EUA **PUBLICATIONS 2006**

THE RISE OF KNOWLEDGE REGIONS: EMERGING OPPORTUNITIES AND CHALLENGES FOR UNIVERSITIES

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EUA
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ISBN: 9789081069854

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BY SYBILLE REICHERT, NOVEMBER 2006

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FOREWORD

Focusing on the role of universities in regional innovation is a new area of interest for EUA, however one that was already identified as being important in the 2005 Glasgow Declaration:

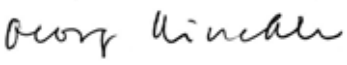
> *"Universities must exercise their own responsibilities for enhancing research and innovation through the optimal use of resources and the development of institutional research strategies. Their diverse profiles ensure that they are increasingly engaged in the research and innovation process, working with different partners at the regional, national, European and global level".*

In taking up this theme the objective is to bring the voice and experience of the universities into the debate on the future development of regional policy, particularly given the new emphasis being placed on investment in science, technology and innovation.

EUA commissioned this study entitled *The Rise of Knowledge Regions: Emerging Opportunities and Challenges for Universities* with the aim of understanding the current role of universities and future potential of universities in regional knowledge development and the study also includes a review on the most recent literature in the field. A particularly important element of this study was a series of interviews with professionals involved in university-industry-government cooperation schemes to foster regional innovation conducted in four selected European regions (Barcelona, Brno, Manchester and Øresund) who provided first-hand experience of these collaborations.

The report was presented at the EUA October 2006 Conference on *"Universities as Catalysts in Promoting Regional Innovation"* in Brno, Czech Republic, that addressed the role of universities as key drivers of innovation. Given the many existing good practices and the new opportunities to maximize synergies between regional, national and European policy initiatives, the initiative lies now with the universities to strengthen their regional capacity in research and innovation. For its part, EUA is currently designing a new range of activities to help its university membership achieve their goals in this field.

EUA would like to thank all the universities, companies, institutions and government bodies that participated in this study for their willingness to share their experiences. Our particular thanks go to the author of the report, Dr. Sybille Reichert, who has been able to provide a well structured insight into the key elements of the social, economic and cultural processes at work in raising the position of regions in the knowledge economy.



Professor Georg Winckler
EUA President

ACKNOWLEDGEMENTS

Unlike most other studies I have undertaken, this study goes beyond the realm of higher education systems and institutions to look at a wider set of actors which are responsible for the development of knowledge-based regions. To gain an insight into the workings of the non-university institutions in this development would have been impossible without the good will and openness of many individuals who were ready to be interviewed without any obvious benefit to their own institutions or any particular identification with the university sector. I am thus all the more grateful for their readiness to share their experiences, perspectives and visions with me, and for widening my horizons.

I would also like to thank the university rectors or vice-rectors as well as the directors of technology transfer and many professors who I had the pleasure of interviewing in the context of this study, for their reflective and critical observations on concrete challenges and medium term developments which go hand in hand with the enlarged role universities.

As always I am deeply indebted to the leadership team of the EUA Secretariat: first of all for their trust which allowed me to go beyond the university sector to explore university-relevant issues in a wider context of knowledge production and exchange, but also for their excellent advice and good sense concerning the early planning phase of this project.

Finally, I would like to express my great admiration and deepest gratitude to Lidia Borrell who joined EUA in January and who immediately provided the best project accompaniment one can imagine. Apart from organizing the visit to Barcelona (her town of origin), she accompanied me on 3 of the 5 visits. With many invaluable reflections, she contributed greatly to making these site visits a very engaging and inspiring experience. Last not least, as a critical and supportive first reader of the drafts of this report, her astute comments were immensely helpful.

Sybille Reichert

Since completing her Ph.D. at Yale University, Sybille Reichert has been working as a consultant in higher education policy over the last ten years for individual universities, ministries of education, the European Commission and the European University Association, focusing on issues of strategic development, internationalisation and organisational reforms of universities in Europe from an internationally comparative perspective. She was the co-author of the EUA Trends III and IV reports in 2003 and 2005 which looked at the implications of the Bologna reforms for university development in Europe. Having been responsible for strategic planning at ETH Zurich until 2004, Reichert has set up her own consultancy firm in 2005, specialising in policy and strategy development in higher education with projects for European organisations, national ministries and universities.

1. INTRODUCTION

1.1 Aims and methodology of the study

This essay tries to describe the emerging phenomenon of the proactive knowledge region by looking closely at the processes of its development, at the key actors and their interactions, as well as at the role of the university in this development. It also aims to investigate how knowledge institutions and their networking are motivated, supported, developed and adapted at regional level, set against the backdrop of emerging knowledge regions and the rising interest of universities and policy makers in close networks of cooperation between different types of knowledge actors at regional level,. The focus will be on city-regions, i.e. areas that are territorially beneath the level of nations though not necessarily formal administrative divisions, which are known to nurture their creative environments in general and knowledge sectors in particular. The study will ask the following questions. How do regional policy makers and major players in the knowledge institutions try to create optimal conditions favourable to all? What forms of cooperation are regarded as successful in a common effort to improve national and global competitiveness? What exactly is the role of the university in this field of action? How can it improve its own performance and how do policy makers contribute to its success? With an in-depth focus on the communication between these different kinds of partners, knowledge development should be anchored with state representatives, private companies, and universities. The accumulated data on successful practices in research literature is taken as a point of departure to then focus on the communicational and operative aspects of any such successful practices. How do universities and their partner knowledge institutions establish well-functioning formal and informal flows of explicit and tacit knowledge, which is so important for the competitive advantage of the regions? How do they identify, communicate and respond to each other's needs? How do they cultivate the sense of the region as a creative environment? How do they make themselves attractive to future knowledge workers from abroad, how do they build the creativity of the next knowledge generation at home? (See Annex 2 for a complete list of guiding questions)

The observations are based on a close look at four European city-regions, with the help of 3-4 day site visits to each city-region. A wide range of interviews were held with different actors from governmental agencies, knowledge-based enterprises and universities, as well as intermediary organisations responsible for the development of the knowledge region or of individual knowledge clusters. Each interview was adapted to the type of institution and conducted in semi-structured form. The policy actions of other city-regions, in particular Montreal in Canada, which was also visited, were taken as benchmarks. In addition to studying the theoretical literature on knowledge and innovation environments and the role of the region, relevant background data and strategy documents were analysed. The desk research, selection, planning and analysis of the site visits lasted from November 2005 to October 2006.

Apart from wanting to achieve a wide geographical spread across Europe, the main criterion for selecting the city-regions of Barcelona, Brno, Manchester and the trans-national region of Øresund, which covers the adjacent cities of Copenhagen, Roskilde, Malmø, Lund, and Kristianstad, was their explicit self-description and positioning as knowledge regions. The small sample of just four regions was not only imposed by limited resources but also reflects the main aim of this study, which consists in mapping the key issues for the use of universities. This investigation does not evaluate the knowledge intensity or innovation capacity of the respective regions. Nor does it pretend to be able to correlate policy initiatives and interactions between regional agencies, universities and knowledge-based businesses, recently coined "triple helix interactions" (Etzkovitz and Leydesdorff 1997), with the success of these regions in augmenting their capacity and attracting foreign investment. Such an attempt would indeed be premature. While knowledge-intensive regions have existed in Europe for decades, the phenomenon of knowledge regions as a conscious interactive triple helix set of policies and actions is only just emerging.

Thus, a comparative evaluation of relevant policy success would not be backed by several years of data. Usually explicit knowledge development policies are needed to even collect such data. Instead, this study seeks to understand the processes involved in conscious policy development and multi-actor interventions aimed at enhancing the assets of the knowledge region. In particular, it describes the current and expected role of universities in such regional knowledge development. As yet, in spite of an increasing interest and practice of international rankings of regions[1], there is no systematic comparison of knowledge cities and their attempts to make proactive use of existing assets and interrelations between public and private actors. However, helpful studies on individual regional innovation systems and knowledge clusters (as compiled by Dunning 2000) provide a useful background to the relevant issues.

Important input on the role of universities for regional development can also be expected from the ongoing large scale comparative project *Supporting the contribution of higher education institutions to regional development* of OECD / IMHE (in collaboration with the OECD Territorial Development and Public Governance Directorate).[2] This project reviews the contribution of universities and other higher education institutions to regional economic, social and cultural development in different regions. It formulates recommendations for each region on how to reinforce partnerships between institutions and regions. The project, which comprises extensive multi-actor self-evaluation reports and peer reviews, in keeping with the widely practiced model of university quality evaluations, will run through 2006, and will lead to a publication and international launch conference in 2007.

Of course, our much more limited investigation of this phenomenon cannot claim to provide such authoritative width and depth of regional comparison. It is designed, rather, as a complementary approach which takes the observation of self-aware proactive knowledge regions as its point of departure and focuses on the "soft" communicational processes involved in the further development of such knowledge regions. It tries to map the key issues and steps in the development of knowledge regions and to describe the ways in which different types of institutions interact, combine efforts and define common agendas. For university and regional policy leaders, this essay draws attention to a new genre of regional competition and to the methods clever regions develop to strengthen their position in the knowledge economy. Finally, it describes the different forms and problems of university engagement in the emerging knowledge region.

1. 2 A place for knowledge

Policy makers and media observers often point to the threats and, more rarely, to the opportunities that globalisation brings. For industrialised countries such opportunities are said to be linked to the success of local knowledge economies since it is only through the superior innovative capacity of the labour force and favourable immobile assets that higher cost environments can be afforded without losing the global market competition. The high added value of knowledge intensive industries is needed to maintain our high standard of living, including the level and spread of social welfare which is valued so highly in Europe. But knowledge defies borders and "knowledge workers" become ever more mobile. Indeed their mobility is even cited as one ingredient of their creative disposition. Knowledge-based assets of firms have become increasingly mobile across national boundaries and form the basis of an increasing share of international direct investment and cross-border strategies and alliances. The mobility of these "created assets" is further enhanced by improvements in management skills, communication and the increasing liberalisation of

1 Such as the frequently quoted FDI (Foreign Direct Investment) ranking European Cities of the Future 2006/07 (February 2006) which also ranks three of our four regions as the number one in their countries. See http://www.fdimagazine.com/news/categoryfront.php/id/239/Czech_Republic.html

2 The project description and ingredient documents can be found at http://www.oecd.org/document/21/0,2340,en_2649_201185_34406608_1_1_1_1,00.html

markets. Given these trends, is there anything a given region or nation can do to bind knowledge and its proponents to a geographical context and economy so as to maintain and even expand its wealth and well-being? Can we create, in the words of Ann Markusen (1996), "sticky places within slippery space"? Can we think of targeted actions to attract more knowledge workers and knowledge-based businesses and the accompanying benefits of social and economic wealth to our part of the world?

Recently economic geographers, economists and other social scientists have started to emphasise that neither all assets of knowledge economies nor knowledge itself are as mobile as its codified expressions in publications and patents. Indeed, the more implicit "tacit" forms of knowledge have a geographic dimension which can be positively influenced by policies and framework conditions. Moreover, it seems that for knowledge economies the dimension of "place" has gained importance in recent years, even or especially in an age of globalisation. How can one explain this apparent contradiction between increasing globalisation, which seems to dissolve the order of place, on the one hand, and a new importance of place, particularly agglomerations, on the other? The answer is attributed to the essence of the knowledge economy. As long ago as 1890 Alfred Marshall observed, in his famous analysis of agglomeration economies, that knowledge spill-over effects cause people to locate closely to each other. His agglomeration theory has been taken up and expanded in recent decades, for example by Dunning and Gray who have pointed out that this new spatial mobility comes at a time when old mass production has broken down and a process of spatial reallocation has occurred: Regional clusters of activity are able to generate "external economies" by creating new opportunities and benefits of spatial clustering, by minimizing distance-related transaction costs and maximising tacit knowledge flows and dynamic learning effects. This attracts firms, particularly those seeking to increase their resources and capabilities. Dunning (2000) observes:

(i) "the greater the degree of knowledge intensity of a particular activity,

(ii) the easier it is for labour to migrate across regions or countries,

(iii) the lower the distance related costs, and

(iv) the more firms engage in foreign direct investment and alliance-related activities to augment, rather than exploit, their existing assets,

then the more likely it is that national and micro-regional economies will develop specialised centres of excellence."[4]

He also points out that such clustering is strongly activity-specific and likely to be most marked where the critical decision-takers in firms need to be in close physical proximity, so as to share tacit knowledge[5]. Therefore, globalisation and technological change have not only upgraded the knowledge intensity of the constituent firms, but also strengthened clustering effects to optimise knowledge spill-over. With time, most of these clusters develop their own nexus of innovating and learning capabilities thus generating dynamic externalities to the participating firms. Indeed, the dynamic externalities associated with horizontal and vertical clusters are becoming more important as intellectual capital becomes more sophisticated, idiosyncratic, tacit, complex, and context dependent. A knowledge intensive firm benefits from the proximity to a cluster of related firms because it can exploit the benefits of untraded interdependencies (Storper 1995) as well as the competitive advantages provided by critical mass. Knowledge industries are thus more likely to locate to cities in order to achieve these advantages. Hence, city-regions have become the main drivers of the knowledge economy.

3 The term «knowledge worker» was coined by Peter Drucker some thirty years ago to describe someone who adds value by processing existing information to create new information which could be used to define and solve problems. Examples of knowledge workers include scientists, scholars, lawyers, doctors, diplomats, law makers, software developers, managers and bankers.

