network Methods, Department of Sociology, University of California, Riverside, UCINET software program, http://www.analytictech.com/ucinet.htm

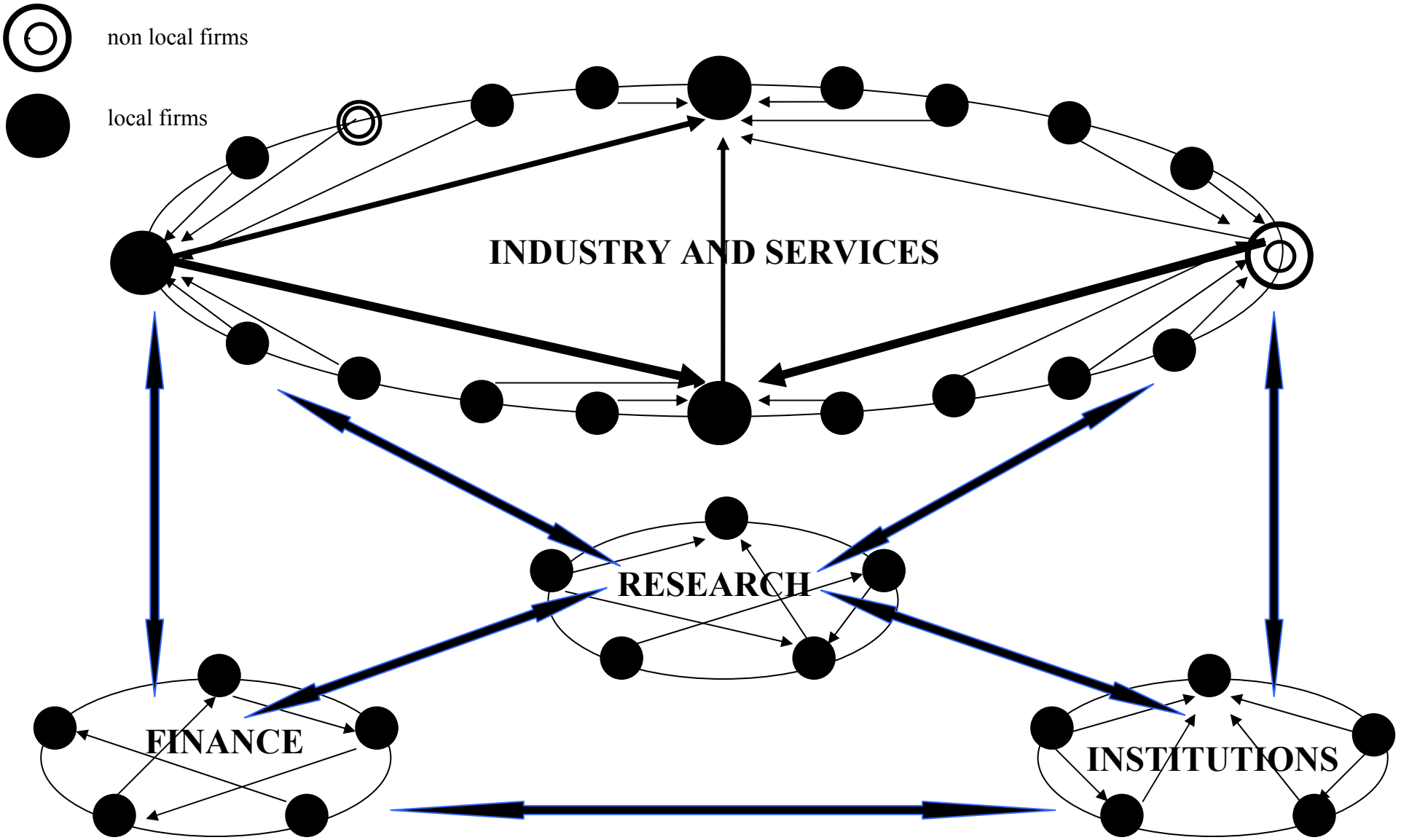

Fig. 1 - The network of links in a national / regional innovation system

Source: R. Cappellin, IKINET - International Knowledge and Innovation Networks, Research for the FP6, University of Rome "Tor Vergata", November 2004

The analysis of the results of the interviews has allowed to define a more precise set of relevant and innovative issues, which are worth an interregional comparison. In order to arrive to tabular representation of the main findings of the empirical analysis a rather detailed list of questions have been identified (cfr questionnaire A, table 1), which has been filled by the researchers having elaborated the case studies. In fact, the questions within this questionnaire represent the subjective evaluations by an expert, who has done a rather in depth study of the firm or organization considered. Due to the complexity and direct reference to the theoretical literature and methods in the economics of innovation, these questions could not be answered directly by the entrepreneurs or managers, while they required the specialized knowledge of an expert. As a metaphor, the adopted approach relies on the belief that the doctor rather than the patient himself is more capable to define a diagnosis. The results of the questionnaire A will be analysed in the second year of research (WP2), within the framework of a statistical analysis focused on the specific theoretical themes, which will be discussed by the research team.

Table 1: Issues on innovation and knowledge creation considered in questionnaire A

I) The evolution of the firm's performance
- Globalization process
- Future innovation strategies
- Growth objective
- External relations and past firm performance
- Key areas for future performance
- Spin-offs and origin of the firm

II) The process of innovation
- Types of innovation
- Motivation to innovate
- Evaluation of innovation opportunities
- Obstacles to innovation
- Sources of innovation

III) Process of knowledge creation (learning process, competencies, internal organization, human resources)
- Motivation of learning and knowledge creation
- Promotion of creativity
- Qualified labour resources
- Management style

Organization of research and learning processes
- Supplier- push or user-pull as sources of technology
- Forms of the process of knowledge creation and innovation
- Specialization vs. competition
- Diversity/accessibility vs. homogeneity/receptivity
- Exploitation vs. exploration
- The multi-dimensional nature of tacit knowledge in medium-low technology sectors

IV) Relationships with local actors
- Recruitment of new staff
- Movement of staff in respect of clients
- Collective innovation and inter-sectoral spill-over effects
- Definition of collaboration
- Characteristics of the local cluster
- Role of personal acquaintances
- Relationships with local partners
- Relationship with local banks
- Local Institutions

V) Relationships with national or international actors

The results of the case studies and the information contained in the questionnaire A, which represents quantitative synthesis of the case studies, may be only explained whether they were related to the structural characteristics of the firms and of their regional environment. For this purpose, the research teams have proceeded to the identification of key statistical indicators according to an interregional homogenous framework. These results are presented in this report.

In order to define the structural characteristics of the firms the research team has defined a second detailed questionnaire (cfr. questionnaire C, table 2). This latter questionnaire resembles to the questionnaire adopted in the "Community Innovation Survey". However it has a different structure and it is based on a different methodological approach. In fact, the questions included within this questionnaire are based on the approach of "territorial knowledge management"[55] and have been identified in order to define quantitative indicators, which could measure the capability of the firms in various key phases of the process of knowledge creation and innovation adoption.

Table 2: Indicators of structural characteristics considered in questionnaire C

• Indicators of size and performance • Indicators of knowledge and innovation • Increase openness, external accessibility and relational capital • Promote internal receptiveness and human and organisational capital • Stimulate common identity, strategic aims, internal cohesion and corporate social responsibility	• Promote internal creativity • Indicators of social capital and of local economic integration • Indicators of management capability • Promotion of market orientation and generation of value-added from know-how

Finally, a distinctive character of the IKINET project is the focus on the analysis of the structure of the networks between various actors within knowledge creation and innovation processes, rather than on the individual innovation capabilities of these actors. In fact, the characteristics of their process of innovation have been analyzed through the case studies and questionnaire A and the structural characteristics of the actors have been analyzed thorough questionnaire C.

In order to identify some relevant characteristics of these relationships a third questionnaire (questionnaire B) has been elaborated. This latter focuses on the flows of key technical personnel between any couple of the industrial firms considered in the case studies and also with other local, national and foreign firms. In fact, tacit knowledge may flow between the firms through the change of employment of these qualified workers and previous labour experiences determine the belonging to formal and informal professional communities, within which intense exchanges of technological information may occur.

The data collected in the questionnaire will allow the graphical representation of the network within each considered industrial cluster, as also the representation through a matrix, which could be analysed through statistical multivariate techniques and also through "social network analysis" methods. A preliminary graphical representation of the results, which may be achieved with the analysis of the results of questionnaire B, is given by the enclosed maps of the links between the industrial firms included in this report.

The high complexity of the design of the questionnaire has induced to postpone the interviews on the questionnaire B and the collection of the data to the second year of research.

[55] Cappellin, R. (2003), Territorial knowledge management: towards a metrics of the cognitive dimension of agglomeration economies, International Journal of Technology Management, Vol. X, n. X.

4. An harmonized statistical analysis of seven regional innovation systems

The seven regions selected for study are located in different countries in three broad areas of the EU – North-Western Europe, Southern Europe and Central-Eastern Europe. They have differing geographical and environmental features and face different economic and social problems, as well as a number which are in common. They also have different levels of economic development and prosperity, different structures of economic activity and different systems of innovation. They include highly urbanised, metropolitan regions (Hamburg, Ile de France and Madrid), industrial regions (part of Wales, Steiermark and Slaskie), regions of industrial restructuring (parts of Wales and Slaskie), lagging regions (parts of Wales – in particular, West Wales and the Valleys – and Campania) and transition regions (Slaskie).

The characteristics of these regions in terms of their level of prosperity and employment, their economic structure, the education levels of the work force, their expenditure on R&D and the output from this can be summarised, using the harmonised data available, as follows.

4.1 Italy

Campania has a level of GDP per head only just over 70% of the EU-25 average in PPS terms and even lower when measured in Euros. This is mainly a consequence of its low level of employment, the number in work being much less in relation to population aged 15-64 than in most of the rest of the Union. While GDP per person employed is also below the EU average, the difference is relatively small. Growth in GDP per head in recent years has been slightly above the EU average and further above the average in the rest of Italy, largely because of an increase in employment, the rise in GDP per person employed being relatively small.

Employment in both high-tech and medium-tech manufacturing is significantly less than both the EU and Italian averages, while employment in high-tech services and business services is also below the two averages when measured in relation to working-age population, if by less.

Education levels of those of working age are relatively low by EU standards and the proportion of those aged 25-64 with upper secondary education is among the lowest in the EU. There is, however, evidence of a significant increase in recent years and while the relative number of young people with this level of educational attainment is still below the EU – and Italian – average, the difference is much smaller. The proportion of those aged 25-64 with tertiary education is even further below the EU average and in this case, the apparent increase in recent years has been less (the region having the 12th smallest proportion of 25-34 year olds with tertiary education in the Union).

Expenditure on R&D is also well below the EU average. This is especially the case for business expenditure which is much less than the Italian average, while public spending is slightly higher, even if still below the EU average. The number of patent applications per million people is even further below the EU average and only around 15% of the number in Italy as a whole. Though high-tech patents are proportionately higher, they are still only a small fraction of the EU average and a third of the average for Italy.

4.2 United Kingdom

In **Wales**, GDP per head is some 10% below the EU-25 average in PPS terms and further below the average for the UK. GDP per person employed, however, is above the EU average, though still well below the UK average, while the number employed in relation to working-age population is less than the EU average and equally lower than in the rest of the UK. Growth in GDP per head has also, in recent years, been less than the EU average as well as less than growth in the UK as a whole, whereas employment has risen at a similar rate relative to working-age population as in the rest of the UK and the rest of the EU.

Employment in high-tech manufacturing is higher than both the UK and EU averages. In medium-tech manufacturing, it is much the same as the EU average in relation to working-age population and slightly above the UK average. Employment in high-tech services is also similar to the EU average, though in this case less than in the rest of the UK, while in business services, it is below the EU average and even further below the average for the UK.

The relative number of those aged 25-64 with upper secondary education is marginally above the EU average, though less than that in the rest of the UK. The proportion with this level of education among younger age groups, however, is significantly above both the EU and national average, suggesting a larger increase over the recent past in participation in education beyond basic schooling than in other parts of the EU. The relative number who have completed tertiary education is significantly above the EU average, especially among younger age groups, though slightly less than in the UK as a whole.

Expenditure on R&D is only slightly over half the EU and national averages, with business spending being even further below both. Public spending, on the other hand, is only slightly less than the two averages. The number of patent applications to the EPO relative to population is also only around half the EU and UK averages and the number of high-tech applications even lower in relation to both.

4.3 Germany

Hamburg has the fourth highest GDP per head in the EU-25, in terms of both PPS and Euros, in part reflecting the relatively narrow confines of the region and the relatively small proportion of people who live outside the city as such. It is also in the top 10 regions in terms of both GDP per person employed and the number employed relative to working-age population (the employment rate), the latter in part a consequence of significant inward commuting from surrounding regions. Growth of GDP per head in recent years, however, has been relatively low as in the rest of Germany and while GDP per person employed has been similar to the EU.

