

ENTREPRENEURSHIP AND THE INNOVATION SYSTEM OF THE AGDER REGION, NORWAY

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EXECUTIVE SUMMARY

Policy bodies and their partners in the counties of East and West Agder, Norway, are undertaking an important common strategic planning exercise with the aim of implementing policies to enhance the Agder entrepreneurship and innovation system. To provide momentum to the process and bring an international perspective, the two county authorities and the independent Agder Research organisation decided to collaborate with the Organisation for Economic Co-operation and Development (OECD) on a case study of the Agder innovation system within the OECD review series on Entrepreneurship and Local Innovation Systems. This document summarises the review process and its findings and recommendations.

The aim of the review is to provide an external assessment by an international review panel of the strengths and weaknesses of the Agder innovation system and make recommendations for future co-ordinated policy development. The recommendations are supported by international learning models that illustrate how places in other countries are addressing similar challenges. The overall objective is to provide advice and inspiration on how public policy can promote entrepreneurship and economic development by contributing to the development of a stronger innovation system in Agder.

The review assesses the following aspects of the entrepreneurship and innovation environment in Agder:

- *People and the labour market*, including skills needs, the education and training system, attraction and retention of qualified labour and labour market functioning.
- *The business sector*, including new start-ups, small business development, high-growth firms, large firm innovation, inward investment and firm networks.
- *Research organisations*, including research funding, research collaborations, research commercialisation and research infrastructure.
- *Institutions and governance*, including public-private and public-public partnerships, policy co-ordination, policy design and delivery arrangements and strategy development and evaluation.
- *The regional endowment*, including innovative activity in key economic sectors, the functioning of the local innovation system and spatial inequalities in innovation activity within the region.

The method comprised the following core components:

- A start-up workshop between the OECD Secretariat and a steering group of key Agder stakeholders to agree the programme of work and the issues to be addressed.
- An initial local diagnostic assessment by a research team from Agder Research and the University of Agder. The assessment analysed existing reports and data sources to provide the review with basic information on Agder's socio-economic context, innovation system,

and innovation and learning processes in four propulsive industries (information and communications technologies, oil and gas, the process industry and the cultural industry).

- A one-week international review panel visit to meet with a variety of stakeholders in Agder. This involved a series of meetings between local stakeholders and the members of the panel (the OECD Secretariat and five international experts) to exchange and discuss views on the past and future development of the local innovation system.
- A one-day workshop with local stakeholders to examine a draft of the review report and to present and debate policy initiatives from regions in other countries that provide insights on how to meet challenges the review has identified as relevant to the Agder case.
- Preparation of a final review report taking into account all the information and comments received in the stages enumerated above.

This summary starts by setting out the review panel's view on the main challenges and opportunities for the Agder innovation system. It then presents the main policy recommendations. It is hoped that these recommendations will be developed into appropriate local actions by all those players who have an influence on the East and West-Agder region, both in the private and public sectors.

Challenges and Opportunities

Strengths and opportunities

Strengths

An efficient labour market and highly-qualified workforce. Agder is in a position of considerable strength in terms of its human capital and labour market performance. In the years preceding the current recession unemployment was very low and labour force participation rates high, reflecting an efficient labour market. The vocational education and training system yields a steady supply of workers who are highly trained in intermediate skills. They are the foundation of a group of highly trained technical workers who underpin the advanced technology used in the region's key exporting industries.

Very competitive large industry. In spite of its small size in terms of population, the region of Agder has leading companies in world niche markets. There are three major sectors all exhibiting a significant degree of local clustering: oil and gas, metal elaboration or transformation and information and communication technologies. The firms in these sectors are active worldwide, and their international activities are also an important opportunity for the region as they could serve as 'ambassadors' of Agder in international markets.

Fruitful regional partnerships and networks. The tradition of co-operation among people and organisations in the Agder region, including during hard times, is a valuable asset of its innovation system. It is reinforced by several notable formal regional partnerships. An important example of what can be achieved by co-operation is the joint efforts of the East and West Agder counties in the late 1990s and again in the early 2000s to take measures to anchor employment locally in response to a proposal by the Ericsson company to move its Arendal division to the Oslo region. The University of Agder is also active in fruitful regional partnerships with industry: the EYDE network centred around the University's Faculty of Technology and Science in Mechatronics and the Xstrata Scholarship in Development. There are also examples of inter-firm partnerships, most notably the NODE network

among firms within one of Agder's main clusters. Such regional partnerships and networks have the potential to have a strong positive impact on Agder's innovation processes.

Comprehensive service and support institutions. The Agder innovation system contains many support institutions and a wide range of services and funding instruments for entrepreneurship and innovation activity. The institutional underpinnings of the policy system provide a good base for supporting the region's innovation system.

Opportunities

Immigrants may underpin diversification. The attractiveness of the Agder region to a wide range of immigrants offers the opportunity for a broadening of the region's skills base and can underpin diversification into new activities and growing sectors. Most of the recent immigrants to Agder possess a high level of skills and the characteristics to integrate well into the regional community. This demographic diversification offers an opportunity to develop new areas of activity that can be part of the emergence of an economy that is less reliant on the prosperity of a small number of industries. A more positive and explicit policy agenda could emerge to harness the potential contribution of an increasing inflow of immigrants to Agder's economic development strategy.

The award of University status can support higher level and softer skill formation. The upgrading of the University College to University status and the accompanying strengthening of its offer and visibility provide the opportunity to enhance the formation of higher level skills. While this is already happening to some extent in the technological skills area, it is much less evident in the so-called 'softer' skills that are essential for the development of higher-order innovation and entrepreneurship activities.

Development opportunities for the University. There are various opportunities for the University to further develop its networks and third stream income. The addition of short-term, non-degree courses is a growing trend in universities worldwide. In Agder, a suite of "executive education" programmes geared toward the needs of local firms and other groups would be welcome by several constituencies in the region. Two other areas with potential for augmenting the third stream revenues of the University are the establishment of more collaborative research projects with local industry and training and consultancy support for public sector leadership development.

Strong local industry groupings. The University could also take advantage of the presence of some strong local industry groupings to develop a regional research focus. Regional engagement with industry is a real possibility in Agder. The industrial base provides opportunities to develop points of combined regional engagement and international excellence, at the same time as creating opportunities for third stream income for the University.

Agder hosts a major research hospital. The hospital is one of the largest in terms of regional research activity in Norway, with dozens of PhDs on staff. Medical and health-related needs are growing worldwide as the population ages. Some of the hospital's researchers may be in a position to start or consult local enterprises in niche medical areas and there may be possibilities to develop a partnership with the University in certain related teaching areas, such as sports medicine.

Further influence the regional agenda through Cultiva. The arts and cultural industries, and what is known as the 'experience economy', represent a large opportunity for developing artistic entrepreneurs. The Cultiva programme has developed an asset base of entrepreneurs with which it works. This can be built on to provide other support for example through appropriate teaching and consultancy by the University.

Expand business activities to new domains. The experience and the reputation of the companies of the oil and gas sector are still strong and they could certainly enter new domains which are not their core business, either directly or through spin-off enterprises. The University could be a strategic partner in this venture.

Combine the 'Doing Using and Interacting' (DUI) and the 'Science and Technology Innovation' (STI) modes of innovation. There is an opportunity to combine the dominant DUI mode of innovation with the STI mode in such a way as to secure stronger economic development. Firms that have used the STI mode intensively may benefit from paying more attention to the DUI mode and vice versa. In addition, innovation policy should be designed to support not only industries using an STI-based mode of innovation, but also non-R&D based industries and all types of services. The VRI programme has the instruments and vehicles to achieve this.

It is time for change. The current economic turbulence provides a window of opportunity to changes by causing a sense of urgency and not allowing economic development support institutions to stay in their 'comfort zones'. There is a clear opportunity to create a strong 'Agder Economic Region' to increase synergies amongst support providers, build a solid base of clients to reach critical mass of activity levels and concentrations of expertise and specialisation in economic support system in Agder supported by a common Agder brand. Adjustments are needed to the system to respond to the economic crisis and the opportunity exists to integrate support across East and West Agder as part of this process.