4 John Dunning (2000), p.16.

5 Ibid.

The 90s have seen an increasing attention to such cluster effects, as demonstrated by Porter's theories on agglomerative economics[6] and refined further by many others who studied innovation systems and their regional dimension in the 90s.[7] After decades of focussing first on comparative advantage (e.g. in natural resources)[8] and then on competitive advantage (acknowledging the role of distributed supply chains and large domestic markets)[9], analysts have recently emphasised the role of knowledge sectors in general, and technological change in particular, as endogenous to economic growth.[10] Some have emphasised the idea of 'learning regions', and have highlighted the role of public and private decision-makers in creating conditions that would attract knowledge firms and workers.[11] This reflection on the so-called 'constructed advantage' emphasises the complementary roles of the private sector, educational and community agencies, multi-level government agencies and programmes to explain the knowledge-based activities and value created. Thus the notion of constructed advantage can help to explain, for example, the remarkable rise in economic performance of new knowledge economies such as Singapore or the Republic of Ireland. Indeed, the central set of resources that appear to be key to the success of these areas is the ability of local decision makers and leaders to turn knowledge, skills and competencies into sustainable advantage. Etzkovitz and Leydesdorff (1997) coined the notion of a triple helix interaction to describe this process of governments, enterprises and universities complementing and reinforcing each other in a joint attempt to develop the knowledge economy.

But the importance of regional assets of knowledge economies, and clusters as instruments to enhance the competitiveness of regions, have not only been highlighted by economic geographers and economists researching the field. Particularly in the late 90s, policy makers and regional agencies began to pay an increasing amount of attention to the knowledge economy and its needs, in general, and the connectivity and support structures of clusters which have developed in the region, in particular. There has been a remarkably proactive attitude on the part of some city-regions, often around metropolitan areas, regarding the creation of attractive conditions for knowledge institutions and workers. Many regions and cities have sought to engage in a multi-actor policy dialogue on the best ways to position themselves as attractive 'knowledge areas'. Such multi-actor policy dialogue was also supported by the EU programme Regions of Knowledge which was introduced in 2003 as a pilot project of the European Parliament. The programme supports experimental actions which aim at developing 'regions of knowledge' through research and technological development, co-operation between universities, and cooperation between regional administrations, universities, and public and private bodies involved in RTD (policy-making and activities) at regional level. The pilot programme met with overwhelming demand (and will continue into the 7th Framework Programme) and reinforced exchange of experience between regions of different EU countries. It thus contributed to accelerating further development of this new focus area of policy interaction as well as to spreading the new discourse on knowledge regions more rapidly.[12]

6 Michael Porter (1990): The Competitive Advantage of Nations. New York: Free Press; Michael Porter (1994): "The Role of Location in Competition" in Journal of Economics of Business I(1), pp. 35-9, and Michael Porter (1996): "Competitive Advantage, Agglomerative Economics and Regional Policy" in International Regional Science Review 19 (1 and 2), pp.85-94.

7 Clusters and high technology complexes have been looked at by Markusen (1986), Porter (1990, 1994, 1996), Saxenian (1994), Sternberg and Tamasy (1999). A summary of the main factors which facilitate intraregional agglomeration is provided by Ottavino and Puga (1997).

8 The theory of comparative advantage, which is usually attributed to David Ricardo who created a systematic explanation in his 1817 book The Principles of Political Economy and Taxation, explains why it can be beneficial for two parties (countries, regions, individuals and so on) to trade, even though one of them may be able to produce every item more cheaply than the other. What matters is not the absolute cost of production, but rather the ratio between how easily the two countries can produce different goods. The concept is highly important in modern international trade theory.

9 Michael Porter, 1990, The Competitive Advantage of Nations, New York.

10 The endogenous growth theory is of course much older than the 90s, introduced mainly by Solow (1956) who already identified technological progress as the prime driver of economic growth. But the debates on technological developments as constant or variable parameter are still heated in the 90s.

11 Richard Florida (1995), B.-A. Lundvall (1992), John de la Mothe and Geoff Mallory (2003), Philip Cooke and Loet Leyesdorff (2004), Peter Maskell and Gunnar Tornqvist (1999) Building a Cross-Border Learning Region: Emergence of the North European Øresund Region, Copenhagen: Copenhagen Business School Press. A recent critique of the concept of the learning region is put forward by Phil Cooke (2006) who understands the term more narrowly as one region learning from policy approaches of another, rather than the internal learning and stimulation processes.

12 See http://ec.europa.eu/invest-in-research/funding/funding03_en.htm and http://cordis.europa.eu/era/regions_knowreg1.htm

2. HOW DO WE DEFINE A CITY-REGION?

In a recent British study which describes the challenges and opportunities for knowledge based city-regions under the term "Ideopolis", a city-region is defined as "the enlarged territories from which core urban areas draw people for work and services such as shopping, education, health, leisure and entertainment."[13] Our interviews confirm that city-regions are widely perceived as experiential realities which warrant political action. As Cooke & De Laurentis (2002) have pointed out, the Knowledge Economy is uneven in its geographical incidence. Cities are, on average, twice as knowledge intensive as towns and rural areas, in addition to their already existing advantages based on agglomeration economies. Even poor parts of a large city like London score above the country's mean for possession of knowledge-based employment opportunities.[14]

The agglomeration effects which political economists and economic geographers have investigated have also been observed by policy makers. However, these realities in economic geography are not reflected in current political and administrative boundaries. Most often, current administrative definitions of regions encompass a significantly larger area than the urban agglomeration, while municipal metropolitan units are usually significantly smaller than the agglomeration. In some cases the agglomeration may be a subdistrict of a larger region, but with little independent economic or political power.

In our study, we have selected four regions which can all be defined as city-regions. Only in the case of the Øresund do we have to qualify this statement, since Øresund comprises a metropolitan agglomeration, with Copenhagen, Roskilde, and Malmø, as well as the more removed towns of Lund and Kristianstad. While Copenhagen, Roskilde and Malmø (the latter on the Swedish side) are geographically close enough to be regarded as part of one greater metropolitan area, the process of such a fusion has only really begun recently as an effect of the new Øresund bridge and as part of the political agenda of the Øresund project. This aims at overcoming current political incompatibilities in order to make such a common metropolitan area a reality. Lund and especially Kristianstad in Skåne, the regional unit on the Swedish side, are more apart in terms of geographical distance and infrastructural connections. For Øresund, regional administrative units are currently being reorganised on the Danish side.

All the other city-regions are part of larger regional administrative units, in addition to having a city council which oversees some policy areas of the more narrowly defined city (not including the economic agglomeration). For Manchester, the decisive political unit is the North West Region which is overseen by the North West Regional Development Agency. For Brno, the relevant regional unit is South Moravia. For Barcelona, it is the state of Catalunya run by the "Generalitat". While these regional authorities have made available important incentives, strategic initiatives and support structures in recognition of the economic and social importance of the city-region for the future of the region, they naturally also have to balance such metropolitan concerns with the interests of the remote, less advantaged regions. It should be noted that, for all of the regions in our case studies, the current political administrative definitions were regarded as unhelpful with respect to the increasingly central concerns of the city-region.

As we shall see, the key issues, policy concerns and deliberations on the role of the university reach across our four regions, in spite of their enormous differences in terms of size (from 400 000 inhabitants in Brno to 4.3 million in Barcelona), national conditions, sectoral profile and even advancement in terms of knowledge intensity.

13 A Framework for City-Regions, Urban Research Summary No. 20, 2006, Office of the Deputy Prime Minister, quoted by Ideopolis, p. 47

14 The Index of Knowledge Economies in the European Union: Performance Rankings of Cities and Regions Regional Industrial Research Report 41, p.5. Cooke and De Laurentis have measured the knowledge economy by taking Eurostat data and Regions: Statistical Yearbook 2001 of the European Commission plus raw data for NUTS 2 regions for both high tech manufacturing (incl. automotive industry) and knowledge intensive services.

3. RECENT POLICY FOCUS ON THE KNOWLEDGE-INTENSIVE CITY-REGION

3.1 Regional policy development in knowledge economies according to recent literature

According to policy researchers and developers, various characteristics of regions are of importance for their competitiveness and for the productivity growth which is associated with knowledge intensive industries. Taking three relevant policy approaches, we can present an overview of key ingredients of regional competitiveness (Table 1), sorted by the research and development context, business environment, human resources and skills base, demand volume and accessibility of the region. The list of ingredients in the first white column is taken from Dunning's research study on regional innovation systems and the impact of globalisation on regional development[15], the second from an international comparison of factors impacting regional innovation (BAK Basel, 2006)[16] and the third is a summary of the "endogenous growth theory"[17]:

Table 1: Overview of Factors Contributing to Regional Competitiveness according to 3 selected regional growth theories

	Regional location factors, according to Dunning and Gray	Regional location factors according to BAK Basel Economics	Regional location factors according to the endogenous growth theory
R&D Context	• resource base, especially quality of immobile public assets (e.g. external benefits which characterise clusters) • institutional infrastructure	• innovation policy and R&D expenditures	• investment in research and development (with fiscal benefits provided by the state)
Business environment, framework conditions and internal communication structure	• macro-organisational policies • commercial environment • general investment climate • regulatory / enabling mechanisms, including degree of fiscal comfort which allows micro-reg. government to supply the necessary support services • firm- or industry-specific incentives • contribution of the region to managerial efficiency	taxation: • income taxation of knowledge workers and • company taxation	• a ready supply of venture capital • effective linkages between research universities and business
	• innate benefits from presence of upstream industries and downstream parallel firms	• industrial structure	• effective business networks (both national and international) to facilitate technology transfer
Human resources & skills base	• resource base (including skills base, but skilled labour and intelligent, industrious labour are both spatially mobile within the macro-region)	• human capital accumulation and regulation of labour market	• innovative and productive workforce, requiring higher levels of investment in training and skills
Demand Volume	• demand characteristics		• absorption capacity
Access		• accessibility (interregional and inter-continental)	

15 In "Towards a Theory of Regional Policy", Dunning (2000).

16 BAK Basel Economics (2006): Research program 'Policy and Regional Growth'. Determinants of Productivity Growth. BAK Report 2006 / 1.

17 As presented in a recent UK-oriented comparison of different cities' approaches to the knowledge economy, Ideopolis (2005) p.17. Ideopolis proceeds to present a position that goes well beyond that same economically oriented list, however. The proponents of the endogenous growth theory (Solow 1956) were among the first to emphasise technological progress as the prime driver of economic growth.

Beyond the characteristics of these approaches which describe innovation capacity and productivity mostly in economic terms, recent research and policy attention has also pointed to additional social and cultural "soft" ingredients as success factors for the attractiveness of a knowledge region. With the rise of competition for mobile highly qualified "knowledge workers", and the positive economic impact of this new class of migrants, more attention is now being paid to the fact that it is individuals who decide where knowledge will be developed (i.e. who will decide on whether a business will relocate, whether they will relocate with a business or indeed whether they will simply want to relocate in order to seek new employment in a particularly attractive environment). This attention to the knowledge worker and his or her inclinations has been given new momentum and popularity with the bestselling studies of Richard Florida. His successful work, "The Rise of the Creative Class" (2002), made an impact by consulting a wide range of cities on the conditions and potential of raising their attractiveness in the eyes of the 'creative class', i.e. the knowledge workers. According to Florida, 'knowledge cities' compete on their capacity to attract, retain and integrate talented individuals who place value on creativity. This capacity relies on the quality of local culture, the presence of local amenities as well the existence of a 'thick' labour market (offering the possibility of lateral moves for knowledge workers who are looking for new challenges). A knowledge-based economy is characterised by a range of networks of creative institutions, businesses and individuals who initiate and implement technological, economic, social and cultural innovation. Like Porter and others, Florida emphasises the attempt to optimise such relational capacity which constitutes a key area for regional policy attention:

According to Florida, the success factors of a knowledge city comprise:

1. Significant growth in leading edge service and ground-breaking economic sectors
2. Strong dynamics of innovation across all sectors, within all institutions.
3. Culture of knowledge (disseminated and valued)
4. Open flow of information
5. Pronounced support for creative activities
6. Strong link between arts/culture and scientific/technological knowledge
7. Significant proportion of the labour force working in creative positions
8. Citizenry actively involved in development of their city, its identity
9. Abundance of places and events valued by knowledge workers

Likewise, the already mentioned study of the British Work Foundation, "Ideopolis", goes beyond purely economic factors of competitiveness. On the basis of a comparison of 10 British and 4 foreign cities and their approaches to the knowledge economy, it develops a model of an "ideopolis" which emphasises social factors of inclusiveness and participation as well as long-term sustainability:[18]

Cities that want to become an Ideopolis, according to the Work Foundation, should not only have high levels of economic success and knowledge intensity but also:

- ***A diverse industry base including distinctive specialist niches***
- ***A university that has a mutually beneficial relationship with the city, leading to industries based on research strengths, knowledge transfer to businesses and the retention of graduates,***
- ***Strong communications infrastructure and good transport links within the city and to other cities,***
- ***Distinctive long-term "knowledge city" offer to investors and individuals alike,***
- ***Strategies to ensure that deprived communities also benefit from the economic success associated with knowledge.***

18 Alexandra Jones, Laura Williams, Neil Lee, David Coats, Marc Cowling (2006): Ideopolis: Knowledge City-Regions. London: The Work Foundation.

They should use the nine drivers of an Ideopolis which are:
1. An appropriate physical knowledge city.
2. Path dependency — building on what's already there.
3. A diverse industry base including distinctive specialist niches.
4. High skill organisations.
5. A vibrant education sector embedded in community and economy.
6. A distinctive 'knowledge city' offer.
7. Strong connectivity within and outside the city-region.
8. Strong leadership around the vision of a knowledge city, supported by networks and partnerships.
9. Community investment.

3.2 Relevant policy competences in the regions of this survey

In our survey, we find that each of the key ingredients to an innovative region listed in these different approaches to knowledge cities is being fostered by the regional or municipal authorities in some form or another, but to widely differing degrees. The different choices and weights attributed in each region depend on a variety of factors, from path dependencies of culture, heritage and sectoral structures, to differing competence distributions between regional and national authorities in the respective countries. It should be emphasised that regional legal competences with respect to knowledge capacity can be quite limited. In particular, research and development investments and grants tend to fall under the competence of national ministries or funding agencies. Likewise, the institutional grants which provide the bulk of the university budgets derive from national sources. The responsiveness of universities to regional business and development thus most decisively depends on national incentives rather than regional funding mechanisms, in particular on the degree to which these national instruments provide incentives for innovation activities or other forms of engagement in the region. Many European governments have recently established university funds for innovation either in the form of research funds for universities or university/business cooperation or in the form of a whole "third stream of funding" (UK) which is attributed on the basis of a wider range of economically relevant engagement with non-academic partners. Such funding channels are intended to enhance the connectivity between universities and their environments and thus indirectly benefit the regional knowledge networks. Furthermore, national regulations on taxes, business environment, labour law etc. affect all regions in the country. In contrast, regional authorities do not exert great influence on university behaviour through financing mechanisms or "hard" regulations.