Employment in both high-tech and medium-high tech manufacturing is less than the EU average and under half the German average. By contrast, employment in high-tech services is significantly above both the EU and German averages, while in business services, it is the third highest in the EU.

The education level of working-age population – the potential work force – is higher than the EU average in terms of the relative number who have completed upper secondary education or training, as it is in the rest of Germany. The proportion of those aged 25-64 with tertiary education, however, is above both the national and EU average. For 25-34 year olds, the proportion is also above the German average but lower than the EU average, reflecting the relatively small increase in recent

years in the numbers going through the university system both here and in the rest of the country as compared with the growth in the rest of the Union.

Overall expenditure on R&D and, more especially business spending, are less than the EU average and even further below the average for Germany. Public R&D expenditure, on the other hand, is above the EU average but still marginally below that in the rest of the country. Patent applications relative to population are even further above the EU average, though again less than in Germany as a whole, suggesting a greater tendency to patent in relation to expenditure than elsewhere in the EU

4.4 Poland

Slaskie has the lowest level of GDP per head in terms of PPS and even more in Euros of all the 7 regions and is in the bottom 25 regions in the EU by both measures. Nevertheless, GDP per head is slightly above the Polish average, as is GDP per person employed, which is under a third of the EU average. The level of employment is also relatively low, in this case below the Polish average. Growth of GDP per head has been similar to the EU average in recent years but less than in Poland as a whole. GDP per person employed, however, has risen by much more than the EU average, while employment has fallen in relation to working-age population.

Employment in high-tech manufacturing is less than the average for Poland and even further below the EU average. In medium-term manufacturing, employment relative to working-age population is above the national average and close to being the highest level in all Polish regions, though it is still below the EU average. Employment in both high-tech services and business services is considerably below the EU average, though in the former it is only marginally less than the Polish average.

The proportion of the population aged 25-64 with upper secondary education is the largest of all the 7 regions, though the relative number who have completed tertiary education is significantly less than the EU average and slightly below the national average. Although the proportion of 25-34 year olds with tertiary qualifications is also less than the EU average, the difference is smaller, reflecting the expansion of participation in this level of education over recent years.

Expenditure on R&D is the lowest of all the 7 regions in relation to GDP and both business and public sector spending is below the average for Poland. While there are no data on patent applications for regions in Poland, the number of applications for the country as a whole is equally small relative to population.

4.5 Austria

In **Steiermark**, GDP per head is slightly higher than the EU-25 average but below the average for Austria. While the number in employment is relatively high as compared with other parts of the EU and similar to that in the rest of the country, GDP per person employed is less than the EU average and even further below the Austrian average. Growth of GDP per head in recent years has been much the same as in the EU as a whole, but whereas growth in GDP per person employed has been marginally above the average, employment has risen by less.

Employment in high tech manufacturing and, more especially, is medium-tech manufacturing is above the EU average as well as, in the latter case, the average for Austria, Employment in high tech services and business services, on the other hand, is less than the EU and national averages.

As in Austria as a whole, the relative number of those aged 25-64 with upper secondary education qualifications is significantly higher than the EU average but the number with university degrees or the equivalent is lower. The same is the case for those in younger age groups, suggesting that there has been only a limited rise in the proportion of people completing tertiary education.

Expenditure on R&D is well above both the EU average and the national average, as it is for business spending and public spending considered separately. The number of patent application per million inhabitants is also higher than the EU average, though much the same as the national average, while the number of high-tech patents relative to population is lower than both averages.

4.6 France

Ile de France is one of the most prosperous and economically powerful regions in the EU. It has the fifth highest GDP per head in PPS terms (the sixth highest in terms of Euros) and the second highest level of GDP per person employed. Its employment rate is also above the EU average, if less so. Growth of GDP per head over the period 1997-2002 was slightly above the EU average, though similar to the rate for the rest of France. As in the latter, growth over this period resulted slightly more from an increase in employment than in GDP per person employed (or productivity), which was marginally below the EU average rate of increase.

Employment in high-tech manufacturing is a little above both the EU and French averages, while in medium-tech manufacturing, it is below. Employment in both high-tech services and business services, however, is the highest in France and around twice the EU average in both cases.

The potential work force in the region (ie population of working age) has a similar level of education to the EU average (and indeed the French average) if measured in terms of those with at least upper secondary qualifications, but there is a much larger proportion of people with tertiary education than in the rest of France or in the EU as a whole. Moreover, this proportion has increased more than in both over recent years and the relative number of 25-34 year olds with university degrees or the equivalent is among the highest in the Union.

The region is also among the top 25 regions in the EU terms of expenditure on R&D, both for business and the public sector, as well as in terms of patent applications, especially high-tech ones for which the region is ranked among the top 15 in the Union.

4.7 Spain

Madrid has the highest GDP per head in Spain and one which is above the EU-25 average, especially in PPS terms. Both the level of GDP per person employed and number in employment in relation to working-age population, however, are much the same as the EU average, though both are significantly higher than the Spanish average. The relatively high GDP in Madrid, therefore, comes in part from having a large number of people of working-age and, as a corollary, a relatively small number both younger and older than this.

Even more than the rest of Spain, GDP per head has grown faster than the rest of the EU over recent years, largely because of an increase in employment, GDP per person employed having fallen.

Employment in high-tech manufacturing is much the same as the EU average, though above the average for Spain, while employment in medium-tech manufacturing is similar to the Spanish average but below the EU average. Employment in both high-tech services and business services,

on the other hand, is significantly above the EU average – Madrid being in the top 25 regions in the Union in both respects – and even further above the average for Spain.

The proportion of people aged 25-64 with upper secondary education, at only just over 55%, is well below the EU average even if higher than in the rest of Spain, though the evidence for younger age groups suggests that the figure is tending to increase significantly. The relative number with tertiary education, however, is among the highest in the EU. For 25-34 year olds, it is the fifth highest reflecting the high growth in the number of university graduates over recent years.

Total expenditure on R&D is similar to the EU average relative to GDP, though higher than in the rest of Spain. While business expenditure is less than the EU average, public spending is slightly higher. The output of this expenditure in terms of patent applications to the EPO is well below the EU average but more than for Spain as a whole; the number of high-tech applications in relation to population is the highest in Spain by some way and above the EU average.

Regional indicator summary table

GDP indicators

	GDP per head (PPS)	GDP per head (in Euros)	GDP decomposed, 2002: GDP per person employed	GDP decomposed, 2002: Employment rate, % pop 15-64	GDP decomposed, 1997-2002: GDP per head (EUR), constant prices	GDP decomposed, 1997-2002: GDP per person employed, constant prices	GDP decomposed, 1997-2002: Employment rate, % pop 15-64
	EU25=100	EU25=100	EU25=100	EU25=100	Annual average % change, 1997-2002	Annual average % change	Annual average % change
Hamburg, Germany	187.8	208.6	152.1	132.3	1.8	1.3	0.6
Average Germany	108.7	120.7	113.5	105.4	1.7	1.0	0.9
Highest region	187.8	208.6	152.1	133.3	2.6	3.2	1.8
Lowest region	66.5	73.9	79.0	80.2	0.2	-0.7	-1.1
Madrid, Spain	126.7	109.0	98.5	100.0	2.7	-1.1	3.0
Average Spain	94.6	81.4	83.9	93.1	2.3	-1.1	3.2
Highest region	126.7	109.0	98.5	104.9	3.4	-0.2	4.7
Lowest region	61.6	53.0	67.2	81.0	-1.8	-2.0	1.3
Ile de France, France	176.0	183.5	166.0	109.1	2.4	1.1	1.4
Average France	113.0	117.8	128.4	95.6	2.4	1.1	1.4
Highest region	176.0	183.5	166.0	109.1	3.3	1.6	2.6
Lowest region	86.6	90.3	107.5	83.5	1.8	0.7	1.0
Campania, Italy	71.9	68.7	93.8	73.0	2.5	0.4	1.9
Average Italy	109.0	104.2	109.4	95.3	1.9	0.2	1.8
Highest region	159.6	152.5	127.3	119.6	2.8	1.3	2.5
Lowest region	67.7	64.7	89.8	70.0	0.6	-0.6	1.1
Steiermark, Austria	102.5	108.2	94.2	113.6	2.2	1.3	0.6
Average Austria	120.8	127.5	109.8	114.6	2.1	1.5	0.4
Highest region	172.9	182.6	148.6	130.2	3.1	2.8	1.6
Lowest region	81.5	86.0	93.1	92.8	1.6	0.0	-1.4
Slaskie, Poland	50.6	27.7	31.3	83.1	2.2	2.5	-0.8
Average Poland	45.6	25.0	28.2	85.9	3.3	3.7	-1.1
Highest region	69.5	38.1	35.8	103.8	5.4	5.8	0.4
Lowest region	32.0	17.5	20.0	70.1	1.1	2.2	-3.7
Wales, UK	90.2	101.4	108.4	97.9	1.6	0.6	1.0
Average UK	117.8	132.4	123.9	109.3	2.4	1.7	0.9
Highest region	315.4	354.4	188.0	175.3	4.6	10.1	2.9
Lowest region	72.6	81.6	81.6	76.2	-1.1	-0.1	-6.8
EU25 average	100.0	100.0	100.0	100.0	2.2	1.2	1.0
EU25 - Highest 25 regions	162.9	179.3	148.7	126.8	5.1	5.2	3.3
EU25 - Lowest 25 regions	41.8	22.2	25.0	73.3	0.5	-1.1	-2.3

Regional indicator summary table

	Structure of economic activity							
	as % of total employment				as % of the working age population			
	Employment in high tech manufacturing	Employment in medium tech manufacturing	Employment in high tech services	Employment in business services	Employment in high tech manufacturing	Employment in medium tech manufacturing	Employment in high tech services	Employment in business services
	% of total employed	% of total employed	% of total employed	% of total employed	% pop 15-64	% pop 15-64	% pop 15-64	% pop 15-64
Hamburg, Germany	0.7	4.6	4.7	12.9	0.4	3.0	3.1	8.4
Average Germany	1.8	9.4	3.3	6.5	1.2	6.1	2.2	4.2
Highest region	4.2	19.3	5.4	12.9	3.0	13.7	3.7	8.4
Lowest region	0.6	2.4	1.5	3.6	0.4	1.4	0.9	2.2
Madrid, Spain	1.2	4.0	6.0	11.0	0.8	2.6	3.9	7.2
Average Spain	0.5	4.4	2.6	6.7	0.3	2.7	1.6	4.1
Highest region	1.2	10.6	6.0	11.0	0.8	7.1	3.9	7.2
Lowest region	0.0	0.1	0.2	3.9	0.0	0.0	0.1	2.1
Ile de France, France	1.6	3.8	6.9	11.3	1.0	2.5	4.5	7.3
Average France	1.2	5.3	3.8	6.6	0.8	3.4	2.4	4.2
Highest region	2.4	11.2	6.9	11.3	1.6	7.2	4.5	7.3
Lowest region	0.4	0.3	1.8	3.0	0.3	0.1	1.2	2.0
Campania, Italy	0.7	3.5	2.8	7.0	0.3	1.6	1.3	3.2
Average Italy	1.0	6.3	3.1	8.1	0.6	3.7	1.8	4.7
Highest region	1.5	11.1	5.7	10.4	1.0	7.2	3.4	6.7
Lowest region	0.3	1.1	1.7	5.8	0.1	0.5	0.9	2.7
Steiermark, Austria	1.4	6.3	2.2	5.0	0.9	4.3	1.5	3.4
Average Austria	1.3	5.2	2.6	6.2	0.9	3.5	1.8	4.3
Highest region	2.8	7.1	4.7	10.1	1.8	5.0	3.0	6.5
Lowest region	0.8	3.8	1.5	4.3	0.6	2.3	1.0	2.9
Slaskie, Poland	0.4	6.1	2.3	3.6	0.2	2.9	1.1	1.7
Average Poland	0.5	4.3	2.3	3.7	0.3	2.2	1.2	2.0
Highest region	1.5	5.7	4.7	6.3	0.7	3.0	2.7	3.7
Lowest region	0.1	2.0	1.1	1.6	0.0	0.9	0.5	0.9
Wales, UK	1.7	5.1	3.2	5.2	1.2	3.6	2.2	3.6
Average UK	1.1	4.6	4.3	7.3	0.8	3.2	3.0	5.1
Highest region	2.3	7.7	9.0	15.4	1.8	5.8	7.1	9.8
Lowest region	0.1	1.5	2.0	4.2	0.1	1.0	1.4	2.8
EU25 average	1.2	5.8	3.3	6.5	0.7	3.6	2.1	4.1
EU25 - Highest 25 regions	2.9	14.6	6.0	10.6	1.9	8.3	4.1	7.1
EU25 - Lowest 25 regions	0.1	1.2	1.0	2.6	0.1	0.6	0.7	1.6