Weaknesses and threats

Weaknesses

Lack of rigour in the Vocational Education and Training system. There appears to be some lack of rigour within the apprenticeship system at both national and county levels in the areas of the training of apprenticeship trainers and the assessment of apprentices. At present, the trainers do not need qualifications and the assessment process is quite informal. The available local autonomy could be used to ensure that the Agder vocational education and training system leads the rest of Norway.

Under-provision of general and soft skills. There is an under-provision of the general and soft skills that underpin discontinuous innovation and management innovation, partly reflecting the lack of a strong tradition of management education.

Weak university-region linkages. A range of local stakeholders feel that the University presents a lack of a clearly communicated vision about the role it intends to play within the region. Linkages with regional actors are also uneven. Whilst there are strong relationships between the Grimstad campus and industry, other exchanges are limited. Various local stakeholders described the university as lacking ambition and too broadly academic rather than focused on the market's needs. Many of the leading local organisations use non-Agder-based institutions for education and training, which suggests that the University could do more in this respect.

Little collaboration in interdisciplinary programmes. The University is not large and to find its faculty and students divided among locations weakens the potential for interdisciplinary interaction. At present, the two university campuses fail to communicate a unified vision and strategy and appear to have distinct cultures. The University is seen by some in the Agder region as two institutions rather than one.

Limited contribution of the business sector to the regional economic strategy. The business sector is not making full use of its capacity to influence the region's economic development strategy. Excluding initiatives such as Teknova, relatively few firms cooperate with the public sector, the University and R&D institutions.

Low levels of R&D expenditure. Even with a rather innovative fabric of firms, the Agder region is well below the national average when it comes to research and development expenditure per capita. This low rate is partly explained by the Doing-Using-Interacting mode of innovation applied in the majority of Agder firms.

Insufficient entrepreneurial conditions. More could be done to promote the emergence of a stronger new firm and small and medium-sized enterprises sector in Agder, not only in well-established industries but also in emerging sectors.

Dense and complex policy support. A divided governance system leads to some duplication of agencies and organisations, which individually become too small and insufficient. This occurs within an already dense and complex fabric of public and semi-public intermediaries dealing with entrepreneurship innovation promotion. The divisions of tasks and potential synergies between the various actors are not clearly identified in terms of roles, space, responsibilities, targets and so on.

Narrow vision of the outside world. The internationalisation mindset of many institutions is limited. Many institutions set their ambition level and benchmark their performance only regionally or nationally, rather than internationally. The Agder region is often characterised as a conservative region, preserving the status quo rather than experimenting and taking risks. With globalisation and recession the status quo is no longer an option.

Threats

Skilled labour shortages. In the period of rapid growth prior to the recession there was a significant shortage of particular types of skilled workers. There were 6,500 unfilled jobs in a wide range of occupations in East-Agder alone, and the likelihood is that this would be at least as big a problem in West-Agder too. Whilst labour shortages are likely to have eased somewhat with the recession it is important to address the causes of the labour mismatches that have been identified.

Traditional academic culture in the University. A traditional academic culture in the University could thwart efforts to promote regional engagement. The University and its faculty members cannot be concerned only with international academic and research communities. Universities also are "pipelines" or "conduits" through which research of an international and national nature is transferred to the local region, thereby enhancing the capacity of the region's institutions for innovation and entrepreneurship.

Risk of lagging behind in the offer of relevant university services. The UiA may fail to respond to new educational needs if no strategic vision is put forward. The student population is shifting toward students enrolled in short-term continuing education activities, and the study programmes offered by the University seem to be lagging behind this demand. A broader conception of the potential demand for university services is needed.

Risk of lock-in to an outdated technological trajectory. Agder faces the risk of "lock-in" (the inability to deviate from an established but outdated technological trajectory) due to the dominant role of relatively mature industries such as the process industry and the equipment supplier industry focused on Doing-Using-Interacting innovation. The specialisation of the region in mature industries

with a risk of decline could result in a loss of regional competitive advantage and innovation capacity if companies are not also supplied with new, external Science Technology Innovation based knowledge and a wider range of innovation skills are not developed applicable to a broad range of activities.

The global financial crisis changes the business environment. The current economic situation changes the business environment and challenges the Agder institutions and regional governance. In case of prolonged global recession, the competence fund investments will stay at a low level for several years if no changes in the investment policies of the funds are made, thus decreasing the possibilities of developing new innovative companies and products in the Agder region.

Policy recommendations

The above conclusions and analyses provide a general appraisal of the current situation of the East and West-Agder counties, and the challenges they face. Actors in the policy system have an important role to play in building on strengths and addressing weaknesses. To guide policy development in view of defining a joint entrepreneurship and innovation strategy in Agder, a series of recommendations on policies and initiatives is presented below.

People and the labour market

Create a stronger culture of lifelong learning. The current education and training system should be redefined to embed a stronger culture of lifelong learning, particularly in the acquisition of the generic and transferable skills that generally underpin successful innovation and entrepreneurship systems. The use of a wider range of skills across a broader range of activities could break the risk of lock-in.

Increase the responsiveness of the education and training system. Agder should make the vocational education and training (VET) system more responsive to the demand side of the labour market. This will involve changes in both the various vocational education and training institutions and the University of Agder. Notably, it is important to promote the emergence of a vocational education and training system that puts in place a skills base that allows it to respond to the new opportunities that emerge as the world economy comes out of the current financial crisis. In particular, the match between the education and training provision and the labour market needs to be improved by linking more strongly the provision of upper secondary level to the availability of apprenticeship places, and by improving the quality of career guidance at upper secondary level. Labour market institutions should pursue the provision of incentives for skill-acquisition whilst the University should update its curricula for short-term courses that meet new and emerging demands. The business networks must be encouraged to take a more pro-active role in driving the skills development process, both within the vocational education and training area and at the higher education level.

Increase rigour in the vocational education and training system. The vocational education and training system could benefit from a greater degree of rigour in the apprenticeship stage, especially in relation to the training of the trainers and the conduct of the final examination. The system should be more market-oriented and rigorous in the manner of its operation, and much more closely linked to other parts of the education and training process. In addition, steps should be taken to ensure that the quality of apprenticeship training is commensurate with the generous subsidies that employers receive for its provision. The assessment procedures for apprentices' practical skills should be reviewed and made more rigorous. Workplace supervisors and trainers of apprentices should receive some obligatory training. The collection and analysis of data on the performance and operation of the VET system needs upgrading to underpin stronger policy development in this area.

Encourage mobility between the public and the private sector. Job rotation between the institutions should be encouraged, including job rotation between the public and the private sector. This would provide the opportunity to exchange ideas, to create stronger regional links, to develop new skills and to understand better the needs of the businesses and the region.

Integrate women more strongly in entrepreneurship and innovation activities. Talented women should be considered more often as candidates when filling the management and senior level positions in Agder and as researchers and innovators in order to provide a wider range of opportunities for women willing to integrate and or make progress in the labour market. More information and analysis is needed on the nature of women's participation in the labour market and the obstacles in order to design appropriate policy responses.

Actively attract and retain international students to the University. The University should help the region build a stronger critical mass of human capital by expanding its provision of programmes that appeal to international students. There are opportunities in research and teaching niches that help the public sector, including tourism, culture, and health care. To work effectively, these programmes will need to be taught in the medium of the English language and their scope should be defined by the University linking with the Agder industry (well-positioned abroad) and with other universities following the same path. In this regard, the University should endeavour to join European and international university networks and get involved in their activities.

Make more and better use of the immigrant population in the region. Agder could integrate better the immigrant population in the region, offering for instance language courses and customised short trainings adapted to the needs of the regional market. The Global Future project, created by the Confederation of Norwegian Business, is a good starting point in this respect. Also, the immigrant population is generally more entrepreneurial than the local community, and providing guidance and mentoring services to assist the development of new ventures should be analysed.

Business sector

Support entrepreneurial activity in the University. The University of Agder has an important role to play in fostering entrepreneurship among its students and academic staff in all disciplines. Entrepreneurship teaching should be promoted and students should be encouraged to consider entrepreneurship as a career option on graduating or in later life. Staff should be encouraged to support graduate and other local entrepreneurs with ideas and mentoring. The partnership should be strengthened between the University and Coventure in identifying ideas in the University and in providing mentoring services beyond the start-up phase.