However, it should be noted that some regions still have significantly more means to influence such behaviour than others. Among our cases, the UK and Spain provide more regional autonomy and specific regional (or "state") resources than in the other two cases. In the UK, for instance, the government decided to increase the direct influence of regions on their skills and research base by giving them greater competence and the means to forge their own futures. Thus the regions, managed by the new Regional Development Agencies (established in 2002), have gained political and financial weight. The North West RDA is highly aware of the region's knowledge economic potential and room for expansion and improvement, as reflected by its readiness to invest in major projects which are designed to boost the infrastructure, such as the recent merger of the University of Manchester which it supported with a £35 million investment, or the £34 million investment (co-funded with the European Objective One Structural Funds and the Department of Trade and Industry) in the National Bio-manufacturing Centre in Speke, Liverpool, which was opened on 1st November 2006 and which aims to establish England's Northwest as one of the foremost bio-manufacturing regions in Europe.

But even in the UK, where the new regions have a comparatively larger scope and greater resources, direct investments in universities, as in the support of the above-mentioned merger, are the exception rather than the rule. Otherwise the usual form of regional support for universities, which may help to steer university attention to regional concerns, relates to local services and infrastructure, ranging from transport and urban space, planning and building permits and structures, to research-relevant infrastructure and services to newly hired researchers. While some additional research grant money may exist, it is insufficient to influence research or innovation behaviour of universities significantly.

Given such limited steering capacity, the regional policy-makers in our case studies use the competences they have in a targeted manner to bring university and businesses into one connective tissue. A good example is the use of regional competence in urban planning and infrastructure. Having been made increasingly aware of the importance of flexible space and high quality infrastructure for competitive research and innovation by universities, regional authorities often link the provision of such space and facilities to projects of joint use and planning for an inter-institutional community of users. Moreover, regional agencies seem to have become acutely aware of the fact that they have some scope to increase regional competitiveness by creating attractive state-of-the-art infrastructures and making them more widely available. While the initiative to build or support a given infrastructure often originated with a university in our case studies, regional planning or development agencies have been described as remarkably responsive and supportive, in all four cases - although with different time lags.

Furthermore, in all four cases, we observed that regional authorities go beyond the traditional support channels to influence university behaviour by trying to create communicative structures which enhance the links between different knowledge intensive institutions, with university-business linkages being at the centre of attention. Often inspired by recent theories of cluster-based competitive advantages (often mentioned by interviewees[19]), regional actors, both public and private, try to promote the flow of information and knowledge on common opportunities of development and show how other partners in the region can complement each other and benefit from each other's proximity. Beyond these common focus areas of regional policy, we find a considerable variance of the attention paid by regional policy makers of our four regions to the different areas, as Table 2 illustrates. To some extent such variance reflects the different scope of regional competences in the respective countries. But the variance does not correlate merely with the varying extents of regional power and resources. Many other factors, cultural, social and economic, determine the distribution of weights of attention.

19 Cluster development is spreading at full speed all over Europe, also helped by EU regional development programmes. For instance, the CLUNET project led by the Northwest Regional Development Agency (NWDA), has been developed in response to an EU call for regional development agencies across Europe to develop and share policies and networks to develop cluster activity with 16 partners from cluster organisations throughout Europe and Canada. Like the other regions in our survey, the Northwest Regional Economic Strategy identifies the need to undertake cluster programmes in priority sectors which have international growth potential, including biomedical, energy and environmental technologies, advanced engineering and materials, food and drink, digital and creative industries and business and professional services.

Table 2: Policy areas, competence distribution and policy attention in the survey's four regions

Policy area	Regional or national competence/ scope for regional policy impact	Regional actors' degree of engagement:			
		Barcelona	Brno	Manchester	Øresund
R&D investment in people and projects	Mainly national, some additional regional funds for targeted major projects	High Considerable competence of the state, high degree of attention, e.g. ICREA salary top-ups for international researchers, support in hiring of int. researchers, support for major biomedical projects.	Medium No regional resources for R&D but significant support for submitting major grant proposals for Structural Funds in support of R&D infrastructure	High Investment in merger of University of Manchester, including support of hiring of world-renowned "iconic professors"	Medium Very limited regional competence. Some project money as incentive for cross border university networking and creation of research relevant networking platforms, mostly funded by EU Interreg programme.
Skills base: investment and priority setting	Mainly national, some additional funds at regional level	Medium Attention to influx of internationally trained researchers (ICREA) but little systematic attention to wider set of skills needs and adjustment	Medium Awareness of high number of students as major asset and to the need to enhance entrepreneurial skills but otherwise little systematic attention to assessing and adjusting skills needs to regional demand.	High Systematic attention to strengths and weaknesses of regional skills base with action plan to address them, "Regional Skills Partnership"	Medium Cross border scope makes systematic skills discussions difficult, but evidence of national or regional skills adjustments to students', graduates', and researchers' entrepreneurial skills
Venture capital for innovation investments	National and regional	Medium still building up VC scene, especially in science park environment, also with the help of national programmes	Medium still building up VC scene, also through national programmes (Czech Invest)	High Mainly through subject related actors, significant successes reported with attracting VCs in Biomedical and Biotech areas.	High Mainly through subject related actors
Infrastructure • transport • housing and other urban structural development • research infrastructure • educational infrastructure • health and other social services	Core area for regional policy development and influence on knowledge based institutions	High Major extension of infrastructural connections planned Major urban area extension for knowledge development Several major projects in biomedical infrastructure development	High Extension of limited airline connections Major urban area extension for knowledge development Major building capital investment planned in medical campus and Central European Technology Institute project (intensive development sites)	High Major extension of infrastructural connections planned Major urban area extension for knowledge development Major building capital investment in "Oxford road corridor" and other areas of knowledge intensive development sites	High Major investments in building Oresund connectivity between both sides of the sound, Major investment in ICT campus in Copenhagen Orestad, as well as other knowledge intensive campus environments and science parks in Copenhagen, Malmø.
Taxation of individuals´ income and taxation companies	Nationally determined	Low	Low But Czech tax climate very business friendly	Low But UK tax climate very business friendly	Low
Enhancing quality of life Attention to citizens´ attitudes, ideas, participation in city/ region´s planning and development		Medium	Medium	High City Growth Manchester Development aims at enlarged participation in knowledge economy. Events to include citizens in science development.	High Events to include citizens in science development.

4. THE NEW RELEVANCE OF THE UNIVERSITY

4.1 Universities as the centre-stage of the knowledge economy

The rise of knowledge economies, increased global competition, and an enhanced inclination of, and EU support for, policy-makers to look across borders for ideas and good practice, have all contributed to the emergence of an international discourse on knowledge regions. Those same trends have also helped to move universities to the centre-stage of the knowledge economy project. As prime producers of knowledge, universities have become key institutions. Consequently, they have also been submitted to more intense scrutiny. Is the kind of knowledge they are producing and disseminating really the kind of knowledge that is most needed in the knowledge economy? Do the channels through which this knowledge flows into production and increased productivity really meet expectations? The following comment is representative of this ongoing debate:

"A strong science base need not lead directly to wealth generation. For instance, although the strength of the UK science base has long been acknowledged, it has only recently begun to translate this into the development of high-tech clusters accompanying knowledge transfer between higher education and industry". (David King, Nature, 2004)

Indeed many policy makers, business representatives and some university leaders and researchers emphasise that additional, wider and more modern channels are needed to allow for a better and wider flow of knowledge to practice in general and commercialisation in particular. Of course, in recent years, interest in knowledge transfer usually applies to natural science and technological research since the latter is perceived to be most directly relevant to wealth creation. Accordingly, innovation programmes and grants have been developed, technology transfer offices created or expanded, connective institutions established to encourage the flow of knowledge from the realm of university research to product development. At the same time, high levels of unemployment and concerns with the duration of university studies and employability of university graduates have led to a wider recognition both outside and inside universities that the relevance of university education, research training and research should be a central concern of current university reforms. Employers continually emphasise that university education should pay more attention to fostering key competencies such as communication and presentation skills and the ability to work effectively in teams and international environments.

The problem of slow technology transfer is widely perceived to be linked not only to structural and institutional hindrances. It cannot be fixed simply by a new design of financial reward instruments, some new management functions and units and supporting additional resources (which are difficult enough to mobilise). The problem is widely acknowledged to be rooted more deeply in institutional and professional identities, values, codes of honour and immaterial rewards which are inherent to the scientific community. In spite of the new importance of technological and scientific (pre-commercial) innovation in the minds of policy-makers, the scientific community and code of professional honour is still largely predicated on the recognition of scholarly pursuit as expressed in academic peer-reviewed publications. But researchers increasingly need and seek industry funding to realise their research projects. More and more often, research projects are co-defined by businesses and universities to ensure mutual benefit. Moreover, according to many of our interviewees, lengthy experience with industry cooperation reduces mistrust and enhances mutual understanding of each other's needs and perspectives. Attitudes are changing slowly but surely, as confirmed not only in the Lambert Review (2003, p.3) but also in many of our interviews. A growing number of university representatives no longer regard universities as the sole source of knowledge from which innovation flows to the outside world but also recognise and respond to the flow of knowledge and innovation from the world of business and practice to university. They see these as stimuli which help them to redefine problems, identify new research questions that may even be of intrinsic (not just applied) interest, and review the education and training they provide to adjust to new competence needs.

The need for commercially relevant university research expertise is reinforced further by the fact that companies "are moving away from a system in which most of their research and development was done in their own laboratories, preferably in secret, to one in which they are actively seeking to collaborate with others in a new form of open innovation", as Lambert reminds us. With research and development becoming global, universities are becoming very attractive partners for businesses. "Good academic researchers operate in international networks: they know what cutting-edge work is going on in their field around the world. Unlike corporate or government-owned research facilities, university laboratories are constantly being refreshed by the arrival of clever new brains." (p.3)

Thus, all three parties of our triple-helix system -- politicians, businesses representatives and university officials – stress the new relevance of university research and education. Politicians become interested in universities as motors of the knowledge economy. Businesses need universities, directly or through recruitment of their graduates, to provide relevant research expertise in order to become or remain globally competitive and enabling them to develop innovative products. Universities stress their new political visibility in order to mobilise the funding which they need to recuperate from years of under-funded expansion and to meet the rising costs of up-to-date scientific infrastructure. It is in this confluence of trends that the new discourse and practice of knowledge region development emerges and falls into place. Politicians, public agencies, businesses and universities become aware of the fact that they need each other to improve their respective and combined performance and that only then they may hope to survive global competition. The widely quoted attention to connectivity and density of tacit knowledge flows pushes all three into one common cause, a new quest for a stimulating ménage à trois. The common perceptions of opportunities and threats constitute the ground from which multi-actor visions, strategies and even concrete action plans emerge. The core element of any such visions and strategies, as we find in those of the knowledge regions investigated in this study, consists in bringing universities, regional public agencies and private companies closer together into a competitive strategic alliance, in the spirit of what Dunning calls alliance capitalism (1997).

Even the regions with a world-leading record of research and innovation capacity and success, such as Massachusetts, are worried about losing their lead if they do not foster multi-actor collaboration.

> "The implication of the shifts toward open sources of innovation and multi-disciplinary research is that states and regions that promote a broader culture of collaboration and specific strategic alliances in targeted technology areas will be the big winners, supporting not only local industries, but attracting major outside investment."
> The Massachusetts Technology Road Map and Strategic Alliances Study 2004[20]

In many countries and regions, citizens also become increasingly aware of the importance of the knowledge economy in general, and the role of the universities in particular, to ensure current and future wealth creation. As citizens and tax payers they face the challenge of how to make informed decisions. The omnipresence of new technological and other knowledge-based developments increases the demand by politicians and the general public for university expertise which would identify emerging opportunities and threats and develop solutions. Thus the public may be said to constitute a fourth party whose concerns and ideas have to be taken as seriously as those of the others. Indeed, we could say that knowledge regions are not so much built on triple helix interactions but constitute a quadruple helix system.[21]

20 Batelle Memorial Institute and Mass Insight Corporation (2004): Choosing to Lead: The Race for National R&D Leadership and New Economy Jobs. Case Statement and Core Technology Audit. The Massachusetts Technology Road Map and Strategic Alliances Study. See http://www.massinsight.com/docs/Case_Statement.pdf

21 The idea of the importance of the public as a fourth party in the system was already proposed by Michael Mehta (2002), at the International Workshop on Science, Technology and Society in Singapore. Mehta proposed that the science and innovation system should include the public as a Fourth Helix, given its influential role e.g. regarding the acceptance and resistance to new technologies. Likewise, Merle Jacob argued that the public be included as a fourth helix at the "Triple Helix Conference" in Copenhagen. This position was criticised by Leydesdorff and Etzkovitz who find that the free public should seen more as a fundament for a functioning triple helix system than a party in the system. While an interested supportive public can be seen as a necessary foundation for a functioning knowledge the public should also be treated as a communication party in the system. Addressing and including the public demands a different set of communication processes and instruments which the knowledge regions are currently beginning to pay considerable attention to.

Thus the university has moved centre-stage, not because the world has suddenly converted into a community of curious knowledge-thirsty citizens, but because the country or region needs the university as a source of innovation and future innovators to ensure its economic and social success.

The newly-felt relevance of the university expresses and realises itself most easily in the university's engagement in the region since personal contacts and cooperative projects can be fostered most easily in geographic proximity. We find that it is not only regional agencies and businesses which are looking to universities as potential sources of future knowledge wealth, but also universities which are reaching out to regional partners to realise the new demand for relevance, contribution to wealth creation and proactive transfer of knowledge. While regions seek to become globally competitive, university partnerships with regional actors are also no longer perceived to be provincial undertakings by fellow researchers, but become part of the same international competition in which academic researchers should thrive. For many university officials and researchers, regional partnerships become one more window onto a global research and innovation community of practice. In the eyes of business, politics and the public, the university finds itself facing an enlarged realm of impact which spans its traditional functions of providing new research and meaningful up-to-date and long-term education and reaches out into realms of knowledge transfer that the university is still in the process of fully making its own. The new demands are manifold, and at the same time the pressure on performing well in the old core functions of research and teaching has not eased at all.