Regional indicator summary table

	Education indicators						R&D and innovation indicators				
	Population aged 25-64 with upper secondary education (2004)	Population aged 22 with upper secondary education	Population aged 25-64 with tertiary education	Population aged 25-34 with tertiary education	Number registered in tertiary education	Participation in life-long learning (ie in education/ training)	Total R&D expenditure	Business R&D expenditure	Public R&D expenditure	Total EPO patents	High-tech EPO patents
	% pop 25-64	% pop aged 22	% pop 25-64	% pop 25-34	% pop 18-29	% pop 25-64	% of GDP	% of GDP	% of GDP	per million inhabitants	per million inhabitants
Hamburg, Germany	81.0	64.6	26.2	25.4	27.7	8.3	1.51	0.78	0.73	236.49	27.92
Average Germany	83.9	77.4	24.9	22.9	19.7	7.4	2.53	1.75	0.78	300.95	45.48
Highest region	96.5	94.2	34.2	32.1	33.6	11.1	7.11	5.25	1.90	748.6	237.71
Lowest region	78.1	55.4	17.7	15.9	12.1	4.3	0.50	0.18	0.42	43.37	3.25
Madrid, Spain	55.8	67.8	35.0	49.4	27.6	3.6	1.87	1.08	0.79	42.95	9.78
Average Spain	45.0	63.4	26.4	39.0	23.8	5.1	1.03	0.56	0.47	25.46	3.53
Highest region	55.8	83.7	37.1	56.1	28.0	8.8	1.87	1.08	0.79	61.54	9.78
Lowest region	33.4	34.9	17.0	19.0	9.0	2.2	0.26	0.05	0.21	2.15	0
Ile de France, France	68.5	78.6	35.5	48.9	29.1	8.8	3.40	2.34	1.06	312.85	78.76
Average France	65.3	80.6	23.9	37.8	22.9	7.8	2.26	1.43	0.83	147.24	31.81
Highest region	72.5	100.0	35.5	48.9	29.1	9.2	3.69	2.34	1.52	312.85	78.76
Lowest region	32.0	73.2	15.8	16.7	13.7	3.2	0.41	0.15	0.19	5.67	0
Campania, Italy	43.1	71.8	10.5	12.2	21.6	6.4	1.00	0.35	0.65	11.92	2.11
Average Italy	49.3	74.7	11.6	14.8	22.2	6.8	1.16	0.56	0.60	74.73	7.08
Highest region	59.8	96.7	15.5	19.3	33.3	9.2	1.95	1.35	1.34	176.82	24.84
Lowest region	40.2	58.0	9.1	11.2	2.0	4.6	0.29	0.01	0.03	6.75	0
Steiermark, Austria	80.2	83.3	17.6	19.8	22.1	13.0	2.53	1.53	1.00	172.82	21.51
Average Austria	79.7	86.4	19.0	20.9	19.0	12.9	1.90	1.18	0.72	174.84	23.59
Highest region	83.6	93.9	25.6	29.3	51.6	15.0	3.14	1.79	1.35	456.26	47.73
Lowest region	74.7	81.8	13.0	14.7	2.8	9.7	0.19	0.14	0.03	83.96	4.85
Slaskie, Poland	86.7	89.3	14.6	22.8	23.3	5.4	0.32	0.09	0.23		
Average Poland	83.6	91.6	15.6	23.0	26.4	5.5	0.59	0.13	0.46	2.72	0.31
Highest region	86.7	96.0	21.1	31.1	43.9	7.3	1.25	0.33	1.11		
Lowest region	77.0	81.6	12.5	17.6	16.0	3.9	0.07	0.01	0.04		
Wales, UK	69.0	83.0	27.3	33.9	28.6	20.0	1.02	0.46	0.56	68.83	7.74
Average UK	70.5	76.8	29.2	35.1	25.9	20.6	1.84	1.19	0.65	128.7	32
Highest region	77.3	85.2	40.2	48.4	36.6	24.2	3.84	3.07	0.97	345.87	160.56
Lowest region	62.2	62.8	20.9	21.0	15.9	13.9	0.85	0.37	0.33	9.67	0
EU25 average	68.2	78.7	22.2	27.8	23.3	9.8	1.93	1.25	0.68	134	26
EU25 - Highest 25 regions	89.9	94.2	35.2	45.4	37.6	24.8	3.74	2.80	1.30	442.76	103.89
EU25 - Lowest 25 regions	37.2	55.6	9.9	11.7	8.6	2.6	0.26	0.04	0.08	4.36	0.39

Notes:
- Unless stated otherwise, data on employment and education (except for NL: 2002) refer to 2004 and other data to 2002
- Data on participation in education/training relates to the number undertaking education or training during the 4 weeks preceding the survey
- High-tech manufacturing comprises office machinery and computers (NACE 30), radio, television and communication equipment (32) and medical, precision and optical instruments, watches and clocks (33)
- Medium-tech manufacturing includes chemicals and chemical products (NACE 24), machinery and equipment n.e.c. (29), electrical machinery and apparatus n.e.c.(31), motor vehicles, trailers and semi-trailers (34) and other transport equipment (35)
- High-tech services comprise post and telecommunications (NACE 64) , computer and other related activities (72) and research and development (73)
- Business services (NACE 74) includes all business activities such as legal, accounting or tax consultancy for example
- EPO refers to the European Patent Office

Source: Data on employment, education levels and participation in education and training come from the EU Labour Force Survey; data on those registered in tertiary education come from UN-OECD-Eurostat Education Statistics; data on R&D expenditure and patents come from Eurostat, R&D statistics; data on GDP come from the EU national accounts.

5. The analysis of the case studies: structure, innovation, knowledge creation and external links

This section of the Activity Report summarizes the results of the case studies elaborated on the industrial and service firms, research and financial organizations and public institutions in the seven selected innovation systems. The results are presented according to the six main themes, which have guided the elaboration of the interviews and the case studies in the seven considered regional industrial clusters. The structure of the linkages between the firms are described in the enclosed maps.

5.1 The process of restructuring in the cluster and the performance of the firms

Sectors indicate long tem cyclical evolution: the process of restructuring with a massive negative impact on employment, which has characterized the last decades, has often been recently followed by a strong recovery.

Most clusters indicate an increasing market orientation of firms, as the result of the privatization processes and the reconversion from state ownership or from military production.

The SMEs may also be distinguished according to **typology**, such as: Schumpeterian highly innovative firms, Smithian and Marshallian firms, based on a tight division of labor and subcontracting relations, either within a vertical cluster or within a geographical cluster, and finally isolated traditional firms.

Firms may be distinguished not only according to their **functional dependence** or independence with respect to their client firms, but also according to their high or low **capability in knowledge creation**. Some firms, while being technologically dependent, have increased in recent times their capacity of design and developed specific engineering capabilities.

A factor which characterizes the cluster considered is the **fast change of ownership** in the SMEs and the development of mergers and acquisitions by large companies or specialized financial intermediaries (i.e. private equity investments).

SMEs are increasingly less isolated and more often linked between themselves by being part of an industrial group of SMEs. Thus, many firms have **financial ties with other firms** either **directly**, being controlled or controlling the other firms, or **indirectly** through the personal financial participations of the same entrepreneur.

Other financial linkages are due to the spin-offs of new companies from existing firms. In fact, most of the new and successful firms have been created as **direct spin-off or transformation of previously existing firms**. Many firms are planning to **create new firms by making autonomous some productions units,** which have reached a critical size to represent a separated company, also in the perspective to exploit a new potential market.

Other firms can be defined as **indirect spin-offs from other firms**, since their funding entrepreneur has had originally a work experience and built his know-how in other firms.

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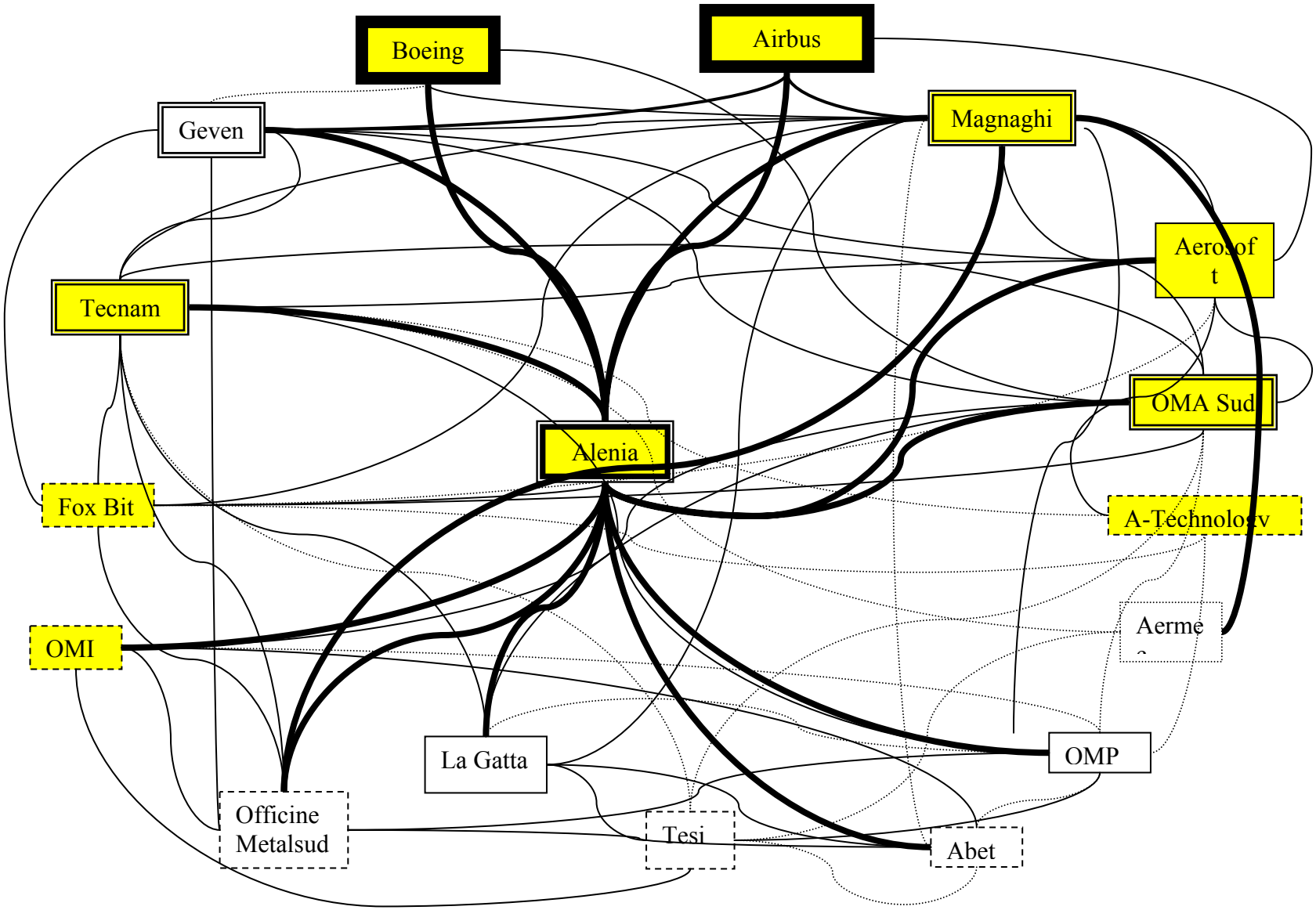
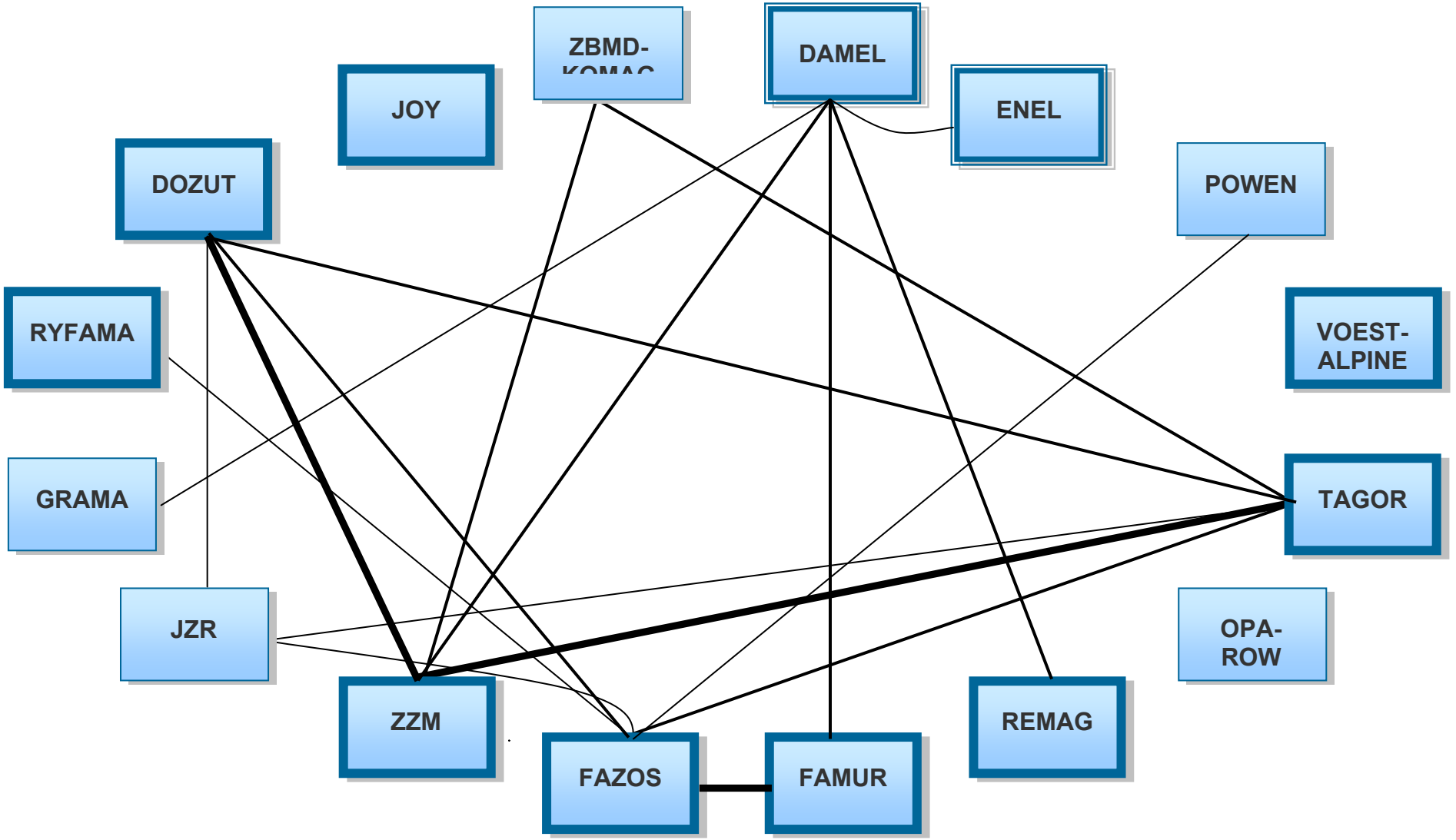
Aeronautic Cluster in Campania Region: **Map of Industrial Firms**