Create a unified entrepreneurship support system. The business sector and the entrepreneurial spirit of Agder could benefit from the reorganisation of the various intermediaries in place. Notably, it is important to unify and enhance the visibility of the support services offered to potential entrepreneurs and small businesses and to better coordinate the interventions of the intermediaries in order to avoid overlapping and build synergies. A unified image of the entrepreneurship support system in Agder, with defined tasks and clear goals, should be created.

Facilitate spin-off development. Cultiva could play a more active role in identifying and supporting spin-offs from large companies. Cultiva's Spin-Ni Programme has been successful in providing pre-seed capital to some business ideas coming from public institutions (e.g. hospitals) but its area of intervention could be enlarged by identifying business ideas coming also from the larger firms – in collaboration with the business networks – and by providing financial support and mentoring services in the longer term – in collaboration with the University.

Ensure financial provision for entrepreneurs. There is a need for risk capital to support start-ups and other commercialisation projects that are not captured by the existing financial system. Public funds could be made less restrictive and more flexible in their application procedures to meet the needs of the entrepreneurs. The wide array of public financial instruments available should work more closely with the various components of the entrepreneurship support system to be more effective.

Understand the needs of the different segments of businesses. In order to provide relevant services and support schemes to the business sector and entrepreneurs, the entrepreneurship support system should understand the needs of the different segments of businesses. This will require a continuous monitoring of the business sector and ideally the mobilisation of academics to gather and process data on the innovation process and behaviour of the business fabric.

Support innovation with 'soft' techniques and networks. Innovation support should not only be designed using technological instruments but also using 'soft' Innovation Management Techniques. This will support innovation more broadly. The creation of 'knowledge networks' to promote collaboration and exchange between large and smaller firms, with the participation of other key stakeholders, could be useful to promote innovation in the business sector.

Integrate into globally-distributed knowledge networks. The business sector should be encouraged to integrate further into globally-distributed knowledge networks and value chains in order to tackle the risk of 'lock-in' to declining technologies and markets due to a lack of innovative capacity.

Research organisations

Develop the "third stream" of the University. The University should put efforts into developing an institutional culture towards a "third stream" of revenue and engagements with its region. To achieve this, it could draw up an action plan to improve the knowledge transfer flows between itself and the regional economy, in order to offer a suite of "executive education" programmes geared towards regional needs. Additional Master's courses could be offered that meet the needs of local firms. The addition of short-term, non-degree courses should also be further explored. There is also a large potential demand for up-grading in the primary and secondary parts of the educational system for public services (e.g. further training of nurses) and for the public administration itself (e.g. language courses).

Build stronger synergies between the two University campuses. To strengthen the creation of a unified University of Agder, efforts should be put to encourage interactions between the staff and students of the two campuses and collaborations between faculties in interdisciplinary research and teaching programmes.

Define a clear image and role for the University in the region. The University should develop stronger vision and strategy (a brand) in order to better define its role and contribution to the regional development process as a key economic actor. It should increase dialogue with the public and private sectors in order to play a more active role in the regional governance. For instance, it could undertake and take the lead in broad regional foresight exercises. In addition it should be central place for ideas, knowledge and exchange within the Agder region. The campus should be made more accessible to the public and should be more actively involved in the regional economic development process.

Strengthen University-industry links. The University should promote more synergies and collaborative projects with local industry. It should provide higher quality products and ensure that its range of services is of relevance to the business sector. It will be important to communicate this offer

as the University will compete in a wide market to “sell” these services due to the international links of the industry in Agder. The establishment of a technology transfer agency inside the University or the expansion of the functions of the Sorlandet Kunnskapspark could be beneficial. To reinforce this, the public sector could provide incentives to the business sector to promote collaboration with the University and other regional research institutions.

Institutions and governance

Assess and organise the actors in the innovation system. The current entrepreneurship and innovation support system with 130-150 institutions needs an “X-ray inspection” including an assessment of the contributions and outputs of each of the institutions to the entrepreneurship and innovation system in Agder. If needed, the system should be restructured and the tasks redefined (or merged) to better organise the work.

Define jointly the “New Common Goals for Agder”. Ever increasing national and international competition requires that Agder looks for synergies and significantly increased cooperation among the institutions in the Agder region – with new vision and goals. The Agder Innovation Strategy should be defined with a vision of “New Common Goals for Agder”. The innovation strategy should be ambitious but possible to reach and relatively easy to communicate among the various stakeholders. The process would include the setting of the ambition level, vision and goals for the coming years. The vision should seek to appeal to not only key institutions but also the individuals in the Agder region. The strategy, if successful, would reduce the regional government/governance divide between the two counties of Agder, and, thus, provide the basis for a pro-active regional government as a key actor in the innovation system.

Develop a communication strategy. The governance of the Agder innovation system needs to be supported and complemented by a strong internal and external communication strategy. The internal strategy should assist in promoting internal networking and partnerships within the Agder region and providing citizens in Agder with a proper picture of the activities and plans of the institutions. The external strategy should clearly communicate the strengths of the Agder innovation system to the rest of the world, and should highlight the assets of the Agder region, notably to promote the industry and to attract talented people and companies to locate and invest in Agder.

Leadership should be identified and supported. Strong leadership needs to emerge to create and deliver a new strategy. The challenges of entrepreneurship and innovation should be tackled in a joint manner to ensure the momentum of change. In the context of Agder, to maximise the results of the joint activities among the actors in the innovation system, a shared leadership would be more likely to succeed than “one-man show”. The personal commitment of top-level individuals such as city mayors, university rector, Chief Executive Officers of leading industries, with a mutual trust, is very important in the further development of the Agder innovation system.

Regional endowment

Combine support of science and technology innovation with a broader-based local innovation policy. Agder hosts two sets of firms with different innovation policy requirements and policy should be designed for both groups. One set of firms are science-based and innovate through the Science Technology Innovation (STI) mode of innovation. Support should be boosted to this group and focused on strengthening their research and development, building their scientific competences and increasing their interactions with knowledge institutions. This policy needs to be complemented with broader-based support for firms that are not research and development based and that operate across all industries and all types of services (including tourism). These firms learn through Doing Using and

Interacting, or the DUI mode of innovation. Support targeted to this group should assist in the introduction of new products and processes and in learning through interactions with other firms. One of the advantages of the broad-based approach is that it can help address the duality problems of Agder, bringing development to the weaker part of the economy, the socially and culturally marginalised as well as the more ‘ordinary’ inland parts of the region. The narrow-based approach has the advantage of strengthening a few potentially major motors of the local economy that require stronger and more specialised support. The VRI programme should use the tools it has available to combine the broad-based (for all firms) and narrow-based (for science-based firms) approaches.

Promote industrial diversity through related variety strategies. Agder could promote the development of new, related variety based industry combining the Doing Using Interacting (DUI) and Science Technology Innovation (STI) modes of innovation, and building on the expertise and know-how of the well-established industries. The region could make use of the existing networks (NODE and EYDE) as well as Teknova and the University in this work. The potential of these new areas for diversification of the economy such as environmental, sustainable energy production or multi-materials elaboration (e.g. brazing) should be explored with the support of foresight methods, techniques and specialists. This should be supported by the Triple-Helix of government, research and industry players in the innovation system to promote industrial diversity. The development of a related variety based strategy could also effectively be used for lobbying and networking towards national and EU authorities to achieve research funding.

Integrate Cultiva into a broader tourism strategy. The tourist sector is a key economic activity and job creator in the Agder region, inland as well as on the coast. Building on this and on its relatively good international connectivities, the region may consider integrating Cultiva as part of a broader regional tourism strategy. Cultiva is an important initiative that could be supported further if its role in supporting economic development is more fully recognised and developed. This could provide Cultiva with an opportunity to develop collaboration with the private sector and to expand its cultural activities in the region.

Define and place the “Agder Brand” in the people’s mindset. To limit problems of attracting and retaining qualified labour, the Agder region should look strategically at the business climate (e.g. qualified and interesting jobs) but also at the people climate. Although a low score on people climate does not necessarily have a negative impact on the attraction of foreign talents, efforts should be sustained to develop further an attractive region, and to place the “Agder Brand” in the people’s mindset. This “Brand” should be discussed as part of the joint efforts of East and West-Agder in order to come up with an agreed and clear image of Agder.