4.2 New demands on the university

Just what do these new demands mean in reality? And how do they relate to the old and new university functions? What are their implications for the region? As the overview in Table 3 shows, universities are confronted with a wide array of new demands which are associated with the enlarged realm of impact. Most of these require new ways of looking at university functions as well as new competences and additional resources. There are frequent complaints that the latter are only provided, in most cases, to a very limited extent. We have noted that it is the politicians and businesses who stress the concerns of technology transfer and the commercialisation of knowledge, demanding increased attention to applied research and even commercialisation of research results. In this survey and elsewhere, these demands are often perceived with mixed feelings by university researchers since they go against the traditional grain and hierarchy of university values which sets basic purpose-free research as the highest pursuit of its members. At most universities visited in the course of the site visits, such resistance were reported to persist even though mentality changes were also observed everywhere. Seen as a whole, beyond the minority of enthusiastic researchers with many innovation initiatives and cooperation projects, we can say that universities as institutions have played a responsive rather than proactive role with respect to these new demands.

However, if we look at other aspects of these increasing demands, we can see that universities are far from being only responsive. Indeed, universities were often the first to stress the wider scope of knowledge transfer beyond the narrow bounds of technology transfer. They happily engage in discussing issues of public concern with the wider public or organise their research in ways that allow it to identify, address and solve wider technological, societal, economic or political problems (e.g. in the areas of environmental issues, public health, cultural conflict). Furthermore, universities in our regions show increasing attention to letting the wider public gain some insight into the excitement of the research process, enhancing not only public understanding of science and research but also identification with research as a human pursuit. Concerns with widening access to knowledge production are also shared widely in the university world. Furthermore, the concern with an optimal knowledge environment, represented by the final ring of Figure 1,

is often proactively pursued and brought to public and political attention by universities. In this context, many appeals are made by university members and leaders to the unique institutional conditions of universities which should guarantee maximum freedom and innovative capacity of its researchers, teachers and students. But many other aspects of institutional conditions, such as interdisciplinary interfaces and flat hierarchical structures, are also being reflected upon and experimented with, in terms of their impact on the optimal knowledge environment. Regional agencies and knowledge-based business often seek dialogue with universities to develop their own solutions for knowledge-friendly creative environments.

Figure 1: The new relevance of the university: An enlarged realm of expected impact

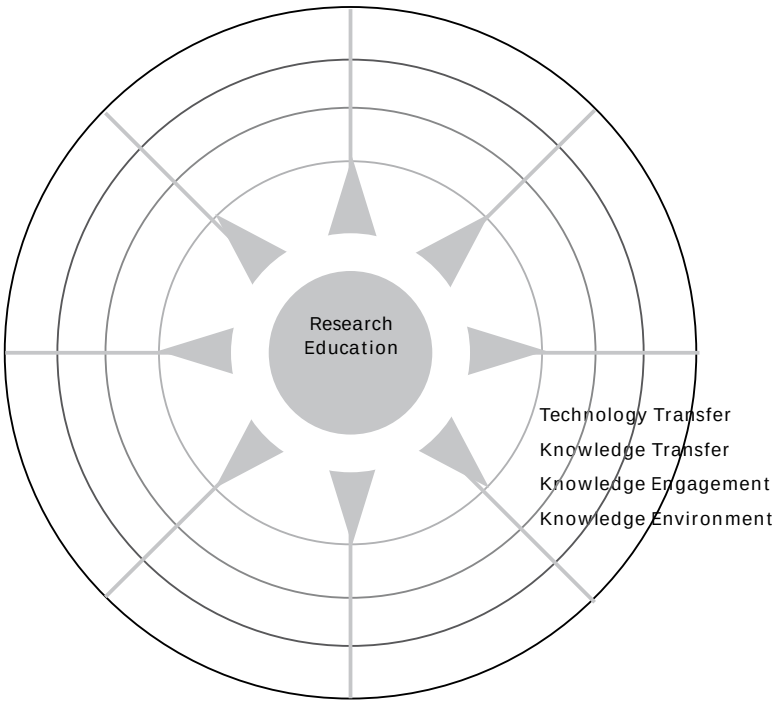


Table 3: Implications of New Demands for Universities and Regions

New demands	Implications for universities	Implications for regions
Educating students and researchers:		
More attention to research skills, interdisciplinary, international and communication / team skills demanded by globally competing employers. Attention to skills: are universities producing the right kinds of graduates?	Competences as structuring principle of university education. Increasing dialogue with employers on skills needs, at subject level, at institutional level. Adapt university programmes, include projects, methods which will foster transferable skills, early exposure to research processes, and introduction to entrepreneurial dimension of research	Regional and national-level skills needs can be defined with the help of regional institutions / stakeholders. Institutional responses will differ depending on type of institution. Differentiated responses of institutions can be coordinated more easily at regional level so as to offer wide variety of programmes which open range of options to different student profiles.
Conducting, managing and supporting research:		
Politicians and policy-makers are becoming aware of global competition for mobile knowledge resources (businesses, students, researchers, managers) and expecting universities to be able to compete.	Since research intensive institutions are highly recognised and more readily resourced, institutions compete in increasing their research capacity. Attracting competitive research resources, the brightest students, PhD candidates and researchers becomes essential if institutions are survive in the face of tough competition. Research infrastructures have to be shared as much as possible. Costly investments have to be well placed (pressure on good strategic decisions).	Research infrastructures can be regionally based projects, i.e. can benefit from support by regional public and private institutions. Such infrastructures can also be meeting platforms for researchers from different institutions but with common needs, complementary expertise, and compatible interests. Regions can make themselves more attractive with major state-of-the-art infrastructure, placing pressure on supporting promising sectors. Regional platforms for knowledge intensive firms (e.g. science and technology parks) and for particular sectors (clusters) can help regional innovation capacity
Transferring technology and knowledge:		
Research results are to be transferred into innovation processes and product development, optimising the flow of university knowledge into knowledge-based wealth creation.	All research intensive universities have created and expanded their tech transfer offices in the last decade (some before). Tech Transfer offices have extended their portfolio of core competences and tasks which ranges from IP protection, support for filing licences and patents, and helping with industry collaboration contracts, to technology scouting, matchmaking firms and university experts, mobilising university researchers' interest in innovation activities and contacts.	University / industry collaboration has to overcome differences of interests, values, and cultures, all of which can be bridged more easily through building a basis of trust with the help of regular meetings, which in turn are more easily supported at a regional level.
University research and education has more to offer society than new technology or product-relevant research results. From updating skills of employees in knowledge-intensive professions to identifying and solving social problems, university expertise is needed in an increasingly large range of professional and political fields.	Knowledge transfer and communication is increasingly integrated as a core function of university processes. Not only does the university justify its existence through its impact on society but it also needs the latter's support.	Knowledge transfer is built on communication and contacts which are most easily fostered in geographic proximity.

Engaging others in knowledge creation:		
A knowledge-based economy and society has to value knowledge sufficiently to invest time, imagination and money into it.	Universities have to show not only the value of knowledge to society and economy but also convey the excitement and rewards of the process to help citizens identify with knowledge creation and to attract more young people to such creative processes. Open doors, science exhibitions, university/ school projects, public discussions or lectures on major topics of interest are all expressions of this central concern.	Such communication, projects or events are most often organised for a regional audience.
Creating an attractive knowledge environment:		
To be competitive, knowledge economies and societies, regional agencies, knowledge-based enterprises and universities all seek to create environments which attract and foster creative individuals and can support each other in these attempts.	Increasingly, universities are becoming aware of the international competition for talent, at graduate and at senior level, and of what they have to offer to attract the best. Qualified individuals are not just attracted by good infrastructure and resources that allow them to realise their ideas but also by their intellectual environment, as characterised by colleagues in the institution, and possibly also other institutions in the area, and by the ambient communication culture.	Regional actors can do a lot to enhance the "creative environment" for different institutions by fostering inter-institutional exchange, thereby increasing the number of relevant partners in different sectors, by organising events that allow experts to learn from each other and engage in joint learning (new relevant scientific areas) or foresight activities. Urban development can also contribute to stimulating mixes of different groups of creative individuals.

The implications of the new demands for universities, as listed in Table 3, do not just amount to new focus areas for institutional development discussions and decision-making, but also require new communication processes, new or adapted professional competences of professors and administrators as well as additional resources to underpin the new tasks.

The new demands on the functions of the university, and by implication on its role in the region, also result in a whole range of new cooperation projects as well as experiments with new cooperation instruments. University researchers already maintain well-established research cooperation projects with private and public partners. Many university teachers offer continuing education and professional development courses to professionally active university graduates. In addition, universities are now setting up (sometimes with the help of intermediary organisations) other channels of communication geared at optimising the flow of ideas and mutual stimulus between universities and outside partners. In our site visits we encountered the following types of cooperation or communication measures:

- Doctoral theses, which are co-tutored by university and industry advisors, were reported to be an excellent way to gain deeper understanding across institutional boundaries and cultures. Of course, these also presuppose some trust in each other's quality standards.
- Regionally organised internships to facilitate (low-risk) recruitment reduce brain drain and build contacts in the region.
- Theme lunches or breakfasts at which university representatives and professionals exchange experience and expertise or learn about and address new issues of common concern. Such meetings should be informal enough to help new encounters.
- Networks defined around subject specialities bringing university researchers and professionals together in regular meetings which build mutual understanding around areas of common interest. Foresight and think tank activities in which research and industrial expertise are brought together are perceived as being helpful since working together in small groups, exploring new ideas, helps bonding and identification of leads toward future cooperation.
- Breakfast meetings with key players from the metropolitan and regional areas (public and private sector) to facilitate identification of common interests, build trust and help each other with relevant contacts.
- Student fairs at which students and employers get a chance to introduce themselves and get to know each other, resulting in internships, traineeships and employment, are greatly appreciated by both parties. Employing qualified workers is still seen as the most important form of knowledge transfer from university to the world of practice.
- Open days or science exhibitions present university research and its relevance to the public, in participatory forms which encourage identification with the process and values of research and knowledge development.
- Common acquisition and use of large scientific technical infrastructure are often helped through regional contacts. Such common use of technological facilities includes sharing technicians and administrators, as well as additional cooperation projects and communication around this common use.

While the readiness of universities to invest in these and other cooperation and communication activities has increased at most universities in recent years, it also varies widely between different institutions and between different units within an institution. Such variation does not only have to do with the relevance of the subject area to societal and economic concerns but also with the different perceptions of what the role of the university as an institution should be, with its explicit and implicit mission and profile. The interviews revealed different underlying models of the role of the university which are not just theories but which also function as drivers of cooperation with the region.

4.3 Four models of the role of the university

On the basis of the study's many interviews, we can distil four conflicting models of the role of the university and its relation to the non-university environment. These models seem to co-exist not only in the same region but also within one institution and sometimes even within one and the same person. While two of these models have been with us for decades (the second and fourth models), the two others may be seen as of more recent vintage and are promoted by the regional development initiatives described in this study. Clearly, all four models entail different versions of how the university would relate to the region.

The first model may be coined the sober view of the university. According to this model, the university is just another knowledge-based institution, not fundamentally different from knowledge-based business, only perhaps with a greater number and wider range of experts. This model sees the university's relation with the region as one of exchange of its knowledge and knowledge workers with the other institutions in the region.

The second model may be called the social view of the university. It sees the university as an important critical counterbalance to governing forces and attitudes, be they market forces or mainstream societal attitudes. The public role of the university lies in its ability to widen the access to knowledge and its benefits to as wide a range of individuals as possible. The university would also be the institution that seeks to be the first to identify and define future developments and problems and to offer solutions to complex societal concerns. In this model the university tries to engage in a dialogue with regional actors in order to identify their needs and respond to them.

The third model entertains the creative view of the university as an institution that is or should be concerned most essentially with optimising and nurturing the creative potential of individuals and of teams. Such optimisation may often involve reserving resources, time, and space for high-risk unpredictable research which cannot be defined ex ante in terms of its impact on regional or other extrinsic development. However, the university's members will still seek a vivid dialogue with outside partners in the regional environment to allow for stimulus and fresh perspectives on their own and other domains so as to realise full creative potential. In this model, the university entertains a relation of mutual stimulus and support with other regional actors, in a common attempt to optimise the conditions for such creative environments.

Finally, the fourth model could be seen as the purist view of the university, which has been dominant in the Humboldtian university. According to this view, the university has to seek a critical distance from its social, political and economic environment in order to optimise its innovative and early-warning potential. Also, the objectivity of university research is regarded as liable to suffer from close engagement with "real world concerns". While the university's researchers and teachers should convey their findings to the outside world, the process of research itself, and even teaching, should be as separate as possible from such concerns. Seen from this perspective, the "ivory tower" may receive a lot of fashionable bad press but time will show that it has its function after all, bringing sustainable benefits for society in the long-term. The relation of the university with the region is one of mostly unidirectional knowledge transfer and dissemination from the university to its stakeholders.

In all of the above views, the university is seen as a central actor, if not a key motor of regional development. Nevertheless, the agility, scope, nature and instruments of the university's engagement with the region are likely to differ significantly in accordance with the dominant view held by its members. As mentioned, the views described above do not only vary from one institution to another but coexist in one and the same institution, even within individual departments. Different strategies, instruments and projects of cooperation will be accepted or rejected according to the ideological mix of each unit as regards the university's role as an institution and its role in the region. Thus, to change the course of action of a university's engagement with its environment in general and the region in particular, may not just be a question of adopting new measures, but may imply a change of mentality and institutional identity, at least of parts of the institution.