ZBMD-
DAMEL
JOY
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ALPINE
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OPA-
ROW
ZZM
REMAG
FAZOS
FAMUR

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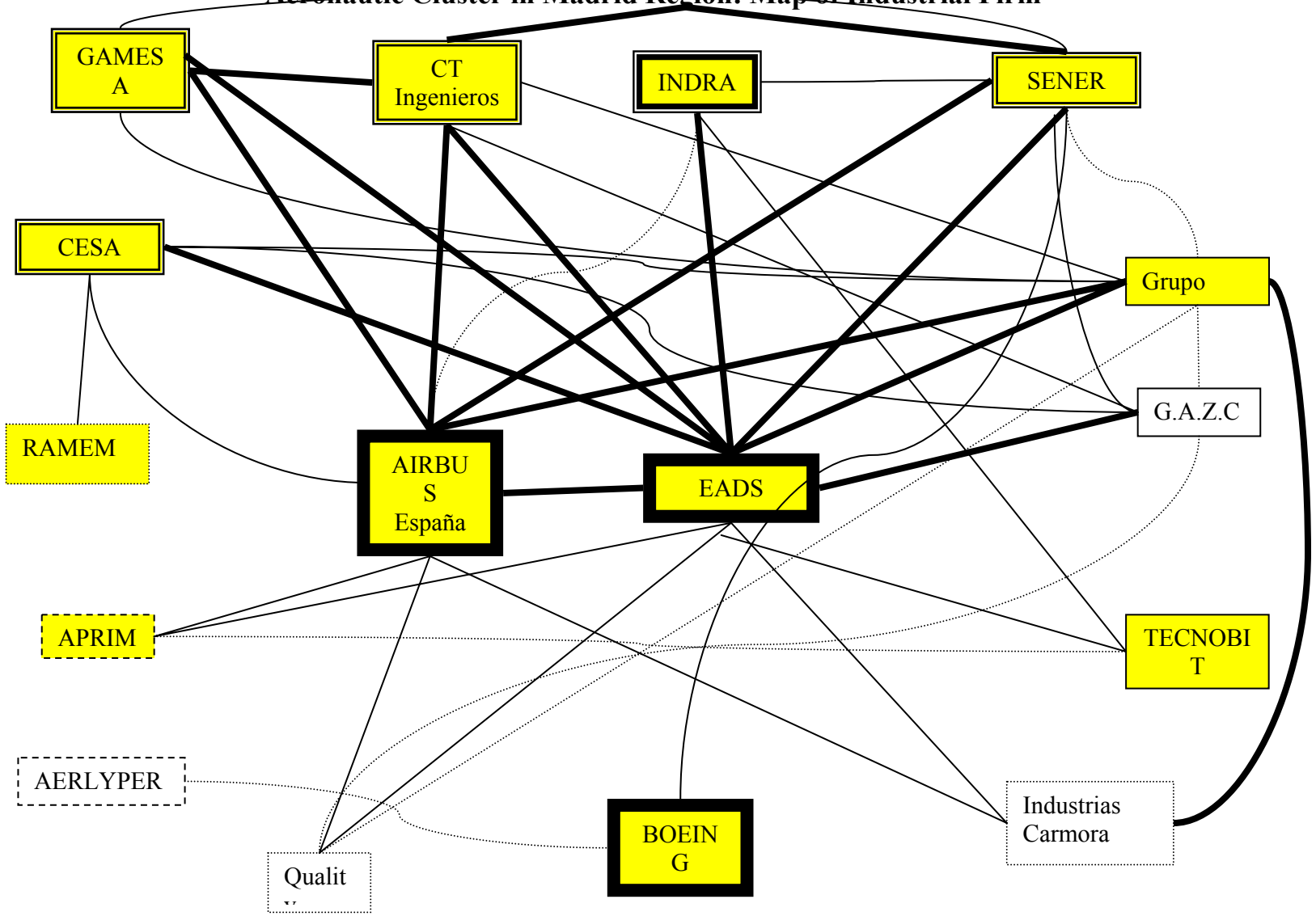
IKINET - INTERNATIONAL KNOWLEDGE AND INNOVATION NETWORKS

~~Aeronautic Cluster in Madrid Region:~~ Map of Industrial Firm



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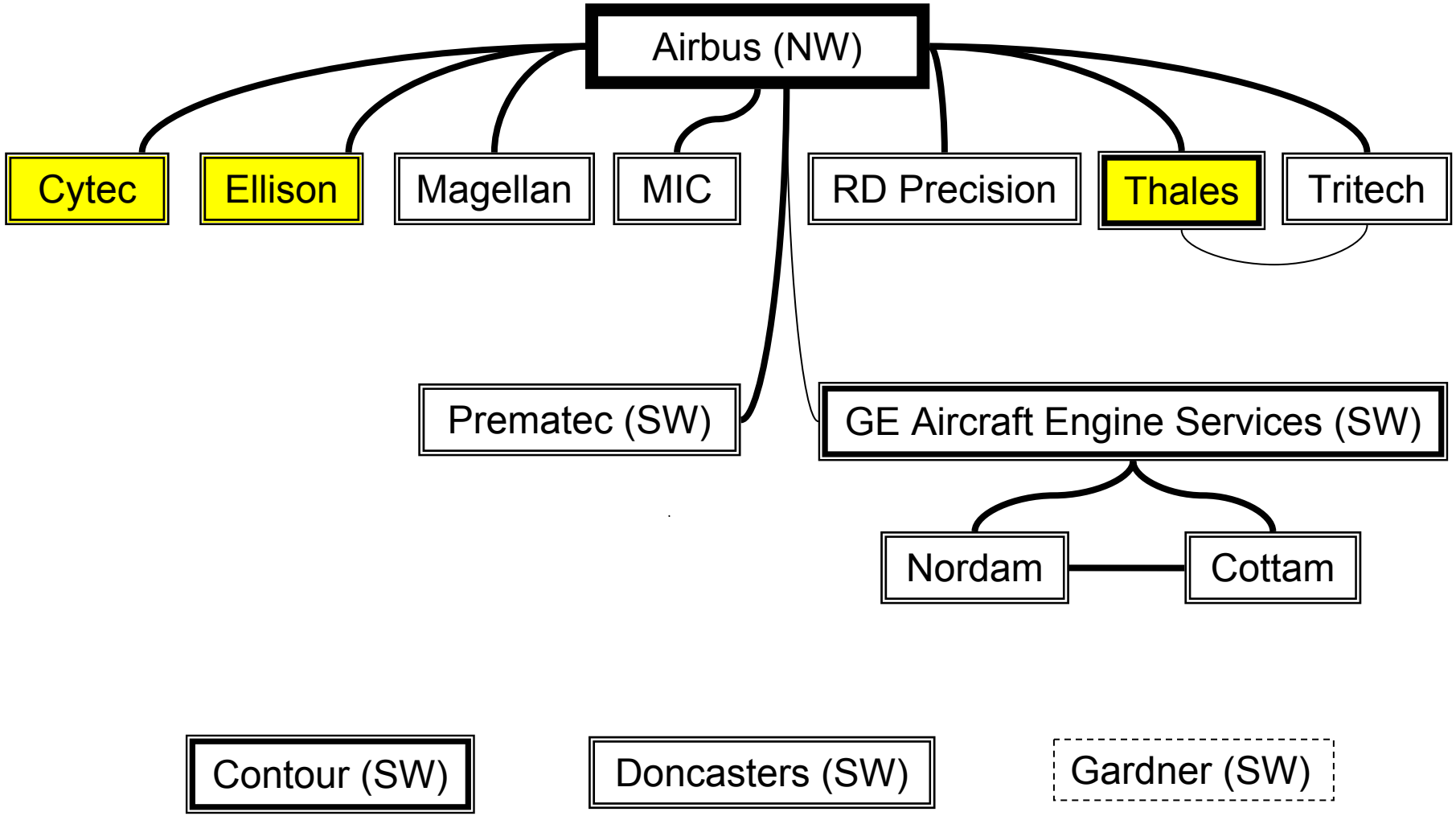
IKINET - INTERNATIONAL KNOWLEDGE AND INNOVATION NETWORKS

Aeronautic Sector in North and South Wales: Map of Industrial Firms



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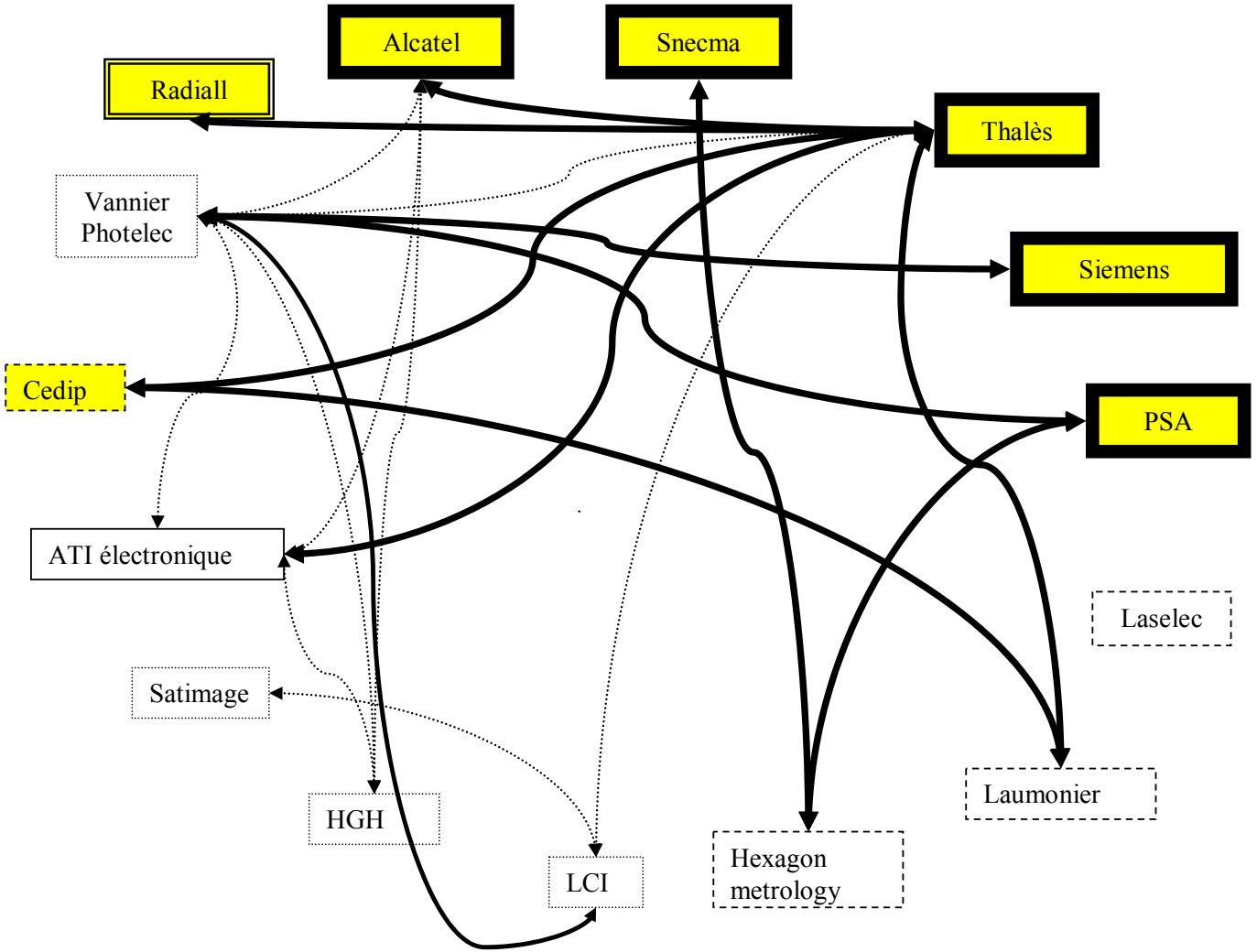
Optics cluster in the Paris Region.