Bring Agder to the international scene and build international links. The Agder innovation system needs to be increasingly integrated into the external linkages of the innovation system. Internationally, Agder should look for strategic, long-term partners fitting into the knowledge base of the region. In particular, Agder could use large industry and industrial networks to increase non-local relationships and knowledge flows. This perspective is highly relevant for many of the largest Agder firms especially for the process industry (where all large firms are owned by foreign MNCs), but also for the equipment suppliers. There is a need of gate actors instead of gate keepers in Agder; gate actors being well-connected individuals and institutions opening and exploiting the new international contact networks. The establishment of an Agder Region Marketing office or an Agder International Agency should be explored.

INTRODUCTION

This report sets out the findings of a review by the Local Economic and Employment Development (LEED) Programme of the Organisation for Economic Co-operation and Development (OECD) of the Entrepreneurship and Local Innovation System review of the Agder region in Norway. The aim of the OECD Entrepreneurship and Local Innovation System reviews is to examine the challenges and opportunities for innovation activity in case study cities and regions, to make recommendations on how policy can best strengthen the local innovative environment and to illustrate these observations and recommendations with descriptions of learning model programmes from other countries. This review was undertaken by the OECD in collaboration with the University of Agder and with the support of East and West Agder regional authorities as part of the OECD review series on Entrepreneurship and Local Innovation Systems delivered by the LEED Programme.

In the case of Agder, the review aims to assist the Agder actors in establishing and activating a local network to drive forward policy change on innovation and entrepreneurship. This review provides an assessment of current policies, recommendations for their future development and international learning models that help illustrate how other places have addressed similar challenges and put similar recommendations into practice. There is an important focus on achieving regional policy coherence through the development of an effective innovation and entrepreneurship strategy and an effective policy delivery framework bringing together all the key stakeholders. The recommendations made in this report also seek to enhance the links between policy makers, the business community, the university, the researchers and practitioners for continued policy learning.

Key aspects of the innovation and entrepreneurship environment that were assessed in this review include the opportunities and barriers to the development of (i) people and the labour market, (ii) the business sector, (iii) research organisations, (iv) institutions and governance, and (v) the regional endowment. The observations, statements and recommendations expressed in this report are based on information gathered through an OECD peer review process. The key steps of the methodology are set out below:

i. Local diagnostic report

A local diagnostic report was prepared by the University of Agder to provide an initial analysis of the regional situation in terms of its innovation assets, connectivities and capabilities, as well as to describe Agder's existing entrepreneurship and innovation policies and challenges.

ii. Review panel visit

The OECD Secretariat led an international review panel in a one-week peer review visit to Agder from 20-24 October 2008. During the study visit, the expert team interviewed local and regional policy makers and other relevant actors in the entrepreneurship and local innovation system and obtain their views on the issues signalled as important in the local diagnostic report, as well as on other issues considered relevant by the review panel members and OECD Secretariat.

iii. Draft report

Drawing on the results of the above, a draft report was prepared including an assessment of the Agder entrepreneurship and innovation system and policy recommendations.

iv. Review workshop

On 20 February 2009, the OECD organised a discussion workshop in Kristiansand in collaboration with the local stakeholders. Representatives of the East and West Agder counties, the University of Agder and other key institutions in the region participated in this meeting to discuss the draft report, preliminary findings and study recommendations. Further written comments were provided to the OECD Secretariat following the meeting.

v. Final report

This final report was prepared taking into account the comments received during and subsequent to the review workshop.

Following this introduction, the report is organised as follows. Chapter 1 sets out the local diagnostic report. This examines the current situation of Agder, it describes its main innovation players and the current policy framework, and sets out some key challenges for further policy development. The next five chapters focus in more detail on the specific issues of the review, namely human capital and labour markets, the business sector, research organisations, institutions and governance, and the regional endowment. For each of these issues, the report presents an assessment of the opportunities and challenges, policy recommendations and learning model programmes. The two final chapters provide further learning models to illustrate in more detail both the main pillars of a successful innovation strategy (the case of Science Vale, UK) and the processes that can be used to create an innovation strategy (the case of the Weser-Ems Region, Germany). They are intended to provide inspiration for the Agder stakeholders in taking forward the development of their own joint strategy. The final chapter incorporates key overarching conclusions.

The OECD LEED Programme was responsible for the preparation of this report. Further information on the series and how to participate in the activities of the LEED Programme is available at www.oecd.org/cfe/leed.

CHAPTER 1

THE AGDER REGION OF NORWAY INSTITUTIONAL-ECONOMIC CHALLENGES

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The Agder Region

The region of Agder has an economic history where the forests, waterfalls and iron mines play a major role. English and Dutch merchants came to Agder in the 17th century to buy timber, mainly oak. Also Danes came to buy timber and cast iron. The shipping harbours thereby became centres of trade. The pattern of urbanization that thereby emerged is more or less the same pattern we see today, although the two largest town centres (Kristiansand and Arendal) have grown relatively more to the rest of the smaller towns along the coastline. By the end of the 18th century Agder people had taken over shipping, started an extensive shipbuilding and become traders in the global market. By the mid 19th century, Agder and its main shipping capital Arendal became for a short period around 1880 the largest sail ship town in Scandinavia. At that time close to 9% of the Norwegian population lived at Agder. A hundred years later, only a little more than 5% of the Norwegian population lived at Agder.

Figure 1.1. Agder Region



A relative decline in the Agder region started around 1890. Shipping, shipbuilding and international trade declined. The three were integrated and all based on wooden sail ship technology that had no chance of survival. The exploration of hydro electric power from the regional waterfalls became the new opportunity, but one that did not give significant effect until after World War 2. Two

of the largest industrial corporations in Norway, Elkem and Hydro, both had their roots in Agder, founded by Sam Eide, the great industrialist born in Arendal.

After WW2, Kristiansand had an impressive growth when the melting industry (Falconbridge and Elkem) as well as again shipping went into a rapid growth period. Agder provided sailors and crew for the merchant fleet. Around 1975, this “new” shipping adventure ended, and redundant sailors had to find new occupations as manning the new oil installations offshore in the North Sea.

The after war period had also established vulnerable (one sided) industrial places and communities along the coast as well as a relative rural decline in the inland areas, as population fled to the two urban areas at the coast (Arendal and Kristiansand).

Geographical situation and population

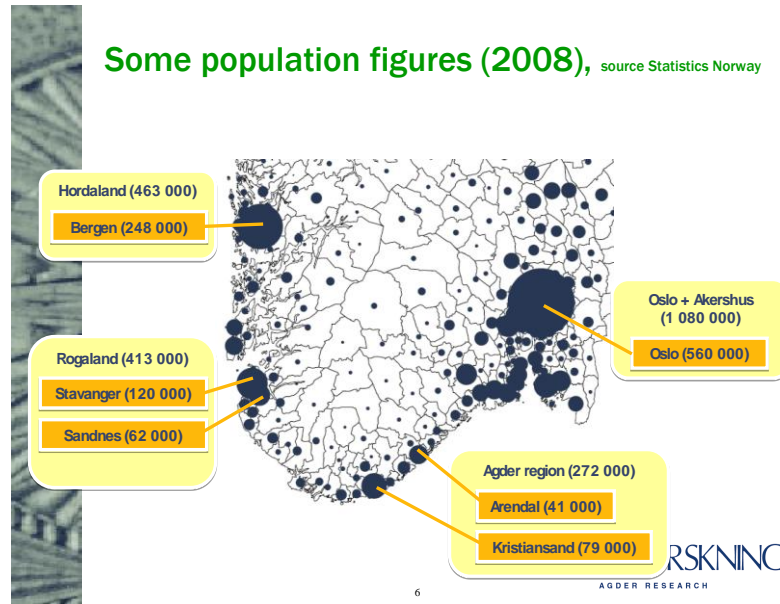
The Agder-region is the southernmost region in Norway and is composed of the two counties East-Agder and West-Agder with a total population of 272 074 inhabitants in 2008 (5.74% of the total population in Norway). Each county is divided into 15 municipalities, most of them rather small. The main part of the population is concentrated on the coastline, in the two urban areas around Kristiansand and Arendal/Grimstad.