5. INGREDIENTS AND PHASES OF DEVELOPING THE KNOWLEDGE REGION

5.1 Leadership

In each of our case studies, interviews with a wide range of actors revealed that the initial vision and initiative to develop the common cause of knowledge region development begins with a very small group of people. Sometimes only two or three people believed in the urgency of such a joint effort and managed to convince others to join the cause. In every city, not more than a handful of names were mentioned as the key political proponents of the knowledge region development. In addition, a small group of individuals, with different functions, managed the process and broadened its impact. These were usually intermediaries or brokers, as individuals or as part of organisations, whose importance cannot be overestimated (see section 6.5). The momentum of the process was widely judged to be strongly related to the drive, imagination, communicative and networking talents of such brokers.

In spite of the considerable size of the cities (ranging from 400 000 inhabitants in Brno to more than 4 million in Barcelona), there was general agreement among different representatives of different institutions that the development of the city as a knowledge city-region did not just depend on resources, a sufficient and diverse skills base and a set of scientific areas of excellence with critical mass. The will and commitment of a few key charismatic visionary individuals who did not shy away from the extra time and effort needed to bring different perspectives together into a common agenda was essential. Often these individuals were widely recognised visible university scientists who had been actively engaged in innovation or other civic partnerships outside academia and had developed an influential network of non-academic contacts. At two of the four cities, a rector had been among the initiators or the key initiator of the process. In the four European regions visited in the context of this study, as well as in Montreal, leaders of the knowledge development process always came from the university or public policy sector, while industry managers joined the process rather than initiated it. However, other studies show that this can be different in other regions, as e.g. in the Scottish IT development of the 1990s.[22]

Without such leadership, these cities would still have the same set of strengths and opportunities, all of which may make outsiders recognise them as knowledge intensive cities. However, they would not have been able to design and realise new major projects as easily. They would not have built common interests as actively and concertedly across different institutions in order to realise and expand this potential. They would have been unable to promote their strengths as explicitly to the outside world.

22 Ewen Peters, Neil Hood, and Stephen Young (2000): "Policy Partnership in the Development of Knowledge Industries in Scotland" in Dunning (2000), pp.259-285.

5.2 Identifying strengths and opportunities, creating internal transparency

The leadership does not develop a vision ex nihilo. There has to be some critical mass, strengths and development potential in terms of knowledge intensity. This would include a sufficient research and skills base as well as enough infrastructural assets which have created competitive advantage and international visibility. General recognition of all of these assets gives the vision of the process leaders some credibility. Particularly, the strengths and weaknesses of the research base demands meticulous attention. Research investments are not only very costly but potentially also most rewarding since R&D activities in a given sector are likely to make those clusters "self-sustaining with only small marginal contributions from public authorities" (Gray and Dunning, 2000). Accordingly, decision-makers and policy-developers have to make sure they select a critical mass of technology which has great potential for future development (p.425). The same caution could be observed in our policy environments. In all four cases, the research assets had been analysed in depth in terms of strengths and weaknesses, across several clusters. A more in-depth analysis followed in other major areas (e.g. biotech and biomedicine, in all four regions). On the basis of this analysis, key areas that provide the requisite strengths and potential worthy of expansion were identified. In all related documents, the opportunities (and need) for enhanced synergies were highlighted and often formulated concretely in terms of actors concerned and planned actions.

To describe the research and innovation capacity of the knowledge city-region, all the four cities highlight the strengths and opportunities provided by the density of universities and other public and private research-based institutions, number of students and researchers in the region. The number and renown of already established knowledge-based enterprises, especially multi-national companies, as well as existing and planned relevant infrastructures are also listed as key assets. In addition to this, regions also point to the disposition of businesses to innovate or adopt scientific and technological innovation. The innovation capacity of SMEs (Small and Medium Enterprises) is a frequently mentioned point of concern. While small university start-ups are by nature innovation-driven, many more traditional, often family-run, businesses have difficulties identifying and seizing innovation opportunities. All four regions focussed both their political and university attention to remedying this situation. Finally, the level and degree of recent foreign direct investments in the regional knowledge economy are frequently mentioned and seen as attractors for other potential knowledge-based businesses and researchers. The idea of a dense and multi-faceted knowledge environment is seen as a key attractor to knowledge businesses and their employees, analogous to the recent suggestion by relevant research that "proactive general regional policies can play a long-term role in attracting knowledge-intensive investments by making the commercial environment friendly to such investments" (Gray and Dunning, 2000), thus constructing comparative advantage (Cooke and Leydesdorff, 2006)[23]. But strengths and opportunities were not just compiled for external promotion. They served as a basis for strategy development including explicit analyses of weaknesses and threats, as well as for internal transparency between different types of institutions. In particular, greater transparency was felt to be needed for different business sectors, where companies were not sufficiently aware of the innovation opportunities which university research could offer them. Written documented overviews of research capacity were regarded as a first necessary step. But additional transparency, tailor-made for individual requests, was to be created by intermediary organisations which were often put in place precisely for that purpose.

23 Phil Cooke and Loet Leydesdorff (2006): "Regional Development in the Knowledge-Based Economy: The Construction of Advantage." Journal of Technology Transfer. Special Issue, pp. 1-15.

Important occasions also arise in relation to funding opportunities and events. Of particular significance are the EU structural funds which have had a major impact on building the science infrastructure in Barcelona, Manchester and Brno:

- In Barcelona, the structural funds supported the establishment of Spain´s first Science Park which is now serving as a role model to other regions in Spain and is attracting knowledge intensive investments to the city. The imminent end of these structural funds is also forcing the region to look for alternative ways to create a self-sustaining knowledge environment.

- In Brno, the recent plan to develop a major science infrastructure proposal for support to the structural fund is acting as a catalyst for further development of the knowledge region and was widely regarded as an essential success factor for the next phase. The Regional Innovation Strategy emphasises that, after the admission of the Czech Republic to the European Union, the possibility of exploiting financial support in the form of structural funds has proved a stimulus. These funds (especially the Operation Programme Industry and Entrepreneurship) are aimed at supporting innovations and increasing competitiveness of Czech enterprises generally.

- In Manchester, research infrastructures have been established and expanded with the help of structural funds. Representatives of different institutions in Manchester also observed that the structural fund projects helped different types of regional actors to build communication channels, which was of major importance in more recent phases of knowledge region development.

- While neither Øresund nor its constituent Danish and Swedish regions could benefit from the EU structural funds, the EU's Interreg programme was instrumental in building the cohesion between the two regions of Greater Copenhagen and Skåne, e.g. by supporting the creation of such cross-border sector platforms as the Medicon Valley.

Apart from creating attractive corporate and individual tax conditions, national-level policies can greatly contribute to the competitiveness of knowledge regions through funding opportunities which target innovation activities, university / business cooperation or regional knowledge clusters. Thus the Third Funding Stream Initiative in UK has influenced university behaviour significantly in rewarding innovation activities which are often conducted with regional partners. The Czech government provides a wide range of innovation and investment incentives for businesses. Thees include a 50% subsidy of investment costs for business activity, training and retraining for technology centres and business support services as well as corporate tax relief for up to 10 years for manufacturing, job creation grants, training grants and infrastructure support and land transfer at symbolic prices. With the help of a national Cluster Programme it also supports Cluster formation, with selection criteria attached which force a group of interested institutions in a cognate sector to prove that they have developed sufficient critical mass and have analysed their competitive position. In Øresund, the Danish national innovation programme has increased cooperation between university and businesses by providing funding for PhDs to be conducted and employed at businesses, as well as by supporting the establishment and strategy development of business-university networks which are supposed to bridge the different mentalities. In Denmark, innovation is also helped by a public Venture Capital for business ventures.

Major regional funding opportunities have been provided e.g. by the North West Regional Development Agency, by supporting research infrastructures, including major support for the merger of the University of Manchester, or by the Generalitat of Catalunya which has supported the recruitment of highly qualified international researchers with financial help to top up salaries and with start up funds (ICREA).

Individual contacts of key personalities provide opportunities that should not be underestimated. In Barcelona, such contacts were reported to have been instrumental, in some cases, in convincing renowned researchers to leave their positions at prestigious institutions in the US and Europe. These helped the cooperation between the town, hospitals and university. In Brno, a single outstanding medical researcher used his international contacts with the Mayo Clinic to convince them to open their European clinic in Brno. At each of the four city-regions, it was frequently observed that the new networks or boards which were created for the purpose of furthering the development of knowledge regions also helped to connect the different networks of individual contacts, using each other as door openers for new projects and initiatives.

In addition to the hard factors of critical mass of people, institutions, infrastructures, tax conditions and funding opportunities, there are important soft factors which are seen as key components of the regional knowledge strength and potential. First of all, in the spirit of Florida, there is frequent mention of the importance of a high quality of life and a creative cultural environment which makes the city-region attractive to innovative individuals. Such quality of life may be reflected in a wide range of features, from the number of cafés, restaurants, theatres, museums, and architectural land-marks to connectivity, uncongested roads and the beauty of the landscape. Some cities have been taking the idea of fostering such environments quite seriously in major urban planning and expansion projects. Measures include the explicit provision of low-cost housing for artists, students and other low-income individuals all of which are well-known for adding a "buzz" to a town area. Interesting urban development projects foresee mixed use, by interlacing science, business and residential space, sprinkled with cafés and creative spaces to glue the different individuals and communities together.[24]

24 Such mixed creative communities are also emphasised in the works of Charles Landry (2000): The Creative City. A Toolkit for Urban Innovators. London: Earthscan Publications.

5.3 An Enabling Collective Psychology and its Symbols

Perhaps just as important as the fore-mentioned factors of cultural and natural amenities are the cultural attitudes which all four cities point to as key assets for a knowledge region. These attitudes (which were spontaneously mentioned by a wide range of interlocutors in each region) are rooted, according to the interviewees, in long-standing traditions of the respective regions as innovation- and technology-friendly environments -- traditions which may have seen their heyday more than half a century ago and have been buried under decades of industrial decline or other limiting factors. They look back to former early industrial wealth when they were centres of textile and chemical industries, enjoying an abundance of international trade and lively cultural innovation. While the skills of the former labour force are no longer relevant and industrial decline has resulted in decades of depression in three of the four cities, their representatives stress the taste for technical and cultural innovation which the early successes in industrialisation brought and which has lain dormant over the years. They have now woken up to their potential. Such a deep-rooted belief in a collective psychology which enables the city to identify, adopt and cherish technological, social and cultural innovation was expressed repeatedly and in remarkably similar terms by a wide variety of interlocutors at all four cities, as two quotes from websites and glossy brochures illustrate:

> "The Catalan capital, Barcelona, was and still is the conduit for Spanish trade to the entire Mediterranean and the Americas. Barcelona is world famous for its creativity and invention, visible in its astonishing architecture. It is worth remembering that this was funded by the city´s industrial and commercial magnates who have always had an eye for innovation and creativity." ("Where Life Science meets Quality of Life. Biocat: The BioRegion of Catalonia" 2006)

"Copenhagen– master of innovation
The Danish working culture is a perfect incubator for creativity and innovation so it is no coincidence that Denmark ranks among the top countries at European Innovation Scoreboard. Danish employees are group-oriented and like a combination of technical and creative disciplines. Their talent for design and development is unique just as a holistic view on their work makes them especially good at innovation – thinking new thoughts!"
(Copenhagen Capacity web site 2006)

Another factor, which one may subsume under the heading of an enabling collective psychology, relates to the common ambition of being better than others, especially the capital, of exceeding the expectations of the established winners. Interestingly, all four cities in this project benefit from a "common enemy effect" and seem to derive some of their energy and ambition from being the "second city" in the national landscape, a label which they want to discard or to which they want to give an entirely new taste or colour. Having a peer city which is (or is perceived to be) more strongly positioned in terms of knowledge economy and critical mass helps them develop a fighting spirit which holds them together as a community.

- Manchester and its ambient North West want to be an attractive alternative to London and the South East.
- Barcelona and the region of Catalunya emphasise their autonomous status and want to position themselves as the most innovative region in Spain, as against Madrid, if not a nation in its own right with Barcelona as its capital.

- As the second biggest city in the Czech Republic, Brno is creating its separate identity as a concentrated knowledge environment which has some advantages as compared to Prague.
- Copenhagen, while clearly being the all powerful centre of Denmark, is positioning itself, with the help of the other Øresund sub-regions, as the number one address in Scandinavia, as against Stockholm, to the great satisfaction of its partner in the game, Skane, which is glad to transform from a peripheral region into a central one.

The will to beat the expected power-house seems to play an important psychological role, which makes it easier to win different actors over to this common cause of beating the traditional expected winner. In this competition with the capital peer, the relative knowledge intensity gives the city-region an identity which the capital could not as easily claim as its own, given its other functions as a capital which tend to diffure the label of a knowledge city.

We also found in each region a set of major historical and recent events to which a common collective value had been attached. These events seemed to have come to symbolise the capacity and future potential of the city for its citizens and for the leaders of the knowledge development of the region. Such common unifying perceptions of historical achievements and recent major events seemed to create a common epidemic sense of the possible.

- In Øresund, it was clearly the Herculean project and spectacular overwhelming reality of the long, Øresund Bridge, which created an overwhelming symbol of the possibility of bridging two different national realities, with diverging attitudes and framework conditions. This new sense of the possible was carried over into common networks, plans and new projects, across difficulties of communication, across different mentalities and languages (with differences that proved to be greater than at first expected).

- In Barcelona, the cultural turning point in the collective psychology was provided by the success of new infrastructures created for the Olympic Games, which reawakened Catalan pride and confidence and created their sense of the possible. More recently, the sense of pride and future potential was epitomised by the opening of the ambitious project of the Parc de Recerca Biomedica de Barcelona, which opens to the sea and provides the seat of biomedical researchers of different universities and businesses in Barcelona, including some of the renowned researchers who were recently recruited from all over the world.