2

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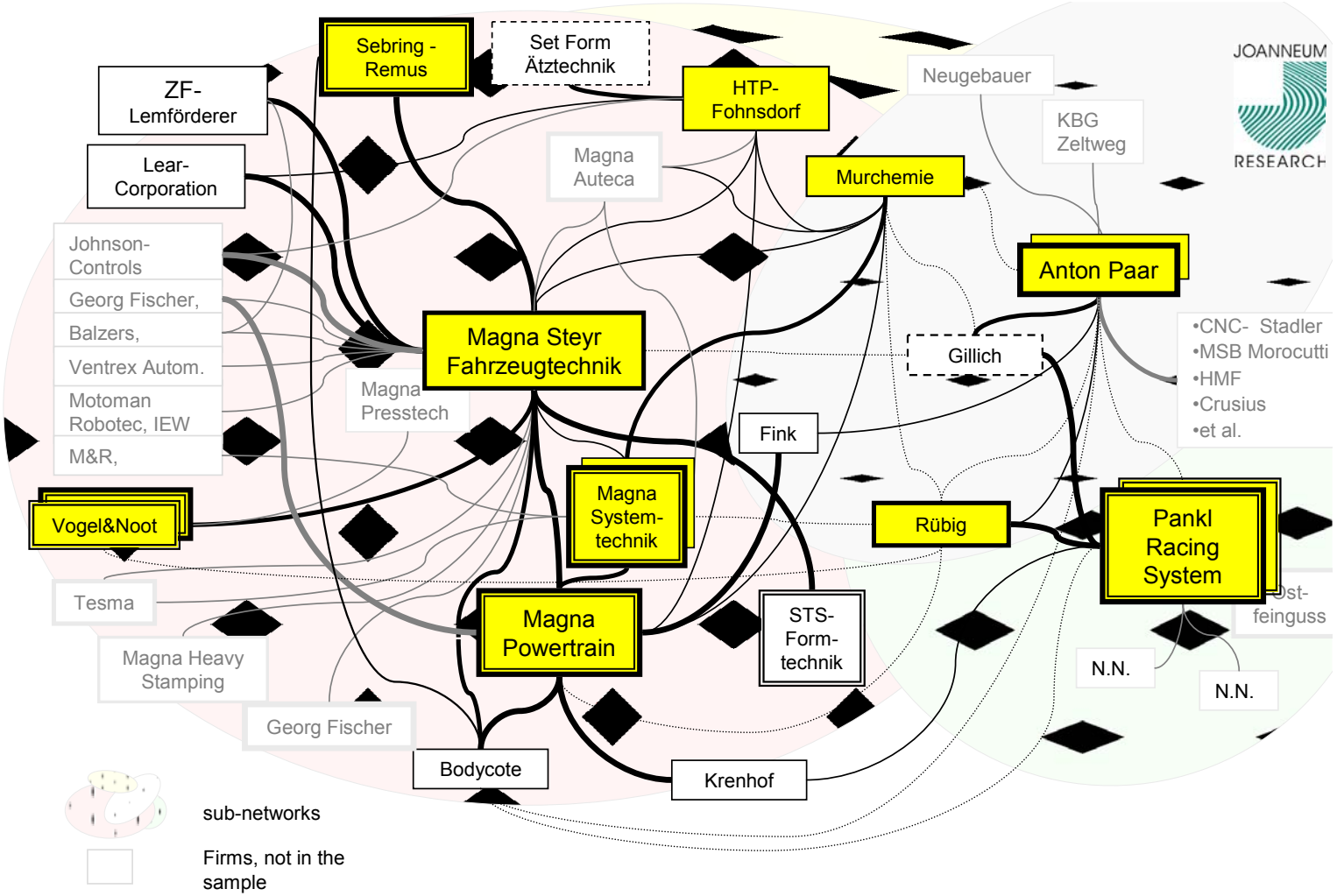
Automotive Sector in Styria: Map of Industrial Firms



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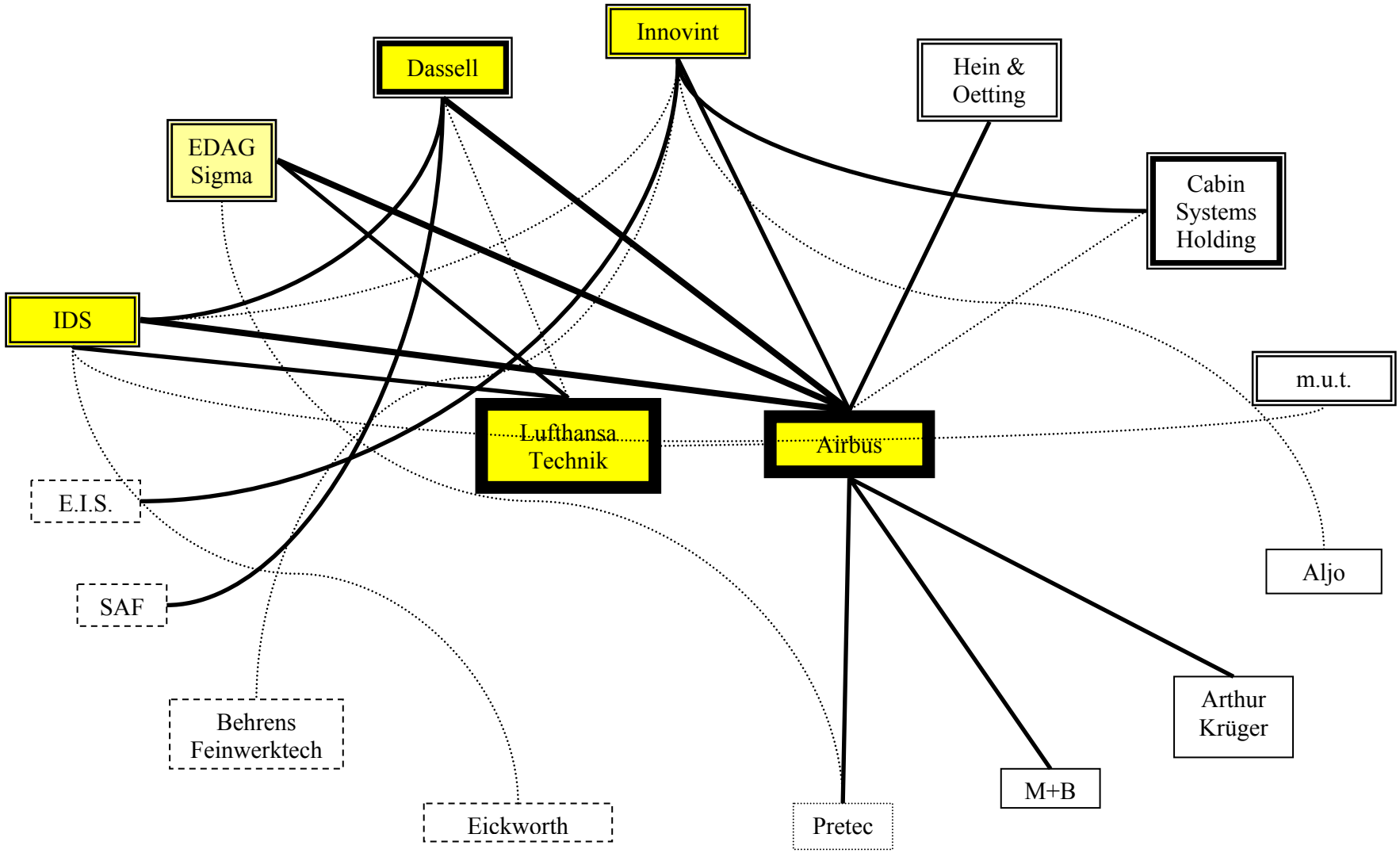
IKINET - INTERNATIONAL KNOWLEDGE AND INNOVATION NETWORKS

Aeronautic Cluster in Hamburg: Map of Industrial Firms



Some trends in the reorganization of the supply chain are common between the various sectors, the aeronautic sector indicates an increasing similarity with the automotive sector.

Firms may be distinguished between the **final producers of integrated products** (OEM – original equipment manufactures), the so called **system suppliers**, which often dominate their market niche at the international level, and finally the regional subcontractors**,** which may be distinguished between **first level and second level subcontractors**.

SMEs are favoured by **trend towards greater outsourcing from major firms**. That also implies a greater standardisation of productions.

The **number of subcontractors is decreasing** notwithstanding the increase of outsourcing, due to the preference of firm for higher lot sizes.

The lack of growth or the limited size of many SMEs is often related to the lack of an explicit aim and strategy to growth by the entrepreneurial family.

The growth of the firm depends first of all on **the capability by the entrepreneur to elaborate a medium and long term projects** and only afterwards on the availability important **financial investments.**

The investments in machinery and structures have to be anticipated by important **investments in the training of the technical staff** and/or in the acquisition of external qualified human resources.

The growth of the firm often is related to capabilities of the **second entrepreneurial generation** and its capability to shift from the focus on technical excellence and efficiency to a deliberate **strategy of diversification** into new productions.

SMEs are only slowly capable to **extend the scope of their productions**. Often, this reconversion towards new productions is related to the need to provide to the client a more complete service.

SMEs decentralize only a minor part of their production to other smaller subcontractors. On the contrary, **a greater vertical integration** is required in order to participate to international tenders and to increase **the export activities**.

The definition of a cluster, which emerges from the regions analysed, indicates that these latter may be quite different from traditional industrial districts.

Local production systems in some regions may be defined as emerging clusters, since they are not easily identifiable and represent a rather new phenomenon emerging in a long term perspective.

Some clusters can not be defined at the local level, since they have a regional or even interregional reach.

Moreover, clusters may be defined not by material linkages but rather by the flows of information and knowledge between firms operating in different

Knowledge clusters have the following distinctive characteristics:
- the gradual development of competencies and tacit knowledge,
- a strong identity and professional ethics between the technical workers,
- a very informal cooperation between the firms.

For example, the **Silesian cluster** is rather new phenomenon emerging in long term perspective, having very local character. It is mostly defined by flows of information and knowledge, but not by material linkages. The development of the cluster is strongly supported by the sectorial research institutions. It is mainly based on very informal cooperation between firms and strong personal relationships among their technical workers what builds strong professional ethics. Almost all key specialists and technical workers have finished the same universities, have the same technical background, participate at the same professional conferences, fairs, etc.

5.2 The process of innovation in the firms

Innovation develop according to a **gradual pace**. **Incremental improvements are often directly suggested by the client,** in order to **solve specific problems** within the specific order considered (such as in the case of a new aircraft model).

Rather than **the time or the year of the adoption of a specific product or process innovation**, it is important to define **the speed of the process of change and innovation** and the impact of this latter on the economic results of the firms in the various years.

Innovation in many firms analyzed **can not be represented as an event but rather as a process.** Innovation is related to the continuous change in the production processes and the continuous improvement of new products. Thus, innovation is not represented by the **purchase of a new machinery**, but rather **the process of using** this latter into new productions.

The **purchase of modern machinery can not be considered as the really key factor,** which is determining the development of new productions in SMEs. **New products** may have originally been produced through more traditional or less automated machineries.