Figure 1.2. The East and the West Region



The Agder-region is surrounded by regions with bigger populations and more important urban areas (Oslo, Stavanger and Bergen). The road (and railway) communications with these regions are however not very well developed.

Figure 1.3. An overview of the surrounding regions with some populations (1st January 2008)



The main trends in the development of population show that the population is growing with the national average. The proportion of the total national population has been stable for the last 15 years.

Table 1.1. Population in Agder 1991-2008

| Year (1.january) | Population | Percentage of national population |
|------------------|------------|-----------------------------------|
| 1991 | 242 405 | 5.70 % |
| 1996 | 250 637 | 5.74 % |
| 2001 | 259 592 | 5.76 % |
| 2005 | 264 872 | 5.75 % |
| 2008 | 272 074 | 5.74 % |

Source: Norwegian Official Statistics (NOS)

Some 51% of Agder's population lives in the three biggest towns: Kristiansand, Arendal and Grimstad. The largest administrative divisions are Kristiansand area (150,000 population) and Arendal area (80,000 population).

Gross Regional Product

The latest available national accounts figures on county level are for the year 2005. Even with exclusion of the oil and gas production in the North Sea, both the counties have a gross regional product per capita well below the national average. The gap towards the national average is smaller when looking at gross regional product per person employed, but the rank is unchanged for West-Agder and still well below the median for East-Agder.

Table 1.2. The regions ranking on gross regional product per inhabitant 1995-2007 (national average=100)

| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|-------------------|------|------|------|------|------|------|------|------|------|
| East-Agder | 79 | 77 | 78 | 84 | 80 | 79 | 75 | 73 | 75 |
| West-Agder | 92 | 96 | 95 | 87 | 84 | 90 | 86 | 87 | 88 |

Table 1.3. The regions ranking on gross regional product per employee 1995-2007 (national average=100)

| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|-------------------|------|------|------|------|------|------|------|------|------|
| East-Agder | 95 | 91 | 91 | 95 | 97 | 94 | 95 | 91 | 88 |
| West-Agder | 99 | 101 | 99 | 94 | 99 | 105 | 98 | 98 | 95 |

Comparing the ranks for 2005 with the corresponding ranks in 1997, might give the impression of a possible deterioration in relative position through the period. However, when looking at the continuous times series for the indexes from 1997 to 2005, it rather gives an indication of fluctuation more than a definite trend in relative position.

The overall ranking has to be seen in relation to the poor performance on productivity in all sectors.

Today's industry structure

Growth industries in the Agder region today are:

- Process industries, West-Agder the largest export county of processed goods in Norway
- Drilling equipment and engineering
- ICT, milieu emerging
- Travel industry,
- Retail trade and services, *e.g.* Sørlandsparken employs 3 500 people.

The strategically targeted industries at Agder today are:

- Process industry, mainly ferro-selicism, nickel and aluminum plants. About 13 plants along the coast of Agder, including Exstrata, Elkem, Tinfos, Saint-Gobin.
- Oil and gas equipment industry, about 45 companies including National Oilwell, and Aker Kverner (Aker Solution) (NOK 40 billions in order reserves).
- ICT industry, mainly in Grimstad area: about 20 medium size and 20-40 small companies, including Ericsson, Devoteam, MCP.
- Cultural and creative industries and entertainment and tourism: hundreds of mainly small businesses. (Color Line (ferry), the Zoo, summer tourism, festivals.) Main driver are three regional funds (Cultiva in Kristiansand is the biggest) with 2.5 billion NOK in capital.

The table below shows the gross product (equal to GNP exempted taxes and subsidies) of selected industries in Agder. The industries in Agder have a gross product of 4.68% of the national total (the oil and gas production excluded). Several industries - mainly in manufacturing, power supply and construction - are well above this average (all other sectors in the statistics are below average).

Table 1.4. Agder's part in national value creation in selected industries

| Sector | Sectors gross product at Agder (mill. NOK.) | Agder's share of national gross product in that sector |
|--|---|--|
| All economic activities | 60 155 | 4.68% |
| Industry total | 10 399 | 6.09% |
| <i>Machinery and other equipment</i> | 3 575 | 8.23% |
| <i>Wood and wood products</i> | 940 | 12.71% |
| <i>Building of ships, oil platforms and moduls</i> | 990 | 5.54% |
| <i>Basic metals</i> | 1 566 | 12.65% |
| Electricity and water supply | 3 089 | 7.26% |
| Construction | 4 696 | 6.11% |

Source: Norwegian Official Statistics (NOS)

Traditional heavy industry (metal melting, etc) is still very strong at Agder. The Eyde network organizes the process industry and consists of 12 firms with 3 000 employees, and a turnover of NOK 14 billion. Main companies are:

- Casting Technologies Farsund, NOK 400 mill., 240 employees
- Elkem Aluminium Lista, NOK 2000 mill., 303 employees
- Elkem Research, NOK 150 mill., 125 employees
- Elkem Solar, 270 employees
- GE Healthcare, NOK 5300 mill., 388 employees
- Xstrata Nikkelverk, NOK 1000 mill., 550 employees

This presence of industry explains why West-Agder is the largest export county in Norway.

Table 1.5. The largest export counties in Norway 2007

| County 2007 (largest Norwegian export counties) | Export in million NOK |
|---|-----------------------|
| West-Agder | 37 240 |
| Hordaland | 20 189 |
| Møre og Romsdal | 17 273 |
| Telemark | 16 872 |
| Rogaland | 15 425 |
| Østfold | 14 540 |

Source: Norwegian Official Statistics (NOS)

Employment structure at Agder

There has been a sharp increase in employment at Agder over the last five years. The sharpest increase has come in retail/tourism and health care, but also industrial employment has increased. The table A.2 in the appendix shows the total employment by sector. The table shows that retail, health and industry are by far the largest employment sectors at Agder and that they all have increased employment in the period 2000-2007. Retail, real estate and construction are the sectors with the largest increase.

If we look at the difference between the national average and Agder in employment, we get a picture of how the regional employment structure differs from the national average. Agder has an employment structure relative to the Norway average, where industrial employment is significantly higher, and so is building industry (construction) and education (schools, teaching and to some extent health care). Agder is below the national average on employment in other sectors, including agriculture, private services and financial sector as well as in public administration.

Productivity

The difference between productivity level in Agder and the average in Norway has been calculated in tables 19-21 (see appendix). This index reflects the value creation at Agder, if industry is efficient, or if Agder has a central place in the value chain within its sector. The overall picture is that Agder is well below national average in productivity. Exception is hydro-electric power supply, but that only indicates the huge resource that the region has in hydro-electric power.

The basis for the employment figures is now table A.2: Employed person by place of work and industrial classification, in the StatBank of Statistics – Norway². The figures for the gross product (value added) on regional level is taken from table A.4 (see appendix). Gross product on county level is a part of the National Accounts statistics³.

The oil and gas production in Norway poses a particular problem by its mere size (20-30 % of the gross national product). As there is no oil and gas production in Agder, this sector is excluded from the comparison with the national level concerning gross product and gross product pr. employed. However, for the comparison of employment only, this sector is included on the national level as a part of the employment in manufacturing and mining. The reason is that one might reasonably suppose that oil and gas workers take part in the same labour market as the rest of manufacturing. As the oil and gas employment is about 10% of the total employment in manufacturing and mining on national level, the particularity of Agder with high manufacturing employment would be even more pronounced if the oil and gas employment had been excluded from the national numbers.

The table on the gross product per employee in different subgroups of manufacturing (Table A.5) gives a more detailed picture of this sector in Agder. Even if the subgroups of course mostly show a lower productivity than the national average, there are some exceptions. One rather big subgroup as the metal industry has a productivity consistently above the national average and the largest subgroup of them all (machinery and other equipment) has a productivity rather close to the national average.

These two findings might indicate that size matters for productivity in Agder. On the other hand, it was found that gross product per capita in business services is higher than the national average, which is not especially large in Agder. It might however be that some subgroups are relatively bigger here than elsewhere, but due to lack of specification in the statistics it is difficult to conclude. The much higher gross product pr. employed in electricity supply reflects economic rent.