- In Manchester, the Commonwealth Games, were widely seen to represent the unique imaginative and informal spirit and resourcefulness of the people of Manchester. They were organised and realised with limited resources, and yet produced widely praised unorthodox stimulating events with the help of a vast number of citizens as volunteers.
  Later, major successes in attracting significant investments into Manchester's financial and biotech sector, turned depressed areas into upcoming trendy areas and revived the spirit of "bringing the ocean to town" (harking back to the construction of a canal from the Atlantic in the 19th century to compete with the harbour of Lancaster). Most recently, the merger of the University of Manchester, and its vision and ability to attract "iconic professors" from all over the world, reinforced the collective sense of the possible. In addition to the high end of international knowledge competition and attracting major research centres and businesses to the region, Manchester also places great emphasis on the inclusiveness of its knowledge economy with respect to disadvantaged communities, as expressed in its "City Growth Manchester" strategy and some recent urban development projects.

- In Brno, the collective psychology was first shaken by the fall of the Iron Curtain, bringing a new freedom which was quickly followed by the dismantling of the uncompetitive industrial base. The combined will of different key regional actors to build on the one strength of the town, the density of its universities, students and academics was supported by the helpful Czech investment climate. This resulted in the settling of major multi-nationals in Brno. Belief in success was boosted further by the growth of a sustained ICT software cluster, but also by being the first in several major initiatives, such as the nurturing of a Czech biotech cluster, with the help of a Biotech platform. Most recently, the decision of the Mayo Clinic to settle in Brno was seen as a major confirmation that Brno's former success as an industrial hub and important Central European trade centre could be revived within this generation. Currently, major efforts are being invested into a multi-actor project of expanding scientific infrastructure in the framework of a European structural fund grant application which is seen as a key spring board into larger scale internationally competitive science and high tech industry.

As can be seen in these projects, there are two creative disciplines which greatly contribute to the construction of collective beliefs of the possible, both of inhabitants of the regions in question, as well as of outside observers and potential investors. These are the business art of marketing and the art of architecture and urban planning. Professional marketing was widely and skilfully used to convey the innovative nature of the region. However, architecture and urban planning plays an even more influential role in the creation of collective visions of the knowledge regions. All four city-regions pointed to major city development projects which were focussed on knowledge and creative industries. These projects were not just fundamental because they provided important new facilities, spaces and possibilities of interaction between different stakeholder groups (e.g. businesses and university researchers), but also because they offered visible symbols of progressive thinking and design, alert to interaction and participation – projects of urban pride for citizens to celebrate knowledge development and innovation. In Barcelona, significant investments allowed internationally renowned architects to design the new knowledge sites, thus reviving the modernist Barcelonan tradition of an innovative design culture that was seen to echo, support and anticipate a spirit of innovation. But even less emphatic architectural projects seem to want to emphasise, celebrate and mobilise the creative potential of the local people. An interesting example of creative urban revival can be found in Manchester where science, architecture and social engineering combine into ambitious regeneration projects of social inclusion, with knowledge production being regarded as the motor of urban revival.[25] The architectural projects surrounding new knowledge infrastructures should not be seen as mere decorative add-ons but as symbols of the region's and citizens' innovative nature as well as attempts to seek new forms of citizen participation in knowledge-based urban development.

25 Interesting descriptions of aims and ingredient actions of such urban regeneration can be found in the City Council's strategy document *City Growth Manchester. Driving Wealth Creation in Manchester.*

Across the different traditions, histories and recent successes of all four cities, the following collective attitudes are commonly held to be recognisable strong assets for a knowledge economy, assets which all four cities feel they offer, in contrast to many other competing cities:

1. *A can-do attitude (we have done it before, we can do it now; difficulties are there to be overcome);*
2. *Informal, direct ("no-nonsense") communication, easy access to the right people without hierarchical detours, resulting in non-bureaucratic procedures – sometimes referred to as "a family or small town feel to communication";*
3. *An interest and curiosity regarding scientific, technological and cultural development and innovation, going back several generations, as well as the inclination of local citizens to celebrate and participate in such developments;*
4. *Openness and welcoming attitudes to newcomers, tolerance and even curiosity towards non-familiar cultural backgrounds, looking back at a long tradition of international trade;*
5. *A life-embracing attitude to culture and communication, giving a distinct throb to the urban environment.*

5.4 Strategy Formulation

One of the first cities which explicitly based its own further development on the awareness of as complete a list of key success factors for a knowledge economy as possible, is the city of Montreal. In 2004, Montreal formulated a vision and strategy Montreal, ville de savoir based on its own comparison of other cities´ approaches to knowledge development. To position itself as a "Knowledge Capital" it not only sought to identify the unique set of features which would mark it out from its competitors in the eyes of mobile knowledge workers or business. It also identified those areas where it saw room for improvement which can only be addressed by actions taken cooperatively by different regional actors. Given the widely distributed, fragmented competences which are of relevance to the knowledge environment, the key ingredient to success according to Montreal is a concerted multi-actor approach. (Montreal, *Ville de Savoir* 2004)

In the regions of our case studies, such multi-actor visions of the city-region as a knowledge environment with unique opportunities are also presented as key points of departure of future concerted actions:

- In Manchester, such visions and strategies are formulated at various levels: the North West Development Agency, the city administration, and the Manchester Knowledge Capital board. this board is an ad hoc group of different actors from the Greater Manchester agglomeration which focus on common aims and projects of knowledge development in the region.

- In Barcelona, the overall vision of the area as a knowledge and innovation region, particularly in the area of biomedicine and biotechnology, applies to the whole of Catalunya and was initiated by state politicians and university leaders. Barcelona was and is the explicit centre of critical mass and research capacity of this plan and Barcelona university researchers, heads of hospitals and politicians are leading the process. A major initiative to launch a multi-actor innovation strategy which encompasses the efforts of the ministries for Universities, Research and the Information Society, for Employment and Industry, and for Health was launched in 2002 and resulted in the formulation of a few major strategic multi-actor projects.

- As a bi-national region, the Øresund region has had greater difficulties formulating a coherent strategy since the administrative competences reach across borders and regional competences are very differently defined on both sides of the borders. However, the development of the cross-border region was initiated by a few university leaders and like-minded politicians with a common vision of the increased potential the wider region would offer. Again, cross-border action plans and strategic projects which are being developed for different technological sectors reach across different groups of actors and stakeholders.

- Brno key representatives have pushed for the formulation of a regional innovation policy (2006), a second innovation policy which takes full account of the new opportunities made available in the framework of the structural funds and changed environments. This new innovation policy sets the framework for several major multi-actor projects to expand and enhance science and technology infrastructure.

All four city-regions studied in this project spent a considerable amount of time and effort to involve different stakeholders in the formulation of regional innovation and knowledge development strategies which aim at enhancing the knowledge base and potential of the region. Such strategy formulation was judged to be important, first of all, for urgent pragmatic reasons, namely to acquire additional resources from national or supra-national funding agencies (e.g. major research infrastructure support from national funding agencies or ministries or from EU structural funds). However, the process of strategy formulation was also widely regarded as an important contribution to enhancing mutual understanding, bringing potential conflicts into a constructive negotiation process as well as establishing common perspectives that can provide a solid basis for future projects. Indeed, strategy development was undertaken (and encouraged by respective superior authorities where they existed) at all levels: national, regional and municipal. The main

achievement of such strategy development consisted in bridging the territories of different ministries or departments of the regional administration. In Øresund, overarching strategies limited themselves to looser cluster strategies, given the impossibility of bridging across two entirely different national policy contexts (including very different competence definitions for the respective regional and national levels). But even here, strategic goals of harmonising key features of the regulatory conditions of both halves of the cross-border region were set by the strategic Øresund Committee.

There was widespread agreement among interviewees of the four different regions that the will to reach across different territorial portfolio boundaries was animated by the common vision of wanting to build an internationally competitive knowledge region. Leading representatives from universities often contributed to building such bridges across different departments/ministries since they were used to seeing the sometimes conflicting effects of uncoordinated government policies. Governmental actors often initiated the strategy formulation process and facilitated the analysis of competitive strengths, including data collection, and helped to define the potential of different clusters in the region. In all strategy formulation processes businesses were involved but, while seeing the importance and benefits of such a process, they did not seem prepared initiate it.

In addition to strategy formulation at the level of the region, different cluster groups were urged to develop strategies to identify the competitive strengths, potential and proposed methods of advancement of the respective clusters. However, the process of developing such sector or cluster strategies seemed to be much more difficult in some sectors than in others. Strategies were most readily developed in the biomedical and biotech-chemical clusters which tended to be more homogeneous with a range of common infrastructural needs and potential mutual benefits to "glue" them together, but perhaps also most fashionable regarding political attention. Other clusters expressed a strong interest in enhancing transparency and providing platforms through which common multi-institutional projects could be more easily developed. But they did not as easily develop coherent views of overarching aims for the sector. To allow for meaningful strategy development, a given area seems to require a minimal level of homogeneous needs, of perceived joint opportunities and compatible specialisations.
The process of cluster strategy formulation was usually required and orchestrated by public regional agencies. E.g. in Øresund, cluster strategies were required by the Danish national government in the framework of their support of technology "networks", as well as promoted by the Greater Copenhagen Authority and Copenhagen Capacity, its Business Promotion arm. We should note, however, that there are other regions where industry has taken the lead in strategy development, as was the case in the software and semiconductor sectors in Scotland (described by Peters, Hood and Young, 2000). But regardless of who had initiated such strategy development for clusters, they were all characterised by the will to include all key stakeholders, in recognition of their deep structural interdependence with respect to wealth creation (in the widest sense of the term). The formulation in Brno's innovation policy may be regarded as typical for this quest of an overarching multi-actor vision and consensus:

> "A political consensus and a good will of all parties involved represents a cardinal advantage in a process of introducing the system supporting the innovative business. Universities, the regional political representation and representatives of the City of Brno have managed to find a common ground and came to an agreement regarding the goals that are mentioned in the second version of the Regional Innovation Strategy".

Our observations regarding this important phase of strategy development are described well by Dunning's term "alliance capitalism" (1997) which summarises the sort of key stakeholder interdependence which we have observed and which Dunning finds as being a key feature of the policy environment of the late 1990s in which public and private collaboration in economic development is broadly welcomed. Of course, this positive view of public/private interaction in the knowledge economy also affects the values and role attributed to the university. Even the contributions of the university to private wealth creation (through patents, licences and start-ups) is seen as part of a broader public good, since the sum of private profit is also regarded as the basis for public wealth and widespread social capital. Facilitating knowledge production, even for commercial purposes, is, therefore, not seen as a contradiction to the public function of the university.

With respect to strategy development, it should be noted, finally, that most strategies we analysed were not just internal working documents but also used as visible promotional signals to the outside world, artefacts which presented a coherent access to a forceful and determined region with a sense of direction. Often, the marketing dimension of the strategies was reflected in remarkably skilful and imaginative brochures which conveyed the message of a creative environment, of innovative spirit and scientific refinement in highly professional visual terms. The visual presentation of knowledge assets has clearly become a desirable marketing genre which attracts major investments and imaginative talents, right from the start.

5.5 Defining key actions and institutions - Intermediaries as nodal points of knowledge region development

These multi-actor strategies and common agendas comprise three major types of actions:

- Joint lobbying of regional actors vis-à-vis national and supra-national funding agencies and policy makers.

- Establishing or expanding common science or technology-oriented infrastructures,

- Establishing intermediary institutions to facilitate interaction between different institutions.

Joint lobbying was mentioned as a key motivating and cohesive factor in the regional development process. Different types of institutions knew that they would convince funding agencies only if they supported each other and developed a larger perspective, using complementary strengths and responding more flexibly to each other's needs. Many funding agencies, from structural funds to national innovation programmes, explicitly require such synergies and overarching strategic goals which bring the strengths of different institutions together. But even without explicit requirements, regional institutions know that they create a more convincing impression of competitive strengths and advantage if they present their case and advantages as one coherent whole. Such joint strategies and presentation are particularly needed when regions want to attract major multi-national companies, institutions or internationally renowned researchers. Such examples were mentioned in Manchester, where different actors combined efforts to win the national competition for a major investment in a biomedical centre; in Barcelona, with respect to multinational pharmaceutical companies; in Brno regarding a major structural fund project; and in Øresund in relation to attracting companies from Asia. Combined lobbying and joint presentation of knowledge intensity is also a key concern of the regional promotion agencies, which focus on attracting foreign direct investment.

Since infrastructural development is one of the core competences of any regional administration, urban planning is a natural focus area for city-regional development. In relation to knowledge development such urban planning receives additional weight and a challenge: scientific infrastructure has to be flexibly adaptable to changing scientific needs. Since it is costly, investments in major scientific facilities also have to be justified by benefiting a community of users and by being associated with reliable long-term scientific strengths of the local institutions. Finally, infrastructures for knowledge-intensive businesses, universities and related agencies have to foster networking and chance encounters that may give rise to unusual innovative ideas for new projects and products. In addition, the expansion of knowledge city-regions warrants supportive actions in the shape of additional infrastructural connections, housing and recreation zones. All of these features have to be part of a sustainable development plan which will allow the expanded city to maintain its attractiveness. The challenge, therefore, for urban planners and architects is to combine these perspectives and still live up to the demands of creative environments. Interestingly, these challenges seem to result in the re-emergence of an old genre of international architectural creativity. If, in the past, academies and universities were the centre of architectural attention, now attention to the design of campuses, science cities, and urban renewal for new mixes of knowledge workers and creative persons, leads to designing spaces which lend themselves to spontaneous communication and chance encounters of the diverse groups of knowledge workers. Knowledge cities are sufficiently self-aware to invest considerable sums in the creation of such spaces.

The last and most extensive focus area of regional development attention is the establishment and support of intermediary institutions which are meant to forge new links between different types of institutions, in particular universities and knowledge-based businesses. In all four regions, a whole set of such intermediary institutions with different purposes were created or supported to foster particular types of inter-institutional links. These institutions have the following functions:

- To make different institutional perspectives transparent and understandable to the other institutions and identify common points of interest;
- To map the strengths and weaknesses of the whole region for different sectors, on the basis of their expertise in the respective sectors thus making the competences of different institutions transparent to each other;
- To identify needs for improvements and the stake different institutions may hold in their regard;
- To moderate processes of common goal-setting on the basis of an analysis of current competitive position;
- To match-make between different institutions which might have a specific interest in each other's expertise;
- To draw attention to easily forgotten issues of common interest in relation to the knowledge region (e.g. support services);
- To help define common major projects in which groups of institutions could collaborate and to help such projects lift off the ground;
- To articulate common visions, perspectives and strengths within and outside the region, seeking moral, political and financial support for common aims and projects;
- To put existing networks of contacts in touch with each other in order to create more opportunities for more people;
- To break the ice of shyness, ignorance or arrogance between different cultures of institutions or professions with the help of informal, welcoming events and facilitating mutually meaningful exchange of experience and expertise;
- To organise informative events on developments in the sector or services relevant for knowledge-based institutions;
- To provide specialised support services for knowledge-intensive services;
- To be a home and community and a space of interesting chance encounters for knowledge institutions and individuals.