Thus, innovation in SMEs can hardly be defined as "supplier dominated" according to Pavitt typology, being related to the use of investment goods produced in other sectors.

Rather, the decision of purchasing a new machinery is the result of the **acquisition of new clients and new orders**, where a new technology is required.

Technological or process innovation in the subcontracting firms are tightly related or dependent by **the introduction of product innovation,** linked to new order by key clients.

The role of the suppliers of machineries is far less relevant than the role by "launch clients", which may be defined by those clients willing to collaborate with the supplier in the technical development of a new product, which clearly requires the existence of an adequate production capability, and **willing to insure to the subcontractor an initial order**, which insures the financial possibility to proceed to major investments in new equipments and in the training of the technical personnel.

Moreover, key barriers to innovation are represented in SMEs by the lack of human capital, of access to complementary technologies and of the stimulus from international markets. Innovation is tightly integrated with the **development of the capability by the technical personnel to design and produce these new products.** Thus, rather than investment in machinery innovation requires investment by the firms in the development of these capabilities.

Innovation is increasingly less pushed by the **autonomous internal search of technological excellence** by the technical staff and increasingly lead by the need of the firms to comply to **new requirements of the market**.

However, **formal R&D activity is only performed by those firms which are producing with their own brand**, since they are capable to appropriate the benefits of their additional R&D effort. On the contrary, the subcontracting firms prefer to develop new technologies and products, through a continuous process of interaction with the client. In this latter case, the development of **technological competencies is more important than formal R&D.**

Most firms have adopted major products innovation following a **short term perspective** and through the adaptation to external pressures by clients and competitors, rather than being willing to ex ante introduce innovation in order to exploit new opportunities. This reactive behaviour may be called **"ex post innovation" and "ex post learning process".**

Innovation within SMEs is lead mainly by routine market relations and most SMEs are **not capable to elaborate a long term innovation strategy** into new productions

However, in some cases, innovation may be the result of **an explicit project of strategic development** by the firm considered, aiming to the development of the specific productions considered.

Innovation depends on a strategic vision by the entrepreneur, since the innovation is not always the result of marginal improvements, but it is sometime the result of key decisions to invest in new equipment and in the training of key personnel, **well before the order of the client and the actual production will start**. In fact, the clients do not assign new orders, whether they are not sure of the production capability of the subcontractor.

Technological innovation are not the only type of innovation and **"organizational innovation"** are most important.

For example, a major factor leading firms to introduce innovation is the aim or the pressure to reduce the delays on production time. Therefore, increasingly important is the adoption of **modern management tools**, such as TQM and ISO 9000 procedures, concurrent engineering, team work and project management, more intensive use of ICT in the relationships between the firms. Large firms have developed rather **sophisticated mechanisms** to integrate the competencies of various suppliers within large projects. In fact, subcontracting is becoming increasingly complex due to the wide diffusion of **quality and measuring standards from integrators to subcontractors**.

In this respect, institutional and organizational innovation, such as **safety regulations, environment protection requirements and international quality standards** have become a key requirements and represent a major factor leading to the adoption of technological innovation.

Moreover, the adoption of certification standards requires major investments in the firms, since in some cases these latter have been obliged to **purchase various complex machinery** for the testing of the products, for the production of these latter. For example firms have been obliged to create **a new team of engineers and technicians for quality management**.

Another case of organizational innovation is represented by the fact that client firms have **increased the autonomy of the subcontractors** both for tool making, such as new pressing-machine,

robotics or new facilities, and in their sourcing capabilities of raw material and intermediate products.

In that respect, the shift from the situation where **all intermediate materials are provided by the client**, to the situation where the SMEs are responsible of the **direct management of the purchase of intermediate materials** leads both to an increase of production efficiency and to the development within the SMEs of the organizational structures.

Often the lack of financial resources does not represent the real obstacle to innovation at least for larger investments, since financial resources in international markets actually are plentiful in this latter case. On the contrary for smaller investments, innovation in SMEs is penalized by the lack of suitable public instruments, since these latter always require co-financing by the SMEs and the lack of seed capital or of funds for start-ups and turn-around.

5.3 The process of knowledge creation within firms

The research process has an **informal character** within SMEs, since explicit R&D activities are lacking in the subcontracting SMEs, while they may be present in their major client.

For most subcontracting firms the final result of the production activity is the **delivery of a product, which is very similar to a service,** since it has to be tailor made for the needs of the clients and it is based on their long standing relationship or reciprocal cooperation.

P**ersonal competencies are more important than the use of codified knowledge**, since the use of modern and highly complex machineries depends on the technical skills gradually accumulated by the key workers or the entrepreneur.

Within the relationships of subcontracting, **flows of tacit knowledge are tightly complementary to the material flows**. However, the geographical span of the **linkages of tacit knowledge also limit the span of material linkages,** which are more rare in the case of firms belonging to other countries or regions or sectors.

Thus, the clusters of SMEs are characterized by a **gradual process of accumulation of a common know-how** and **upgrading of common competencies.**

Within the organization of production and of the process of innovation the focus has shifted from the aim to **minimize production costs** to that of the **management of the knowledge flows and of the transaction costs.**

Tacit knowledge is a key factor in knowledge creation and innovation. Tacit knowledge in medium-low technology sectors has a multidimensional nature.

Five types of tacit knowledge or types of capabilities have been identified, being related to:
- creativity,
- receptivity,
- automatic coordination,
- “deutero” leaning,
- reputation.

The SMEs do not have elaborated completely new technologies, while they are capable to combine different fragments of existing knowledge in order to solve a specific or local problem **("creativity").**

The SMEs are capable to select and interpret "weak information" on the base of long time experience and knowledge of the state of the art in a specific field **("receptivity")**

The SMEs react to external stimula in an automatic way according to specific "routines", which have been interiorized and are often only based on experience **("automatic coordination")**

The SMEs are highly involved in a common interactive learning process and acknowledge that they have learn one from the other and have technologically improved together in the course of last years **("deutero" leaning")**

The SMEs circulate among themselves opinions on the various actors and tacit knowledge may be represented by the rather **diffused esteem and thrust** that an individual firms or entrepreneur enjoy in the local business community

The management of human resources and the internal organization in the firm is based on **a paternalistic and hierarchical model,** as in the case typically family business, and only rarely is based on consensus, as when several owners collaborate as partners in the firm. However, management style has shifting from bureaucratic centralized to open, consensus based and horizontally integrated.

The education level of the entrepreneurs is often rather low. On the contrary, the level of technical education of the sons of the entrepreneur is higher and may represent a key factor for the mastering of new complex technologies and in the promotion of the growth of the firm into new fields.

5.4 Relationships of the firms with the local actors

The **networks of SMEs** considered in the empirical research represent a **more general form** of organization of firm linkages than the **traditional local clusters.**

The success of the SMEs highly depends on the complex capability of the entrepreneur to **master the complex personal relationships** with other business partners, the key technical workers in the firm and the actual and potential **clients** in the local economy, the capability to identify potential **partners** or **key workers** and to avoid conflicts of interests and to promote **flexible forms of cooperation** in specific common fields.

The most important relationships of the SMEs at the local level are the **relationships with the clients** and the **personal relationships with other actors** of the local community.

In that respect the relationships **with suppliers are considered as less important**. Especially, the smaller firms decentralize only minor parts of their production and are not interested in the technological development of their suppliers.

The labour relationships are very stable and the turnover is very low. Labour indicates an high loyality to the firms.

SMEs prefer apprentices, which have been qualified internally, for key positions.

Most of entrepreneurs have developed their competencies within **previous professional experiences in other often larger firms of the same area**.

The **mobility of the key technical personnel** is worth a more through analysis. That would allow to establish indirect links between the firms and to understand the process of **the creation of intellectual capital in the case of SMEs**.

Other important relations are those aiming to the **technical training of skilled technical personnel** through short term courses in the framework of technical cooperation between client and supplier.

There is a tight flow of information between the entrepreneurs of the various local firms. The **receptivity to external information is high** due to the sharing of a common production culture and of common values. However, this exchange is highly informal.

While **interaction** between the actors in the sector is high, it **is rather low with actors belonging to other sectors in the same local area**.

Subcontracting and **physical linkages** are often less intensive than other, mainly informal and immaterial, types of linkages, such as: **technological exchanges and informal exchanges of information** between the key technically qualified workers and the entrepreneurs.

These relationships of informal cooperation, while not being formalized in specific contractual agreements, are the precondition to the future development of material purchase-selling linkages. They are also the reason which explain material linkages, i.e. subcontracting relationships, face severe obstacles to expand to foreign countries, due to lack of reciprocal knowledge and trust between the entrepreneurs.

Regular relationships with the public institutions are restraint by the **suspicion of political interference** in the life of the firms. Firms prefer to recur to public institutions only **when severe problems arise**. Thus, the growth of the firms is not only due to individual entrepreneurial capabilities, while especially in specific crucial phases of the company life has been explained by the possibility to have **access to specific public financial programs**.

Moreover, the role of the local institutions seems much weaker than that of national administration. As entrepreneurs are suspicious of the high instability of local governments and prefer to rely on the more stable national schemes for industrial policy.

Relationship with local universities are mostly rather intense, while they still have an high potential in the future. In particular, these relationships are mainly related to the **education function of universities**.

For example, firms are interested in the hiring of young qualified graduates or in the collaboration of students doing research for preparing their thesis. On the contrary, the relationships with universities in the **elaboration of fundamental research are more rare**. Often research collaboration are informal and based on advice and reciprocal exchange of information and **contract cooperation contracts for technology transfer activities** between the university and the firms are still quite rare.

The **local clusters** are often still characterized by a **low thickness, low formalization of reciprocal relations and low diversification of the actors. Jo**int initiatives are often fragmented, discontinuous, not coordinated and overlapping.

5.5 Relationships of the firms with national and international actors.

The pressure of international competition is quite different in the various sectors.

For example in the case of aircraft industry national policies still plays a major role and **international agreements** require that major subcontractors in aircraft industry should use only national suppliers.

Spatial contiguity of productions is required due to the small size of the orders, **the need for continuous interaction with the client**, which has externalized some of its internal productions

An important factor limiting the competition from less developed and low wage countries is the key importance of quality certification.

For example, **quality certification is highly complex** in the aircraft sector and represents a **key barrier to entry** to firms in LDC where the labour costs are lower.

Thus, the **diffusion of international outsourcing** from the most developed EU regions to the EU peripheral regions or to Central Eastern Europe is still rather limited in the most technically qualified productions. These purchases are still only determined by the aim to reduce production costs. Thus the diffusion of technological know-how toward these regions is limited to the phase of the establishment of new production capacities, while explicit technological cooperation with the firms in these regions is still rather weak.

A further major obstacle to the development of international relations is represented by the **too small size of the individual firms.**

In particular, when firms qualify as subcontractors, they lack products with their own brand and contacts with clients in other regions and countries. These subcontracting firms often look for an explicit diversification into new fields of productions. However, this effort is hindered by the **lack of organization of marketing structures** not only at the international, but even at the national level.

International contacts have an occasional character. The investment by the SMEs in the **market promotion** and in the development of international relations is very weak.

The participation to international fairs is not systematic and does not prove to be a major source of new contracts. SMEs entrepreneurs mainly focus on the production and technological organization and do not have the time and the personnel to organize their commercial relationships in foreign markets.

Knowledge of firms, potential clients and suppliers in other countries and of the business environment in these latter **is still very low** within SMEs and an obstacle to the development of international relations is the **lack of sharing of common values, history and traditions** with foreign actors.

While export activity is still rare in the case of smaller SMEs, the international relations assume the form of **exchange of technical information** and most firms agree that foreign markets are the key areas for their future development. In some cases indirect international relations have been established by the **experience of key personnel abroad**, as that may bring an access to foreign technologies.

On the positive side, **SMEs in a metropolitan area** are favoured by the higher level of international relations, the growth of FDI and the accessibility to large universities.

FDI are in the clusters considered are mainly quite rare, however their role is increasing. International mergers and acquisitions may become increasingly important in the cluster considered, as some companies have recently been characterized by **rather frequent change of ownership.**

The development of international relations seems to **require a greater vertical integration** of the various firms, since the international clients want to **purchase complete products or systems rather than individual components**.

6. Objectives, achievements, problems and corrective actions

The research project has been coordinated by:

- Università di Roma "Tor Vergata"

The other contractors are:

- University of Wales Cardiff
- Ruhr-Forschungsinstitut für Innovations- und Strukturpolitik - Bochum
- Instytut Badań Systemowych – Polska Akademia Nauk – Warszawa
- Joanneum Research Forschungsgesellschaft - Graz
- Institut National de la Recherche Agronomique - Paris
- Universidad Autonoma de Madrid
- Applica sprl – Bruxelles

The first year of research was devoted to the elaboration of "WP1 - Design of the empirical analysis".