- The overall picture for the manufacturing sector in Agder is still a lower gross product pr. employed than for the national average. This main finding can be explained in several ways:
- The productivity of the work force in Agder is lower than the national average due to factors as lower educational level and weaker innovation systems.
- This lower productivity could also be linked to eventually less capital intensive production than in the rest of the country (no readily available statistics to clarify this question).

- A possible over proportional part of firms in Agder being owned and integrated in international concerns might give tax adjusted input and output prices artificially reducing the gross product in the Norwegian firm (no readily available statistics to clarify this question either).

Education level, employment and migration

The overview of the statistics on education and employment rates below is clear. The education level and employment rate at Agder is below national level. Also, as seen from demographic statistics, the region had a net “loss” of population in “education age” 20-29, but migration makes up for this loss. Net migration from abroad is rather high, more than 2000 persons in 2007.

Table 1.6. Education level in percentage of population above age 16 (2007)

| | Primary schools | High-school | University, college level | Master or PhD level |
|-------------------|-----------------|-------------|---------------------------|---------------------|
| Both sexes | | | | |
| National level | 30.9 | 43.1 | 19.9 | 6.0 |
| East-Agder | 30.6 | 46.7 | 18.8 | 4.0 |
| West-Agder | 29.4 | 47.1 | 19.4 | 4.1 |
| Male | | | | |
| National level | 30.0 | 45.6 | 16.8 | 7.6 |
| East-Agder | 28.8 | 50.0 | 15.6 | 5.6 |
| West-Agder | 28.1 | 50.1 | 16.1 | 5.8 |
| Female | | | | |
| National level | 31.8 | 40,8 | 23,0 | 4,4 |
| East-Agder | 32.3 | 43,4 | 21,9 | 2,4 |
| West-Agder | 30.6 | 44,2 | 22,7 | 2,5 |

Source: Norwegian Official Statistics (NOS)

Table 1.7. Employment age group 15-74 as percentage of number of people in that group (2007)

| | Both sexes | Male | Female |
|------------------|------------|------|--------|
| National average | 70.9 | 74.0 | 67.8 |
| East-Agder | 68.9 | 72.8 | 65.0 |
| West-Agder | 69.4 | 73.7 | 64.9 |

Source: Norwegian Official Statistics (NOS)

Table 1.8. Migration in Agder (2007)

| Age group | Domestic migration | Foreign migration |
|----------------------------|--------------------|-------------------|
| 0-5 | 247 | 278 |
| 6-15 | 94 | 325 |
| 16-19 | -20 | 146 |
| 20-29 | -435 | 406 |
| 30-39 | 286 | 626 |
| 40-49 | 115 | 311 |
| 50-59 | 62 | 82 |
| 60-66 | 41 | 28 |
| 67 years and older | 48 | 29 |
| Total in Agder 2007 | 438 | 2231 |

Source: Norwegian Official Statistics (NOS)

Unemployment

As we write, unemployment is 2.1% and until the advent of the current major recession was not a major issue in Agder or in Norway. However, less than ten years ago it was a major concern and East-Agder has had the worst employment rating and highest unemployment rates in Norway over the last 30 years. With the global economic crisis, and decreased oil prices and reduced world trade, unemployment could again become an important issue in Agder.

Research and development in the region

Table 1.9 below shows the R&D-related expenses for the two Agder counties available for the years 2001 and 2005. In the first year there is a clear difference between East-Agder and West-Agder. East-Agder has a level of R&D-related expenses per capita above the national average while West-Agder is well below. It should also be noted that the R&D-related expenses in East-Agder is almost entirely within the business sector and very small within the research and university sector.

Table 1.9. R&D expenditure 2001 to 2005

| | Total R&D expenditure 2001 (mill. NOK) | R&D expenditure pr.capita 2001 (NOK) | Industry R&D expenditure 2001 (mill. NOK) | Industry R&D expenditure pr.capita 2001 (NOK) | Total R&D expenditure 2005 (mill. NOK) | R&D expenditure pr.capita 2005 (NOK) |
|------------|--|--------------------------------------|---|---|--|--------------------------------------|
| East-Agder | 605.7 | 5897 | 600.0 | 5841 | 243 | 2348 |
| West-Agder | 230.7 | 1471 | 122.2 | 779 | 388 | 2403 |
| National | 24469.4 | 5433 | 12613.7 | 2801 | 29643 | 6435 |

Source: Forskningsrådet (2001)+ NIFU/step (2005)

This internal distribution for R&D-expenses is not available for the year 2005, but the picture for the total expenses has changed. Now the two counties have about the same level of R&D-expenses per capita and both are well below the national average.

The main explanation of the difference in observations for these two years is probably the dramatic downscaling of the Ericsson department in East-Agder (Grimstad) which started in 2002. Much of the mobile phone research in the Ericsson company was located in Grimstad until 2002, which accounted for a major part of the total R&D-expenses in East-Agder in 2001.

It must be stressed that after the downscaling of the Ericsson department, most of the qualified engineering staff stayed in the region. Many of them started new firms within the same business sector. Some of them will still be classified as ICT development, but others will work in companies and start-ups that are more service related – see chapter 3 on the business sector.

In reading these R&D statistics, one should refer to what is said about companies' innovation mode below. Agder companies are innovative. The region has one of the largest start-up rates in the country. However, the small companies at Agder do not report innovation as R&D.

The Innovation System in Agder

This section aims at providing a description of the existing structures and policies in Agder that support entrepreneurship and innovation, and who is delivering them. It focuses on policies used by

local governments and its regional and local partners. National initiatives are discussed with respect to their fit with local initiatives.

The regional policy in Norway

Municipalities

In the following we give a brief introduction to political organisation at the local level in Norway. The atomic level of formal representative political organisation in Norway is the municipality. Norway has currently 430 municipalities, which is significantly more than the comparable Scandinavian political system where Denmark has 270, and Sweden 290 municipalities. Norwegian municipalities vary much in size, some of the largest city municipalities have several hundreds of thousand inhabitants, while some of the smallest have less than a thousand inhabitants. Ten thousand inhabitants are often in the Norwegian debate, outlined as an ideal size, but it has proven difficult to muster enough political will by central government to merge municipalities that do not want to merge.

Norwegian municipalities are geographically restricted political and administrative units, they are partially (semi) self governed in local matters. Norwegian municipalities are mainly steered by central government through taxes, transfers, laws and regulations. They are responsible for: spatial planning, primary education (10th grade), primary health services, day-care centres, nursing homes, municipal roads, and in this context important local economical development. The municipal council is the central political body in the municipality and is elected every 4th year. A mayor is elected as the political leader, and a chief officer is the administrative leader. All Norwegian municipalities (kommune) are part of a county (fylke).

Counties

Counties are the political midlevel in Norwegian political structure. Norwegian counties are geographically restricted political and administrative units. They are partially (semi) self governed in regional matters, steered by central government through taxes, transfers, laws and regulations. There are 19 counties in Norway, and it is important to note that the counties have no instructional authority over the municipalities. The counties handle matters as high schools and county roads, and regional economical development, and until recently hospitals as well. Each county has its own assembly (fylkesting) whose representatives are elected every four years together with representatives to the municipality councils.

There is a debate on the future of the county as an administrative entity in Norway. For instance the Conservative Party and the Progress Party called for the abolishment of the counties. Even though the status of the counties and mere number of municipalities is a “hot” political topic in Norwegian politics, there is broad political agreement that the legitimacy of the counties as an independent political level imply a larger “portfolio” of development tasks than it has today. This was also the aim of what was initially thought to be a comprehensive restructuring of the county/regional level.

In 2002 the counties were given (by the central government) central responsibility for leading regional development efforts. Little support for this was initially given.

Regional reform efforts

The aim of a new regional reform was initially to replace the counties with fewer and larger regions with more responsibilities – a new regional level. The new reform was planned to be in effect

from 1.1.2010. However, typical of the relationship between the local level and central government, this reform effort was halted after the hearing round where:

- 8 of the counties said that they wanted a reinforcement of existing counties, 11 counties said they wanted stronger regions.
- 80 municipalities said that they wanted a reinforcement of existing counties.
- 156 municipalities wanted strong regions.