This challenging list of tasks may be weighted differently at different intermediary institutions, but the vast majority are part and parcel of every single one we came across in our comparative study. There are five types of intermediaries:

Table 4: Five types of intermediary institutions

Types of Intermediary Institution	Example
1. Institutions which coordinate common interests and infrastructures of universities and other research institutions.	IDIBAPS in Barcelona Øresund University
2. Institutions with the primary function of brokering between universities and businesses, often including common infrastructures and support services or events to bring the two together. These include science parks, technology parks tech transfer offices and innovation centres.	Parc Scientific de Barcelona UAB Research Park Manchester Science Park Øresund Science Region Ideon Science Park Lund Innovation
3. Institutions which help to establish and develop contacts between different businesses or which support the emergence of new businesses by creating a supportive community for them and helping them forge relevant contacts with other businesses. These would include incubators, business networks and some technology parks.	Barcelona Incubators South Moravian Innovation Centre (and Incubator) Czech Technology Park Manchester Incubator Manchester Science Park
4. Institutions which focus on a particular sector with the aim of maximising synergies and innovation potential by identifying common interests and creating events at which institutions can get to know each other's relevance. The numerous cluster organisations belong to this type. University-Business Relations are a focus area of these institutions. These institutions are all public-private cooperation platforms.	Barcelona: BioCAT (bioregion), Parc de Recerca Biomedica de Barcelona, Barcelona Medical Centre, Barcelona Digital Foundation, Barcelona Logistics Centre, Barcelona Design Centre, Barcelona Aeronautics and Space Association et al. Brno: Czech Biotech Cluster (run by JIC in Brno), First Innovation Park (ICT) Manchester: Biotech Cluster Øresund: Medicon Valley, Øresund IT Academy, Øresund Environment Academy, Øresund Design, Øresund Logistics, Øresund Food Netowrk, Diginet Øresund, Nano Øresund, The Humanities Platform
5. Institutions which aim at overarching common visions, strategies, marketing and creating a common identity and brand by bringing different actors together and brokering between their respective perspectives. The regional development and promotion agencies as well as regional strategy groups or boards fall under this category.	Conseil Interministériel de Recherche et Innovation Technologique de Catalunya South Moravian Regional evelopment Agency Manchester Knowledge Capital Øresund Science Region, Øresund Committee

The importance of these intermediary institutions cannot be overestimated. On the basis of the wide range of interviews at four cities, we can safely claim that the growth and success of inter-institutional partnerships for innovation is greatly influenced and determined by these nodal institutions. They are the ones to identify promising areas of cooperation and to create the climate and mutual understanding on which sustainable partnerships can be built. It should be emphasised that the notion of intermediary institutions employed in this context goes far beyond the common narrow understanding of intermediary institutions as consultancies or public-private organisations which act as interfaces or translating devices between different types of institutions. Most of the intermediary organisations we encountered do not replace direct contacts but rather help to provide the right conditions for these to happen. Once such contacts are made, they do not intervene. Moreover, we have found that intermediaries with similar functions to the organisations we have seen, can be found within the different types of institutions, universities, business and regional agencies: individuals who have excelled in both types of environment and therefore naturally perform a bridging function, in an attempt to bring their experiential worlds together. Examples are professors with an active business innovation record, or former industry researchers in university positions, heads of knowledge businesses with a previous career in academia and regional politicians with a past in the knowledge intensive business sector or a university career.

Likewise, the success of many intermediary institutions does not hinge simply on their functional self-definition as matchmaking organisations. Their success is also widely held to depend on individual intermediaries, i.e. the skills of the people who lead such platforms. Indeed, whether organisations with the same set of primary tasks flourish or fail, seems to depend on two things: on the quality and innovation potential of the particular cluster or group (sufficient overlap of innovation potential and common interests), and on the matchmaking, strategic and communication talents of their core expert brokers and animators. It seems that a new professional competence profile of “knowledge broker” has emerged here which appears to be having a remarkable impact on the development of the networking density of the developing knowledge region.

Successful knowledge brokers represent a particular kind of hybrid professional who is sufficiently rooted in an academic or scientific discipline to understand the thrill of discovery and innovation. They identify strongly with knowledge producers or innovators because their own intellectual disposition would have propelled them along this same path earlier in their careers. Their choice not to pursue academic scientific careers themselves usually has to do with their outstanding ability and enjoyment of connecting people and different perspectives which they feel represents only a very small part of established academic careers. Over time, in their chosen profession, these people gravitate toward such connecting bridge-building functions and are often the ones to conciliate opposing perspectives. With the help of this ability they gain influence and are often approached when difficult intra- or inter-institutional relations require such bridge building. They become aware of their talent and apply (or are approached) for functions where bridging perspectives are the key ingredient of success: cluster directors, network coordinators, tech transfer directors, an so on. Often they leave comfortable positions in their previous organisations to take on these significantly less secure positions, simply because they enjoy the function and challenge. In this way they enjoy what is now commonly called entrepreneurial spirit. In their brokerage function, they excel at

- ***gaining a quick overview of a field and identifying the key frontiers and challenges***
- ***identifying potential common ground,***
- ***at formulating questions and future issues which a diverse of group of people might want to explore together;***
- ***at intuiting which people might chemically interact very well and at finding the right entry lines to make them connect;***
- ***at spreading an atmosphere of warmth and human and intellectual acceptance which cuts through the usual hierarchy and territorial preoccupations of the professional world and allows everybody to concentrate together on the matter at hand,***
- ***at organising events and group work in such a challenging and structured way that participants develop a communal ambition and a sense of pride and achievement at the end of the day,***
- ***at being naturally generous with the passing on of information and contacts,***
- ***at being able to accept without grudge that they are not going to be credited for a new idea, even if it came from them, while their chief ambition consists in being the initiators and catalysts who make others develop ideas,***
- ***at inspiring identification in others and making participants feel at home in such network activities.***

In conclusion, this new knowledge broker profile appears to be deeply akin to the old 18th century host or hostess of a salon: smart intellectuals who love to discover nearly as much as they love the sharing of discovery, who not only have the talent for both, but also the communicative disposition and generosity to develop this combination into a human art form, a celebration of shared knowledge development.

Given the complexity of disciplinary fields and institutional competences which have to be combined nowadays to enable innovation in science, technology and product development, knowledge regions and their constituent institutions need such brokers more and more urgently.

5.6 The role of industry

In the course of this study we have interviewed a wide range of representatives from businesses as well as from universities which cooperate closely with businesses. Nevertheless, given that this sample was more restricted than the one from the university sector or the public agencies, we cannot draw conclusions or pass solid judgements on the role of industry in our knowledge regions. Having observed in our case studies that industrial players, whether large or small, did not play a central role in the development of these knowledge regions, but rather that of the follower who clearly sees the benefits of the development, we do not feel that we had enough of a differentiated basis to justify a proper analysis. It remains to be hoped that future studies will reveal the multiple facets of industry engagement in the knowledge region project, including the ways in which industry actors reach beyond those activities which directly benefit the respective company. Indeed, the public role of the private actor is a theme which deserves full and more differentiated attention than can be provided in this context, and should be made the key focus of future analysis.

6. THE UNIVERSITY AS HEART OF THE KNOWLEDGE REGION?

We have traced how four knowledge regions fashion themselves, how they try to formulate an overarching vision and ambition, how they create internal transparency of each other's competences, how they define common interests and projects between interested constituent institutions. We have seen that knowledge regions are sufficiently self-aware to realise that they have a lot to gain from combining the strengths, ideas and competences of their constituent institutions. Hence they focus strongly on facilitating the interrelations of the different types of institutions. Their key actions aim at building strengths, creating critical mass, maximising synergies, pooling complementary expertise into even more challenging projects and innovations, and presenting such combined capacity to the world. Thereby they want to create an even more coherent powerful effect on the international market of mobile knowledge resources by attracting foreign direct investment, businesses and knowledge experts. Thus the knowledge region is clearly a triple helix phenomenon par excellence: universities, governments and businesses combine their efforts to construct a common advantage which they would not be able to offer on their own. They develop ideas which are enhanced by each other's perspectives, difficult as it may be sometimes to bridge different perspectives and interests. Intermediary organisations play a decisive role as the key facilitators of such interrelations, as motors of the triple helix interaction. In addition to the three strains of the triple helix, knowledge regions pay an increasing attention to the participation of citizens, of engaging the public in the processes of knowledge creation, creating quadruple helix interactions.

What is, then, the exact role of universities in such knowledge region development? How does it differ from the knowledge-based businesses? What are the challenges and opportunities that lie in store for universities if they want to live up to the expectation of being the heart blood of a knowledge region? In our survey, we observed five functions that universities play in providing the knowledge region with the blood it needs – though, given the constraints of resource and restricted autonomy, perhaps not always as smoothly as desired:

1. A first function of universities may be easily overlooked: individual university researchers, educators or leaders are often better than many others at identifying important new developments. These cover not just scientific and technological development, as knowledge-based businesses know only too well, but also social and cultural phenomena. Interestingly, the phenomenon of the knowledge economy as well as of the importance of regions, clusters and multi-actor triple helix interaction for such knowledge development were all identified, studied and explained first by university researchers and educators. Moreover, such knowledge was transferred so quickly to the larger non-academic community that regional administrators adopted their theories or key ideas within just a few years of their development.

   It must be emphasised that, in all four regions, university representatives were initiators or co-initiators of the idea of developing the region as a knowledge region in a combined effort of the different stakeholders involved. They not only believed this path to be promising but pursued it with zest and conviction, attempting to win others over to the idea. Thus, universities cannot be described as being simply responsive to knowledge region development. Rather, many university representatives are proactively promoting the cause.

   The proactive attitude of universities is also acknowledged by the peers who reviewed the contribution of Higher Education Institutions to regional development in Øresund: "Based on the 'learning region' concept, it was university scholars who were at the forefront in the late 1980s of promoting the idea of a cross-border integrated urban region encompassing the economic, political, social and cultural aspects of life in the Øresund. Research from the constituent HEI members of Øresund University continues to be important in developing understanding of the potential for further development of the region."[26]

26 Steve Garlick, Peter Kresl, and Peter Vaessen "Supporting the Contribution of Higher Education Institutions to Regional Development. Peer Review Report. The Øresund Science Region: A cross-border partnership between Denmark and Sweden" June 2006, p.34.

2. Most importantly, universities educate and train graduates for the knowledge region. All four knowledge regions pride themselves in offering an abundance and greater density of such graduates for their expanding knowledge economy than other competing regions. While this task is taken extremely seriously by the universities, with curricula and quality of provision being constantly reviewed, problems still arise. If too many graduates leave the region to look for more attractive options elsewhere without a similar intake of incoming graduates or if the skills of the graduates are insufficient for the tasks they will be facing in their professions as innovators, researchers, technicians or managers this may cause an imbalance Of course, generally, there is an expectation that there is some sharing of training functions between universities and employers, with universities educating for a whole range of professions, tasks and training adaptability to changing perspectives, while employers train for the specific task ahead in a given position. But in all regions we visited there were some adjustments that still needed to be made for graduates to be optimally adapted to the challenges of the current and expanding regional knowledge economy, or indeed for those of other regions. While many channels exist or are being established to allow for feed-back on improvement, only one region had organised this feed-back systematically as a regional skills partnership where different universities, training institutions and employers could discuss skills needs and provision.

   The most widely mentioned lack concerned entrepreneurial mentality and skills, which were generally seen to be insufficiently developed, not only among students but also among researchers. But many regional representatives commented that universities are not necessarily best suited for providing such entrepreneurial training. In some places, such training is thus co-designed by universities and businesses, supported by governmental regional agencies, in others, universities provide such courses but with many business representatives as teachers.

3. The third obvious task, most frequently dwelt upon in policy papers, consists in providing the research base for the knowledge economy. As the peer reviewers of the Øresund region commented the contribution of research to regional innovation is made up of the following aspects: research capacity; research quality; research applicability; effective infrastructure for knowledge transfer; and knowledge absorption capacity in the economy. Universities can contribute to the first four out of those five aspects. They are keen to excel in research capacity; and research quality. Depending on the institution, they tend to be more resistant to research applicability since this is sometimes seen to undermine research quality. The fourth aspect, namely the effective infrastructure for knowledge transfer is the current key challenge, which universities are eager to address but do not have the means nor, for some aspects, the expertise to address sufficiently. In most institutions, technology transfer offices have been established in the last 2-3 years and do not yet have enough staff to be able to confront the wider array of new tasks which they are to tackle. Tthe task of mobilising a particularly large part of the professorial community into becoming more interested in innovation and entrepreneurial activity is time-consuming and requires more human resources than most institutions have available. Moreover, in 3 out of the 5 countries in our 4 case studies, the majority of university researchers were still characterised (by university, business and government representatives) as being adverse to the idea of contributing directly to commercial innovation. But a lot is changing in a remarkably short time. In all four places, an increasing number of professors are slowly becoming more open to, and interested in, innovation and cooperation with industry. With more and more positive examples of renowned basic researchers also being entrepreneurial - and enthusiastic about both types of research engagement - more and more ice is broken in the attitudes of the more conservative representatives of the profession. By and large, the former purism of academics believing they live in a poorer but higher order, outside the impure concerns of money-making, is dissolving. Nevertheless, there continues to be a lot of resistance to knowledge becoming too much of a private good, also among those who are commercially active. Moreover, IP expertise and conditions were generally seen to be unclear, fragile, and in need of improvement at most places.