As indicated in the Annex 1 to the contract (Technical Annex), "the core objective of WP1 is to examine the operation of knowledge networks in seven regions from across Europe. WP1 brings together the core tasks for the research project and will involve all research teams. It will map local and international networks and highlight the factors influencing their development". The WP1 objective was to elaborate an extensive empirical internationally harmonized analysis structured according to different regional and firm characteristics".

Seven contractors (Rome, Cardiff, Bochum, Warsaw, Graz, Paris and Madrid), have been involved in this empirical analysis, while one contractor (Bruxelles) has been involved in designing the methodology of the three questionnaires.

The work undertaken tightly corresponds to the work described in the Annex 1. Some variations have occurred due to an improvement of the research methodology and some minor delays related to the greater complexity of the work to be undertaken, with special reference to the firm willingness to collaborate in the empirical analysis.

According to Annex 1, "the WP1 consists in an empirical analysis in seven regional innovation systems to identify the structural characteristics of the key nodes local and international innovation networks. An in-depth analysis will be done on 35 firms and organisations within each region. That will allow to collect the following indicators:

General economic structural indicators for the overall regional innovation system. The partners will collect a selected set of economic structural indicators on the specific regional innovation system to be considered. These indicators will be used for an international comparison of the

general environmental factors affecting the innovation performance of firms in the regions to be considered.

Indicators considered in the European Innovation Scoreboard for each of the 35 firms and organizations (key nodes of the network). The empirical analysis of individual firms and organisations will first concentrate on the collection of those indicators, which are indicated in the "European Innovation Scoreboard" for the various EU countries and regions. The methodology adopted will be the same as used by the national statistical offices in elaborating internationally comparable statistics".

These analysis have been carried out both by using EU harmonized statistics, by contractor: Applica (Bruxelles), and using national statistics and information. In particular, the analysis has been extended to the analysis of the structural characteristics of the sectoral cluster to be considered.

According to Annex 1, a further work to be undertaken was the elaboration of the case studies on the various firms/organizations, which "will start with the identification of leaders and other actors in the regional network to be considered. Then, it will proceed with a first series of interviews of the individual actors on the base of a qualitative questionnaire, focusing on:

a) innovation events history
b) main innovation indicators
c) internal organisation
d) relationships with the local environment
e) relationships with the international economy
f) relationships with the other individual actors of the network

The results of this first series of interviews will lead to the elaboration of a first draft of a report for each firm/organisation analysed. On the base of this information the interviewer will proceed to define a first draft of a quantitative questionnaire. This latter will then be verified and completed through a second series of interviews of the firms/organisation considered. The quantitative analysis will focus on the following issues:

a) the general characteristics of the sectoral cluster, with specific reference to its internal unity and openness, the norms and behaviours within the sectoral cluster, the governance mechanisms
b) the structure of the network relationships between the individual actors, with particular reference to the nature of flows and intensity of the flows between the actors, the complexity of the relationship, the frequency of the interaction between the actors, the strategic nature of the relationship between the actors, the distance between the actors, the existing intermediary structures, both material or immaterial
c) the norms and behaviours in the relationships between the actors in the cluster, with reference to specific issues such as the origin of the relationship, its opportunity value and opportunity cost, the commercial/co-operation/hierarchy nature of the relationships, the causes of conflict, the forms and costs of bargaining/coordination, the trust/confidence relationships, the sense of unity, the friendship ties, the sense of solidarity and reciprocity.

Information collected in this second series of interviews will allow to finalise the case study and a report on each firm/organization analysed. These reports will provide preliminary information on key issues, which are the main aim of the research project".

Moreover, according to the Annex 1 the research had to collect a third type of indicators:

"*Indicators on the production, capital and labour flows and on technological collaboration within the cluster considered*. The empirical analysis in each of the seven regions will be based on a series of 35 case studies on firms and organisations representing a specific cluster. These case studies will

be elaborated through a series of in-depth interviews of the various firms/organisations. As a result, important qualitative and quantitative information on four types of key and interconnected networks existing between the 35 firms and organisations in each regional cluster will be available:

- product flows network,
- capital flows network,
- labour flows network,
- technological relations network.

These data help to understand how knowledge and innovation networks are tightly related to other types of relationships, such as the input-output flows of supply networks, the equity tie-ups between different firms and the mobility of labour and human capital between the various firms.

The structure of these four networks will be the object of a graphical description of the various nodes and links".

Finally, according to the Annex 1, a further (fourth) type of indicators to be collected had to be related to:

"Key indicators in Territorial Knowledge Management (TKM). The empirical analysis will focus on the collection of metrics related to the following seven complementary fields which allow to identify a set of different but complementary dimensions of the knowledge creation and innovation processes:

1. Manage accessibility and technological capital
2. Manage receptivity and human capital
3. Building identity and institutional/organizational proximity
4. Lever creativity and internal organizational capital
5. Enhance entrepreneurship and innovation capital
6. Customers satisfaction
7. Financial performance and creation of value"

The adopted methodology did maintain the proposed approach of having a first series of qualitative interviews and a second series of interviews more focused on quantitative issues related to flows between the firms and finally a third type series of interviews, related to the collection of the TKM indicators. It also maintains the aim to collect the for types of indicators indicated above.

In particular, the first two types of indicators have been collected on the base of research on national sources and on EU harmonized sources.

However, a major difference with the approach illustrated in the Annex 1, was that the first series of interviews has been aimed to a much larger scope of issues, as earlier anticipated and in order to allow a comparability of results it has been organized on the base of very detailed list of issues, which have been updated several times on the base of the intermediate results achieved and the suggestions by the individual research partners.

Moreover, this qualitative analysis has been extended by including a quantitative section, indicated as questionnaire A.

In fact, questionnaire A was not anticipated in the Annex 1, while it has proved necessary in order to insure a comparability of the results investigated in the qualitative analysis of the firms /organizations. This questionnaire has been completed by the experts, who did the interviews to the firms, rather than by the firms themselves. In fact, it has proved to complex to receive well articulated answers from the firms on rather complex issues, while the standing of the firms on

these issues could be better evaluated by the expert indirectly on the base of the various qualitative and quantitative information collected during the interview.

The second and third series of interviews, according to Annex 1, should have a mainly quantitative character.

In particular, the measure of the "*structure of the production, capital, labour flows and technological networks*" proved to be much more complex than anticipated, as the collection of this type of indicators (i.e. indicators on: product flows network, capital flows network, labour flows network, technological relations network) proved to be unfeasible due to the lack of availability of the information on these flows within the firms/organization considered. Thus, it has been decided to change the structure of this survey, to focus it only on the labour flows between the firms (questionnaire B) and to postpone it after the collection of the other types of indicators (questionnaire A and C).

Moreover, questionnaire A and C have provided a qualitative representation of the relationships between the firms/organizations. In fact, the qualitative interviews to the firms have allowed to construct for each sectoral cluster a "graphical description of the various nodes and links", as indicated in the Annex 1.

Finally, the third series of interviews, indicated in the Annex 1, has been organized on the base of questionnaire C, which has been aimed to collect the fourth type of indicators, defined in the Annex 1 as "Key indicators in Territorial Knowledge Management (TKM). The aim of these indicators is to measure those internal factors of the firms/organisations considered, which may explain the characteristics of the innovation and knowledge creation process of the firms as also the pattern of their external relationships.

In conclusion, the implemented methodology has attributed a larger importance to the qualitative analysis of the characteristics and factors innovation and knowledge creation process and of their external relations with the regional environment and the national and international economy. On the contrary, the collection of quantitative indicators of the flows between the firms has been limited by the unavailability of adequate information.

On the basis of the changes and the unexpected factors illustrated above, it has proved necessary to prolong the period in which WP1 - Design of the empirical analysis" had to be elaborated. It was also decided to initiate the "WP2-Validation and improvement of theoretical models", as indicated in the Annex 1, at the beginning of the second year of research. That will imply that the first quarter of the second year will be devoted to the elaboration of the following remaining components of the WP1:

- completion of the collection of: ***general economic structural indicators on the region***
- completion of the collection of: ***regional indicators considered in the European Innovation Scoreboard***
- completion of the collection of information on questionnaire C
- collection of the information required by questionnaire B

The results of these activities imply a shift of four months in the following deliverables:

- A series of reports - compiled as a single deliverable - on knowledge network development in each of the selected regions elaborated by the individual research units, which have participated in the survey.

- A database of the research results of each individual regional case study

In fact, the data base on results of questionnaire A can be implemented in time, while the delay depends only on the availability of the results of questionnaire C, which is in the process of completion, and of the results of questionnaire B, which had to be postponed to the second year of research.

Since the elaboration of "WP2 -Validation and improvement of theoretical models" implies first an in depth theoretical analysis before the statistical testing of theoretical models, the anticipated corrective action seems not to have a consequence on the completion of WP2. Moreover, the statistical elaborations could immediately start on the results of the questionnaire A, which summarizes the results of the qualitative case studies on the selected firms/organizations.

Section 2 – Workpackage progress of the period

The research carried out in the first reporting period has been related only to **WP1 - Design of the empirical analysis** and **WP6 - Intermediate and final report.**

1. **the objectives of WP1 and WP6** correspond to those first indicated in the Annex 1 of the contract**,**

2. **the progress** toward objectives **in WP1** has implied:
   - 2.1. the identification of the regional sectoral clusters to be considered in the 7 regions
   - 2.2. the identification of the firms belonging to these clusters and to be analyzed in the case studies
   - 2.3. the definition of a detailed list of issues or key questions to be investigated in each case study
   - 2.4. the elaboration 35 case studies in each of the 7 considered regional clusters
   - 2.5. the definition of a questionnaire (i.e. questionnaire A) summarizing the results of the case studies and allowing a international comparison
   - 2.6. the completion of questionnaire A by the researchers involved in the interviews,
   - 2.7. the definition of questionnaire C on the structural characteristics of the firms
   - 2.8. the definition of questionnaire B on the mobility of key technical personnel between the industrial firms
   - 2.9. the collection of statistical information and economic studies on the regional economy and the sectoral cluster to be considered
   - 2.10. the collection of harmonized information on economic structural characteristics and innovation factors in the seven considered regions

All contractors have been involved in the actions indicated above to a major or minor extent. The coordination activities have been regularly secured by the following contractors: Università di Roma "Tor Vergata", Ruhr-Forschungsinstitut für Innovations- und Strukturpolitik – Bochum, Instytut Badań Systemowych – Polska Akademia Nauk – Warszawa.

3. **the progress** toward objectives **in WP6** has implied:
   - 3.1. the registration and opening of the project internet site on month 2
   - 3.2. the elaboration of the first intermediate report on month 13

4. **Deviations** from the project work-programme **in WP1**, and corrective actions taken/suggested consist in the following:
   - 4.1. an enlargement of the scope of the issues which have been considered in the case studies and summarized in questionnaire A
   - 4.2. a minor delay in the collection of some indicators (questionnaire C in particular) to be completed in the first quarter of the second year of research (month 16)
   - 4.3. a major change of the structure, new focus and postponement to the second year of research of the analysis on flows (questionnaire B), to be completed in the first quarter of the second year of research (month 16)
   - 4.4. a postponement to the first quarter of the second year of the production of the final draft of the papers on the results of WP1-Design of the Empirical Analysis in the various considered regions (month 16).

The decision of these changes have been taken by the Steering Committee of the research project.

5. **Deviations** from the project work-programme **in WP6**, and corrective actions taken/suggested consist in the following:
   5.1. the publication of material on the project web site has been postponed for the lack of availability of material to be of "public use", since the intermediate material was considered as confidential. It was agreed to publish on the project website the first intermediate report.

The decision has been taken by the Steering Committee of the research project.

6. The **list of deliverables** for the entire project, including due date and actual/foreseen submission date, is presented in the following table:

This new list of deliverables includes the organization of three scientific seminars (months 13, 24 and 27), adding to those already planned (months 17, 20), as it has proved necessary to organise at least two meetings/year of all partners in order to insure a tighter coordination of the research activity.

7. **The milestone of WP1 was** indicated in the Annex 1 as: "The final result of this first work-package of the research should be the creation of a database, which will be made available to all research units of the project, and will comprise various internationally harmonized metrics for each of the 35 case studies elaborated in the seven regions/countries and the qualitative information collected". That milestone was anticipated to be achieved on month 15. It is proposed to postpone it to month 16.