As a result, there is not going to be a regional reform but some new tasks are probably going to be transferred to the counties/regional level. Regional research funds are now decided to be implemented, with start-up in 2010. There will be 5-7 funds in Norway. Other significant reforms are probably going to be:

- Some responsibility for fishery regulations.
- Some tasks from the county administrator (state representative) to the counties.
- Some responsibility for roads are transferred from the state to the county.

In other words, the reform is not going to represent any fundamental change of local development dynamics and administrative borders. In Agder this could mean that some municipalities that have “waited” for this reform are going to initiate administrative reforms on their own. In more concrete terms this means that some of the municipalities in East-Agder County are going to initiate processes where they ask to transfer to West-Agder County. If it happens with enough of the municipalities could have consequences for East-Agder County’s ability to function as an independent formal administrative unit. This is currently one of the “hot” and unclear political topics in the Agder region.

Key actors of the innovation system in Agder

Key actors in governance

Developing a place or policy area (industry, culture, sports, transportation) through networks is not a new phenomena in the Agder region. Industrial trade associations have existed in the largest cities in Agder for more than 150 years. What is relatively new is the action of thinking of development in regional terms, while it previously was confined to the city, the municipality, the county, the business or industry. This regional perspective was formalised and institutionalised in Agder as late as in the mid 1990s, most notably through institutions such as Agderrådet. Now 15-20 years later there exists a multiplicity of networks, institutions and actors that has a regional perspective on their development activities.

Some notable actors and networks in the governance system in the Agder region include:

- *Agderrådet*: a political body (partnership) that includes the two counties and all of the municipalities. In addition are also the social partners and the universities represented. Agderrådet is a consensus based organ without any formal decision making power.
- West-Agder County, see above.
- East-Agder County, see above.

- *Arendal municipality*, second largest municipality in Agder (41 000).
- *Kristiansand municipality*, largest municipality in Agder (79 000).
- *Knutepunkt Sør*, one of the most developed intra municipal partnership structures in Norway and the most formalised in Agder. Includes six municipalities surrounding Kristiansand.
- *Listerrådet*, intra municipal partnership in the west of West-Agder. Includes six municipalities.
- *Mandal-Lindesnes*, collaborative structure between two municipalities located between Listerrådet and Knutepunkt Sør.
- *Setesdalen*, intra municipal partnership to the north of Knutepunkt Sør.
- *Indre Agder*, in a development phase includes all of the municipalities that don't have a coast line.
- *Østre Agder*, intra municipal partnership in the east of Agder.
- University of Agder (UiA), the university is an important governance actor in the Agder region.
- Competence Development Fund of Southern Norway (CDFSN), a fund that finances R&D activities in West-Agder.
- *Cultiva*, a fund that finances projects aimed at developing culture related workplaces in Kristiansand municipality.
- *NODE*, is an offshore and engineering cluster that is funded through innovation Norway's ARENA program.
- *Eyde-network*, is an network for the process industries in Agder.
- *SIVA*, a national policy instrument, finances growth parks and incubators etc.
- *Innovation Norway*, a national policy instrument (the largest) finances a long range of development programmes and projects.
- *NAV*, is the Norwegian Labour and Welfare Administration, it has regional offices and often work in partnership with other regional actors.
- *LO*, The Norwegian Confederation of Trade Unions.
- *NHO*, The Confederation of Norwegian Business and Industry.

In addition to this list, we might include other actors in the innovation system. Some of these are listed below under *Key actors in the knowledge infrastructure*. The list above includes both private networks and associations and lobby groups, and more public and official bodies and formal decision boards. The relation between these is an interesting and important field of study. This list can be made

much longer, an attempt at counting governance actors in the Agder region identified about 150 institutions/actors (2006), in addition is there a long range of R&D programmes and projects, for instance VRI (Programme for Regional R&D and Innovation)⁴.

The establishment of Agderrådet in 1995 was accompanied by the development of a new set of regional policies/ agenda. In its wake many other institutions and actors emerged in support of the new regional agenda (*Common Goals for Agder*). When the Triple-Helix rationale was introduced and adapted in early 2000 alongside other regional development concepts such as regional clusters and learning regions, creative class reenergized the emerging regional development policy agenda. One of the direct results of the regional policy agenda was that hydroelectric power shares were sold in 2001/2. This financed the new regional development funds such as Cultiva, CDFSN and the Competence fund at East-Agder (these three funds have together 2.5 bn NOK in capital) .

Governance process results in the Agder region

In the 1990s and early 2000 the Agder region prioritised its resources towards three priorities: Education and research, Communications and infrastructure, and Culture and travel industries. This prioritisation was made possible through the workings of regional governance institutions and policy agendas organised through Agderrådet and presented as *Common Goals for Agder*. This prioritisation proved to be very effective. The main achievements have been:

Education and research: Some of the notable results within the policy area of education and research was realised when Agder University College gained status as a University (in September 2007).

Communications and infrastructure: A long range of results can be attributed to the regional commitment to communications and infrastructure. Main constructions include the new motorway between Kristiansand and Grimstad, the new road in West-Agder (Lister), the Airport planned expansion (Kjevik), and the Port (Kristiansand). Trains were not prioritised as much as road projects, and have consequently suffered from this.

Culture and travel industries: The region has probably been most successful in terms of realising policy aims in this area. For instance substantial financing of culture projects through Cultiva, the municipalities, and the counties. Several culture institutions have been built and strengthened such as: Agder Teater, Kristiansand Symfoniorkester, Sørlandets kunstmuseum, Bomullsfabrikken, etc. Culture infrastructure has been developed, for instance the Arendal Kulturhus, the Kilden in Kristiansand, the Lyngdal Kulturhus etc. and educational programmes at Agder University. *Kilden*, the new concert hall in Kristiansand, is under construction and will cost about NOK 1.7 billion. A series of new culture festivals has also been emerging through public financing in the period, some of the largest are the international Pop and Rock festivals Quart and Hove, Kammermusikkfestivalen, Kirkemusikkfestivalen, Canal Street (currently there are about 95 festivals at Agder).

Much of this development has been spurred by the perspective where culture and industry is tightly coupled; in addition is of course the rationale of using culture as a mean to attract a creative workforce. This is also a commonly shared belief among politicians in a region where Richard Florida and Michael Porter probably are the most well known experts.

A more detailed look at the process behind realising these results reveal a very effective governance system in the Agder region, in a certain period at a certain time was maybe the Agder region one of the most effective cross-county governance systems in Norway. Now the economy is

very good, but there are signs that governance processes, network collaboration and effectiveness is reduced.

Key actors in the knowledge infrastructure

The knowledge infrastructure is dominated by the University of Agder. The university has about 8,000 students and 900 employees. The study programme is quite broad. Most relevant for many firms is the activity at the Faculty of engineering and science. This faculty has more than 1,500 students and about 220 employees. The majority of the students are bachelor students in technology, which indicates that the faculty is more important as an education institution than as a research centre. The faculty has two PhD educations, in Mathematics Education and Mobile Communication Systems. The University of Agder has in total seven PhD educations.

In addition to the University of Agder, the region hosts other smaller and more specialised education institutions that offer university courses, undergraduate courses and further education as well as intermediate skills. These include:

- *Department of BI Norwegian School of Management*: it is based in Kristiansand and gives graduate and undergraduate courses in management fields.
- *Gimlekollen School of Journalism and Communication*: it is based in Kristiansand and builds on a Christian objects clause. It gives graduate courses.
- *UNEP GRID/Arendal UN University*: this institution runs an online education master programme in global environment and development
- *Folkeuniversitetet Adult Education Association*: is located in Kristiansand, Arendal and Lister and offers courses on different levels, including more intermediate skills, for part-time students.

Agder also has a number of smaller and specialised research institutes. These are:

- *Agder Research*: with its 30 researches focuses on social science. This research institute is partly owned by the University. With a few exceptions, there is, however, little cooperation between researchers in the two institutions.
- *Technova*: this is a new research institutes starting up. Its focus is on science and technology, and applied research for regional firms. Technova and Agder Research are located in Kristiansand.
- *UNEP GRID/Arendal on environmental issues*:
 - Marine research institute Flødevigen: based in Arendal
 - Agricultural research centres
 - Private research and consulting organisations.