4. Universities have added a fourth function to such concerns with transfer of research capability into commercially relevant knowledge production, a function which their partners tend to overlook more easily, namely the transfer or exchange of knowledge that is not directly commercialisable. From cooperation with museums to educating citizens on burning issues of dialogue between religions, from environmental protection to the effects of nanotechnology, universities engage voluntarily, often enthusiastically, and generally free of charge with their communities, organising a knowledge transfer that does not take a tech transfer office but is supported by university researchers and educators, as well as university event and press offices. Thus they contribute not only to knowledge transfer and to public understanding of science and scholarship but also to knowledge being valued in the community. Several universities reported on the remarkable interest which citizens show towards scientific and scholarly knowledge production, beyond any concern of material wealth creation, as demonstrated by mass attendance at science events and exhibitions. As communities which are characterised by an abundance of intrinsically motivated individuals, universities have a lot to contribute not just to the production of knowledge but also to its celebration. Indeed, we may say that university representatives contribute to extending the widely noted triple helix interaction into a quadruple helix which includes the wider public and presents knowledge as something to take part in and not just watch from the sidelines.

5. The fifth and last function relates to the role which universities place on the development of the individual and his or her ideas. While the degree of attention to individual creativity and development may sometimes have been overshadowed and restricted by other concerns, universities usually strive to give individual creativity as much scope as possible. In education, ideally speaking, the individual's intellectual development should be at the centre of university education, and in research the creativity of the individual is the fuel of scientific progress. While reality may often look less rosy and the quality of such attention to individual creativity may differ greatly between different universities and within each institution, the university is still the only type of institution which addresses such creative development as a core value. Even though no standard recipes have ever been found that would describe the ingredients of an optimal creative environment, universities have a long history of experimenting in an attempt to create such environments. In this context, we may think of traditional methods of nurturing the creative individual such as providing sabbaticals (i.e. separate purpose free time) or secluded purpose-free research environments. More recently, mixing different disciplinary and national backgrounds has been associated with increased creativity or ground-breaking innovation. With the rise of the proactive knowledge region and its emerging concern with providing attractive environments for knowledge workers - or creative workers, as Florida calls them - universities and regional actors come to share this concern. While the university may be the best source of experience to turn to in such quests for creative environments, many recent cases of stimulating creative environments in knowledge based businesses or urban areas show that universities have something to learn as well as something to offer in this respect. The ever-present issue facing knowledge-based companies of how to put together creative teams and how to recruit individuals whose creativity would also flourish in teams could serve to remind universities of their own core concern with creativity in their encounter with some regional needs, questions and projects.

Clearly, universities in the four regions we visited deserve to be called the heart of the knowledge regions. But for the knowledge region to function as such, universities need the others as much as knowledge regions need universities. Businesses that are willing to take up the challenge of knowledge development to innovate their products and services are needed. Governmental agencies that facilitate institutional interactions, provide the necessary infrastructure, connectivity and promotional support are also essential. Last, but not least, a public that engages itself with the knowledge project and is willing to sustain it with its support, imagination and ideas is a necessary component. All four parties of the quadruple helix are vital for knowledge regions to thrive in a global world.

7. ANNEX

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Øresund Network: *Øresund Science Region.* Øresund Network AB.

Øresund Network: Øresund. *The Human Capital of Scandinavia.* Øresund Network AB.

Øresund University (2005): *Self-Evaluation Report for the Øresund Region to the OECD/IMHE-Project: Supporting the Contribution of Higher Education Institutions to Regional Development.* Øresund University.

7.3 Questionnaires for interviews with representatives of different types of institutions (university, knowledge-based enterprise, state authority or agency in one overview, intermediary organisation, on subsequent pages)

Institution A: University	Institution B: Knowledge based enterprise	Institution C: State / regional / city authority	Institution D: Intermediary organisation
Operational and organisational dimension: Instruments, incentives, promoting and rewarding initiative			
• What are the incentives (rewards) for institutions to seek cooperation within the region? • How does the institution motivate or support regional engagement (financially, with service support, symbolically, career development)? • How do universities prioritise their regional partnerships? Are there priority partners and how do they support these partnerships? • How is the availability of Venture Capital ensured, fostered? • Regarding the above (or other aspects) what should be changed in order to make the university contribute more effectively to regional development and competitiveness? How should the interplay between the different actors engaged in the development of the knowledge region be organised?	• How do enterprises prioritise their regional partnerships? Are there priority partners and how do they support these partnerships? • How is the availability of Venture Capital ensured, fostered? • What relevant tax incentives exist? • Which other forms of public support do knowledge-based enterprises find in the region? • How are knowledge-based enterprises helped in building partnerships with universities in the region? • What are the experiences with common (public/ private) technology platforms and infrastructure, science parks or other common facilities? • What is the role of intermediary organisations? • Regarding the above (or other) aspects what should be changed in order to make the different knowledge institutions (universities and businesses) contribute more effectively to regional development and competitiveness? How should the interplay between the different actors engaged in the development of the knowledge region be organised?	• What are the methods and instruments of the regional development agents / policy makers to promote knowledge creation and transfer? - infrastructure development - science culture events and promotion - enhancing the skills base (school, HE, LLL) - support for research, researchers - support for tech transfer, science parks • What are the national constraints and incentives for regional development? • How is the availability of Venture Capital ensured, fostered? • What kinds of intermediary organisations, platforms are being supported and how? What is their exact role? • Regarding the above (or other) aspects, what should be changed in order to make the different knowledge institutions (universities and businesses) contribute more effectively to regional development and competitiveness? How should the interplay between the different actors engaged in the development of the knowledge region be organised?	• Why was the organisation created, i.e. looking after which needs, with what role? • What is the role of the organisation now and what should it be ideally? • How does the work of this organisation differ from that of other intermediary organisations, platforms? • How has the role of the different knowledge institutions, businesses and universities, changed in the last decade and where do you see major trends for future developments regarding the distribution of tasks and functions between the different institutions? • What are the methods and instruments used to promote knowledge creation and transfer? - infrastructure development - identifying skills needs and enhancing the skills base - support for cooperative research projects and researchers (from ind. and HE) - support for tech transfer offices, science parks, other interfaces and common platforms - science events and promotion in the region - marketing - incentives and rewards (financial and symbolic) • How is the availability of Venture Capital ensured, fostered? • What are the national constraints and incentives for regional development?

Institution A: University	Institution B: Knowledge based enterprise	Institution C: State / regional / city authority	Institution D: Intermediary organisation
Operational and organisational dimension: Instruments, incentives, promoting and rewarding initiative			
			• Regarding the above (or other) aspects what should be changed in order to make the different knowledge institutions (universities and businesses) contribute more effectively to regional development and competitiveness? How should the interplay between the different actors engaged in the development of the knowledge region be organised? • How are clusters being promoted and what role do the universities play in supported important clusters? (Portfolio adjustment?)

Institution A: University	Institution B: Knowledge based enterprise	Institution C: State / regional / city authority	Institution D: Intermediary organisation
Communicational dimension: Building up partnership and Process of communication, tacit knowledge flow			
• Given the importance of tacit knowledge flows and open continuous networking between different knowledge actors, how do regional authorities help the communication between different partners; what are some of the typical channels, forums, events, committees, which lead the dialogue and how and by whom are these channels of communication being fostered? E.g. - research cooperation - foresight / strategy dialogue - advisory boards - internships, student projects - job fairs, knowledge days - research cooperation - science parks - use of common infrastructure • (How) is dialogue actively built up where it had not existed before and was deemed necessary? What works and what does not? • What are some examples of particularly successful or unsuccessful cooperations and why and in which way were they successful or unsuccessful? • How do the different knowledge institutions and partners in the region know of each other's capacities and needs (in terms of skills and competencies, knowledge products and emerging fields)? • To what extent and how do the different institutions adapt to each other's needs? • Can one observe different phases of development in the regional knowledge development and mutual understanding and responsiveness? How does continuity in a partnership make a difference? • Where would you want to see improvements in the future?	• Given the importance of tacit knowledge flows and open continuous networking between different knowledge actors, how do regional authorities help the communication between different partners; what are some of the typical channels, forums, events, committees, which lead the dialogue and how and by whom are these channels of communication being fostered? • (How) is dialogue actively built up where it had not existed before and was deemed necessary? What works and what does not? • How do the different knowledge institutions and partners in the region know of each other's capacities and needs (in terms of skills and competencies, knowledge products and emerging fields)? • To what extent and how do the different institutions adapt to each other's needs? • Can one observe different phases of development in the regional knowledge development and mutual understanding and responsiveness? • What are some examples of particularly successful or unsuccessful cooperations and why and in which way were they successful or unsuccessful? • How does continuity in a partnership make a difference? • Where would you want to see improvements in the future?	• Given the importance of tacit knowledge flows and open continuous networking between different knowledge actors, how do regional authorities help the communication between different partners; what are some of the typical channels, forums, events, committees, which lead the dialogue and how and by whom are these channels of communication being fostered? • (How) is dialogue actively built up where it had not existed before and was deemed necessary? What works and what does not? • How do the different knowledge institutions and partners in the region know of each other's capacities and needs (in terms of skills and competencies, knowledge products and emerging fields)? • To what extent and how do the different institutions adapt to each other's needs? • Can one observe different phases of development in the regional knowledge development and mutual understanding and responsiveness? • What are some examples of particularly successful or unsuccessful cooperations and why and in which way were they successful or unsuccessful? • Where would you want to see improvements in the future?	• Given the importance of tacit knowledge flows and open continuous networking between different knowledge actors, how can this organisation help the communication between different partners; what are some of the typical channels, forums, events, committees, which lead the dialogue and how and by whom are these channels of communication being fostered? • (How) is dialogue actively built up where it had not existed before and was deemed necessary? How do you matchmake? What works and what does not? What are the reservations and obstacles on both sides? How do these reservations dissolve? How do you help this process? • How do the different knowledge institutions and partners in the region know of each other's capacities and needs (in terms of skills and competencies, knowledge products and emerging fields)? • To what extent and how do the different institutions adapt to each other's needs? Do you see a learning effect in terms of speed of adjustment? • Can one observe different phases of development in the regional knowledge development and mutual understanding and responsiveness? • What are some examples of particularly successful or unsuccessful cooperations and why and in which way were they successful or unsuccessful? • Where would you want to see improvements in the future?

Institution A: University	Institution B: Knowledge based enterprise	Institution C: State / regional / city authority	Institution D: Intermediary organisation
Globalisation: new geography of knowledge: regional vs. / complementary with international cooperation and competitiveness			
• What are the international developments which strongly affect the regional knowledge development? • How do regional partnerships and international ones interface (if at all)? • How does the regional networking affect the institutional positions in their competitive arenas (concretely)? • Which trends concerning regional knowledge development do you see emerging?	• What are the international developments which strongly affect the regional knowledge development? • How do regional partnerships and international ones interface (if at all)? • How does the regional networking affect the institutional positions in their competitive arenas (concretely)? • Which trends concerning regional knowledge development do you see emerging?	• What are the international developments which strongly affect the regional knowledge development? • How do regional partnerships and international ones interface (if at all)? • How does the regional networking affect the institutional positions in their competitive arenas (concretely)? • Which trends concerning regional knowledge development do you see emerging?	• What are the international developments which strongly affect the regional knowledge development? • How do regional partnerships and international ones interface (if at all)? • How does the regional networking affect the institutional positions in their competitive arenas (concretely)? • Which trends concerning regional knowledge development do you see emerging?
Focus and content shifts through regional partnerships			
• Are there sectors which are being prioritised in networking attempts, which ones, why and how? • (How) do the regional partnerships affect the university's priorities in terms of scientific areas? If not, should they and under which conditions?	• Are there sectors which are being prioritised in networking attempts, which ones, why and how? • (How) do the regional partnerships affect the company's priorities in terms of focus areas? If not, should they and under which conditions?	• Are there sectors which are being prioritised in networking attempts, which ones, why and how?	• Are there sectors which are being prioritised in networking attempts, which ones, why and how?

Institution A: University	Institution B: Knowledge based enterprise	Institution C: State / regional / city authority	Institution D: Intermediary organisation
Theatrical "mise en scène": mutual engagement and stimulation / creativity enhancement			
• Experience with the following types of approaches: 1. Public understanding of science events for multipliers and key players 2. interfacing different knowledge arenas (e.g. creative economy and academia) 3. Event management, PR 4. Campus development 5. Marketing		• Experience with the following types of approaches: 1. City development projects 2. Events for multipliers and key players 3. Event management, PR 4. interfacing different knowledge arenas (e.g. creative economy, business, finance and academia) 5. Marketing for the region	• Experience with the following types of approaches: 1. City development projects 2. Events for multipliers and key players 3. Event management, PR 4. interfacing different knowledge arenas (e.g. creative economy, business, finance and academia) 5. Marketing for the region
New model of university: private / public interests interplay?			
• What is and should be the respective role of universities and other knowledge institutions? How should this be reflected with respect to: - Technology transfer support - Rewards - Intellectual property arrangements - Co-funding of research - Privately sponsored professorships - Student research projects in companies - How far can innovation activities of individual professors go (personal gain, time investment etc) - Role of university and other knowledge institutions from point of view of universities - Ethics, codes of good practice • How would you imagine an ideal interplay between the different knowledge institutions and their supporting agencies?	• What is and should be the respective roles of universities and other knowledge institutions? • How would you imagine an ideal interplay between the different knowledge institutions and their supporting agencies?	• What is and should be the respective role of universities and other knowledge institutions? • How would you imagine an ideal interplay between the different knowledge institutions and their supporting agencies?	• What is and should be the respective roles of universities and other knowledge institutions? Is there any kind of scientific pursuit which should be reserved for universities, what is its worth and how should the system foster this kind of scientific pursuit flourishing? • How would you imagine an ideal interplay between the different knowledge institutions and their supporting agencies? • Do you see a conflict of interest between scientific inquiry as a public cultural good, disinterestedness of science, on the one hand, and the pursuit of private profit? How are such conflicts solved? • How do IP concerns affect the flow of knowledge, the publication of scientific results?

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