8. **The milestone of WP6** was indicated in the Annex 1 as: "The first intermediate report will be elaborated in month 13 and it will be discussed in the first diffusion workshop (WP5) (month 15)

Table 1: Deliverables List
List all deliverables, giving date of submission and any proposed revision to plans

Del. no.	Deliverable name	Workpackage no.	Date due	Actual/Forecast delivery date	Estimated indicative person-months	Used indicative person month	Lead contractor
1	Project website	6	2	2	1	0	URTV
2	First Scientific Seminar	1	3	1	0	0	URTV
3	Second (and Second*) Scientific Seminar	1	13	8 (and *13)	0	0	URTV
4	Series of Scientific Papers on WP1	1	13	16	95	70,5	URTV
5	First Intermediate Report	6	13	13	4	4	URTV
6	Data Base on the empirical research	6	15	16	2	0,5	APPLICA
7	First Diffusion Workshop	5	15	19	1,5	0	CIMPAM
8	Second Diffusion Workshop (and scientific seminar)	5	19	24	1,5	0	JR-InTeReg
9	Third Scientific Seminar	2	21	17	0	0	UWC
10	Series of Scientific Papers on WP2	2	23	23	29	0	RUFIS
11	Third Diffusion Workshop	5	23	29	2,5	0	URTV
12	Second Intermediate Report	6	25	25	4	0	URTV
13	Fourth (and Fourth*) Scientific Seminar	4	27	20 (and *27)	0	0	RUFIS
14	Series of Scientific Papers on WP3	3	27	27	5,5	0	URTV
15	Series of Scientific Papers on WP4	4	27	27	12	0	UWC
16	Final Report	6	30	30	6	0	URTV

Table 2: Milestones List
List all milestones, giving date of achievement and any proposed revision to plans

Milestone no.	Milestone name	Workpackage no.	Date due	Actual/Forecast delivery date	Lead contractor
1	Database	WP1	12	17	URTV
2	Reports	WP2	22	24	RUFIS
3	Matrix INT	WP3	27	27	URTV
4	Report	WP4	27	27	UWC
5	Proceedings	WP5	23	28	URTV
6	Reports	WP6	30	24	URTV
7	Coordination	WP7	30	30	URTV

Section 3 – Consortium management

The Steering Committee has met on:
October 29, 2005, at University of Rome "Tor Vergata". Participants: R. Cappellin, P. Cooke, R. Wink, S. Walukiewicz
April 30, 2006, at University Bocconi, Milan. Participants: R. Cappellin, R. Wink, S. Walukiewicz
June 24, 2006, at University of Rome "Tor Vergata". Participants: R. Cappellin, R. Wink, S. Walukiewicz

The discussion with the partner institutions in the research project has been organized in two workshops, which have been held on:
October 29-30, 2004, at University of Rome "Tor Vergata"
June 22-23, 2005, at University of Rome "Tor Vergata"

The identification of the regional sectoral cluster to be studied has proved to be a rather complex operation in all countries and especially in the case of various research units: Bochum, Warsaw, Graz, Paris, due to the need to identify a specific subsectors within the mechanical sector, where network relationships could be rather intense, and also the need to secure the active collaboration by the firms performing the role of leaders in the cluster considered. That has led to change the sector and in two cases even the selection of the region to be initially considered. Similarly the identification of the firms/organizations/institutions has proved to be time consuming due to the lack of commitment by many firms to participate in the repeated interviews required by the elaboration of the 35 case studies in each region.

The elaboration of questionnaires A, B, C have been undertaken on the base of the first round of interviews in the elaboration of the case studies and have required a time consuming effort aiming to find common issues of relevance for the rather different firms in the various regions.

Problems have been solved through regular contacts between the members of the Steering Committee and the various partners, through the above indicated meetings and through email and telephone.

No change in responsibilities has been taken in the first reporting period, with respect to the tasks originally assigned in the Annex 1 of the contract.

The most relevant change in the project time table is the postponement to the second year of research of the analysis on flows of personnel between the firms (questionnaire B). Thus, this component of the WP1 will be completed in the first quarter of the second year of research (month 16). In fact, the measure of the "*structure of the production, capital, labour flows and technological networks*" proved to be much more complex than anticipated, as the collection of this type of indicators (i.e. indicators on: product flows network, capital flows network, labour flows network, technological relations network) proved to be unfeasible due to the lack of availability of the information on these flows within the firms/organization considered. Thus, it has been decided to change the structure of this survey, to focus it only on the labour flows between the firms (questionnaire B) and to postpone it after the collection of the other types of indicators (questionnaire A and C).

This change will imply only a minor change on the planned milestones: the completion of the Data Base on the empirical research (deliverable 6) from month 15 to month 16.

Table 5: Workpackages - Plan and Status Barchart
PROJECT BARCHART and STATUS
IKINET - CIT2-CT-2004-506242

		1ST YEAR																2ND YEAR									3RD YEAR			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	**final 30m**
WP1	***Empirical survey and construction of indicators of innovation potential***																														
Task 1.1	Elaboration of a regional case study by the following partners: Rome, Cardiff, Bochum, Warsaw, Graz, Paris, Madrid. Bruxelles will help Rome in the design of the questionnaire and will be in charge for the collection of regional and national data available at the EU institutions																														
Task 1.2	Coordination of WP1 will be a task assigned to Rome research unit																														
Task 1.3	Seminar 1 will be organised by Rome research unit																														
WP2	***Validation and improvement of theoretical models***																														
Task 2.1	Elaboration of at least two research papers by each partner, including an original quantitative analysis of the data collected in WP1, suitable for inclusion in the final publication according to opinion of selected referees																														
Task 2.2	Coordination of WP2 will be a task assigned to Bochum research unit.																														
Task 2.3	Seminar 2 will be organised by Rome research unit																														
WP3	***Synthesis and quantitative framework for innovation policy evaluation***																														
Task 3.1	Elaboration by the Rome research unit of a research paper including an original quantitative analysis of the data collected in WP1																														
WP4	***Policy recommendations***																														
Task 4.1	Elaboration of one research paper suitable for inclusion in the final publication according to opinion of selected referees																														

Task 4.2	Coordination of WP4 will be a task assigned to Cardiff research unit																																	
Task 4.3	Seminar 3 will be organised by Bochum research unit																																	
WP5	***Diffusion of research results***																																	
Task 5.1	Organisation of diffusion workshop 1 by Warsaw research unit																																	
Task 5.2	Organisation of diffusion workshop 2 by Graz research unit																																	
Task 5.3	Organisation of diffusion workshop 3 by Rome research unit																																	
WP6	***Coordination activities***																																	
Task 6.1	Coordination of intermediate rapport by Rome research unit																																	
Task 6.2	Collaboration to the elaboration of the intermediate report by Cardiff, Bochum and Warsaw research units																																	
Task 6.3	Coordination of final rapport by Rome research unit																																	
Task 6.4	Collaboration to the elaboration of the final report by Cardiff, Bochum and Warsaw research units																																	
Task 6.5	Creation by the Rome research unit of a web site of the project																																	
Task 6.6	Creation by the Bruxelles research unit of a data base of the all results obtained in the empirical analysis of WP1 and quantitative elaboration of the data included in the data base suitable for the elaboration of papers in WP2 by the various research units																																	
WP7	***Coordination activities (Management activities)***																																	
Task 7.1	Coordination of the overall project by the Rome research unit																																	
Task 7.2	Collaboration to the coordination of the overall project by the Cardiff, Bochum and Warsaw research units																																	
Task 7.3	Financial coordination of the overall project by the Rome research unit on the base of the individual financial statements of the various research units																																	

Appendix 1 – Plan for using and disseminating the knowledge

Section 1 - Exploitable knowledge and its Use has not been filled since it is not relevant in the case of economic research.

Section 3 – Publishable results has not been elaborated since the respective material will be produced in the second year of research. However, a detailed plan for the production of the publication is included in the following section.

Section 2 – Dissemination of knowledge

This section includes past and future dissemination activities. It contains a preliminary indications of these activities since the research activities of the project have only now completed the first year. The results of the research activities undertaken in the first year will be then diffused in t he second and third year.

1. Publications

The major results of the research activities will be published in a book. The provisional title is:

"International Knowledge and Innovation Networks"

The publication will be organized in five major sections, which correspond to the scientific areas of research of the project.

Each of the first four sections will comprise contributions, which will consider:
- a survey of the literature
- a contribution to innovation theory
- an analysis of empirical results undertaken in the research project

The fifth section will contain an indication of policy strategies emerging from the project.

Overall approximately 20 papers will be published in the book. In particular: 16 papers in the first 4 Parts and 4 papers in the part V.

The preliminary draft of the contents of the book and the preliminary list of the contributors are the following table:

"International Knowledge and Innovation Networks"

final publication of the IKINET research project
FP6: CIT2-CT-2004-506242

Preface

Introduction

Part I - Geographical agglomeration within clusters and the development of the local networks model

Papers the following research units:
- Madrid
- Graz
- Cardiff
- Warsaw

Part II - Interactive learning and the process of knowledge creation

Papers the following research units:
- Rome
- Bochum
- Cardiff
- Bruxelles

Part III - The role of institutions and social capital in knowledge creation

Papers the following research units:
- Graz
- Warsaw
- Rome
- Paris

Part IV - Openness as a factor of innovation and development

Papers the following research units:
- Bochum
- Paris
- Bruxelles
- Madrid

Part V – Policy strategies

Papers the following research units:
- Rome
- Cardiff
- Bochum
- Warsaw
- Graz
- Paris
- Madrid
- Bruxelles

The book should be published by an international editor in Spring 2007, just after the end of the project. Material should be provided in different stages:
- research area to be considered: October 2005
- provisional titles: December 2005
- early draft of the paper: March 2006
- complete draft of the paper: June 2006
- presentation of the papers in international scientific conferences: Summer-Fall 2006
- final draft of the papers: November 2006 to be sent to the publisher

2. Project web-site

The project website address is: www.economia.uniroma2.it/dei/ikinet. A second linked address is the following: www.iunet.uniroma2.it/ikinet

The project web site should contain information of interest for the general public. These will include the official information communicated to the EU commission. It will contain information useful to contact the various research units. It may contain indications of the research activities undertaken in these research units in the IKINET and related project.

It will contain also material which is not suitable for publication. Research contribution to be included in the book will not be published in the project website as they are confidential and in order to protect intellectual property rights.

3. Conferences

A major role in the plan for using and disseminating the knowledge will have the following three conferences:

a) May 2006: First Diffusion Workshop, Warsaw, organized by IBS- Polish Academy of Sciences, on: role of SMEs and regional institutions in knowledge creation and international co-operation, presentation of the results of the empirical analysis (WP1).
b) October 2006: Second Diffusion Workshop, Graz, organized by Joanneum Research, on: role of large firms in international transfers of tacit knowledge, presentation of the results of the theoretical and empirical studies (WP2)

c) March 2007: Final diffusion conference, Rome, organized by the University of Rome, on: national and European policies for knowledge creation and innovation, presentation of the results of research activities on a quantitative framework for innovation policy evaluation (WP3) and on policy recommendations (WP4).

The speakers at the conferences will be the leaders of the various work-packages of the research project as well key note speakers from other EU research projects. Various round tables and working groups will be organized will be the participation of entrepreneurs, public officials and policymakers.

The conferences is addressed to entrepreneurs in small and large companies, public officials at the regional and national level, policy-makers, officials of the European Institutions and researchers in related fields.

The first conference will be mainly be addressed to participants representing the industrial community and the public sector from new member states. The second conference to participants representing the industrial community and the public sector from central and north Europe. The third countries will be addressed to participants representing national and European institutions.

The size of the audience will be of 30-60 participants in the case of the first two conferences and hopefully a larger participation is anticipated in the third conference.

4. Flyers

A flyer will be elaborated to be distributed at the first diffusion conference and it will be updated in for the following conferences. A flyer will be elaborated in order to publicize the book to be produced the final results of the research.

5. Direct e-mailing

A mailing list will be created in order to publicize the three diffusion conferences. This list will include regional development agencies, technology transfers institutes, specialists in the economics of innovation, coordinators of related research projects and key stakeholders in the various regional industrial clusters considered and finally of all the persons interviewed in the empirical analysis

6. Posters

The key research results achieved by the eight research partners in the IKINET project will be summarized in posters to be presented ant the three diffusion conferences.

7. Press release

Press release will be timely organised in correspondence to the three diffusion conferences. An abstract of the book

Section 2 – Dissemination of knowledge - Overview table					
Planned /actual Dates	**Type**	**Type of audience**	**Countries addressed**	**Size of Audience**	**Partner responsible /involved**
Spring 2007	Publications	Research community	World	N/A	University of Rome "Tor Vergata"
November 2005	Project web-site	General public	World	N/A	University of Rome "Tor Vergata"
May 2006	Conference 1	Industrial community and public sector	Eastern Europe	30-60	IBS – Polish Academy of Sciences
October 2006	Conference 2	Industrial community and public sector	Central and north Europe	30-60	Joanneum Research
March 2007	Conference 3	National and European institutions	European Union	> 60	University of Rome "Tor Vergata"
April 2006	Flyers	General public	World	500	University of Rome "Tor Vergata"
March 2006	Direct e-mailing	General public	World	500	Various partners
April 2006	Posters	General public	European Union	150	Various partners
May 2006	Press release (press/radio/TV)	Media	European Union	40	Conference organisors