There are also corporate research institutes in some large firms, e.g. Elkem Research. However, besides the externally owned process firms (smelters like Elkem) rather few firms have their own R&D department. The regional hospital also has a considerable research activity seen in relation to the total research in the region. It has been calculated to a yearly turn over of about 40 mill. NOK⁵.

The knowledge infrastructure also includes knowledge parks located at the two university campuses in Kristiansand and Grimstad. These also include an incubator aimed to help start-ups. The region also hosts three næringshager ('industry gardens'), in Risør, Mandal, and Lyngdal⁶. These mostly contribute with premises and collocation of smaller firms. In a study carried out in 2002⁷, the author found that more than 100 organisations and institutions at Agder worked in the intermediate area of promoting innovation and entrepreneurship.

The knowledge infrastructure in Agder thus includes a number of organisations aimed to develop and diffuse knowledge. The University of Agder dominates while the other organisations are rather small and specialised.

Key programmes of the innovation system in Agder

There are some specific innovation programmes in Agder that are worth mentioning. These programmes aim at supporting innovation activities across the region, while promoting economic activities in key sectors. We highlight the most relevant programmes and agencies to this study:

Innovation Norway and SIVA: The national agency for innovation has regional branches and distributes funds to enterprises, particularly in rural areas and for SMB and start-ups according to national rules.

FORNY: this is a programme of the Norwegian Research Council programme that supports entrepreneurial ideas based on commercialisable inventions from the research institutions⁸.

ARENA: this business network is a national programme that distributes some 5 mill. NOK a year. Agder, through the NODE network for oil industry and the ICT industry is partly partner in an Arena programme.

Storbyprosjekt: the Agder region has this 'large city project' that intends to develop inter-municipality collaboration around the largest cities in Norway. Kristiansand has such a programme.

East- and West-Agder County: the two counties of Agder have funding for business development. Part of this goes to support the two research and technology parks in the region. It also supports digital development in the region, entrepreneurial education, small start-ups, and quite a lot goes to support tourist industry. The total budget for these development tasks by the two counties is calculated in the regional plan to yearly 26 million NOK.

Regional Funds: there are three funds in Agder that are public but partly operate independently of the counties and the big cities. The *Competence Development Fund of Southern Norway (CDFSN)* is a fund of 800 mill. NOK that finances R&D activities in West-Agder. Yearly they distribute about 40 mill. NOK in support, about 1/3 goes to the university. *Cultiva*, is a fund of approximately 1,3 bn NOK that finances projects aimed at developing culture-related workplaces in Kristiansand municipality. It has a yearly distribution of about 50 mill. NOK. The *Competence Fund of East Agder* has about 300 mill. NOK in capital, and distributes around 15 mill. NOK yearly.

VRI Project: the region has a VRI project that receives around 6 mill. NOK from the Norwegian Research Council, and is also supported by the region. The total yearly budget is around 14 million NOK.

Modes of Innovation and Learning in Agder

This section examines innovation processes and forms in learning in four main industries in Agder. These are the four industries selected as target industries in the new VRI Programme (VRI – Instruments for R&D and Regional Innovation). The VRI programme is financed by the Research Council of Norway and East- and West-Agder counties, and it aims to increase innovation activity and competitiveness of four industries in Agder: the ICT industry, the oil and gas industry, the process industry (mainly metal smelters), and the cultural industry.

About the VRI survey

The empirical study of innovation processes and forms of learning in these four industries in Agder builds on a web-based survey to firms, which is a part of the research activities in the VRI programme. The survey was carried out during autumn 2007 and the beginning of 2008. The survey is quite extensive, and includes questions regarding basic information about the firms; firms' core competence and learning; firms' innovation activity; R&D and patenting; idea and knowledge sources for innovation; regional factors stimulating and hampering innovation; and regional cooperation and networks.

The questionnaire was sent to 197 firms in Agder only. These include all 41 firms participating in the regional network NODE (Norwegian Offshore and Drilling) at the time of the survey, all 12 process firms that are members of the Eyde network, and all 72 firms seen to be part of the regional ICT industry to the information of a regional organisation (STS) working to support firms and networking in this industry. This selection procedure ensured that nearly all oil and gas equipment suppliers, process firms and hardware and software ICT firms in Agder were registered. The cultural industry is more heterogeneous. It also consists of many individual enterprises and is difficult to overview. It was decided to concentrate on a few supposedly innovative sectors of the cultural industry, i.e. architecture, design, film and design intensive manufacturing. Based on the telephone catalogue, websites and inquiries to municipalities, a list of 62 firms in these industries was made.

The managers in small firms and the technical directors in larger firms were asked to answer the questionnaire. The response rate is about 50 percent after several rounds of reminding (see table 1.10). The last reminder consisted of telephone calls to contact persons in the largest firms, and the sample includes almost every firm with more than 10 employees. It is difficult to find statistical figures for the number of jobs in the four sectors as these do not always correspond with the two digit NACE sectors that are available on the county level from Statistics Norway. However, calculations indicate clearly that the sample of ICT firms, equipment suppliers and process firms in the survey includes a substantial share of the jobs in these sectors in Agder, and the sample should then give a good picture of these industries in Agder⁹. The culture industry in the survey includes a few small industrial sectors where the number of jobs is not available in the official statistics.

Table 1.10. Size of survey sample

| Industrial sector | Number of firms | Response rate (%) | Number of jobs |
|---|------------------------|--------------------------|-----------------------|
| ICT firms | 36 | 50.0 | 742 |
| Suppliers of equipment for the oil and gas industry | 21 | 51.2 | 2 488 |
| Process firms (smelters etc.) | 8 | 66.7 | 1 936 |
| Culture firms (architects, designers, film companies, design intensive manufacturing firms) | 31 | 50.0 | 290 |
| Total | 96 | 51.3 | 5 456 |

Source: The VRI survey

Characteristics of the firms surveyed

The surveyed industrial sectors have some specific characteristics. The process firms (*i.e.* metal smelters) are clearly the oldest and largest ones, and are all part of a larger corporation (see table 1.11). These are production units that largely employ skilled workers. The firms produce mainly standardised products in large quantities, but they also to some extent adapt products to individual customers. The equipment suppliers are also quite old and large, although they include a mix of old and new, small and larger firms. These are more often engineering firms that produce small batches or one-off products adapted to individual customers. Nearly half of the equipment suppliers are part of larger corporations.

The two other sectors include much smaller firms, although three of the ICT firms in the sample have about 100 employees. The ICT firms are often software producers with many higher educated employees. The culture firms in the sample (such as architects, designers and film producers) have also many higher educated staff. These are mainly small firms, locally owned, and also characterised by a high degree of customised products and services.

Table 1.11. Basic information of the surveyed firms

| Industrial sector | Average age (in 2008) | Average number of jobs in 2007 | % share of firms where more than 50% of the employees have higher education | % share of firms that are part of a larger corporation |
|---------------------|-----------------------|--------------------------------|---|--|
| ICT firms | 9 | 21 | 86 | 32 |
| Equipment suppliers | 23 | 118 | 68 | 46 |
| Process firms | 41 | 242 | 0 | 100 |
| Culture firms | 16 | 9 | 66 | 8 |

Source: The VRI survey

The ICT firms and the equipment suppliers in the sample are all located in the Kristiansand and Arendal/Grimstad city regions. This is also the case for most of the cultural firms, although a few of these are also located in the rest of Agder. The process firms are located in Kristiansand and the western part of the region.

The sample reflects the situation of strong economic expansion over several years when the survey was carried out. Thus, most of the firms report increasing turnover the last five years. This is in particular the case for the equipment suppliers which have experienced an enormous increase in the market for equipments to the oil and gas industry following the rise of the oil price (see table 1.12). Also a large share of firms in the three other sectors has experienced growth.

Table 1.12. Firms' assessment of changes the last five years or since the start-up

| Industrial sector | % share of firms with increasing turnover | % share of firms with an increasing number of employees |
|---------------------|---|---|
| ICT firms | 78 | 67 |
| Equipment suppliers | 92 | 91 |
| Process firms | 57 | 25 |
| Culture firms | 49 | 35 |

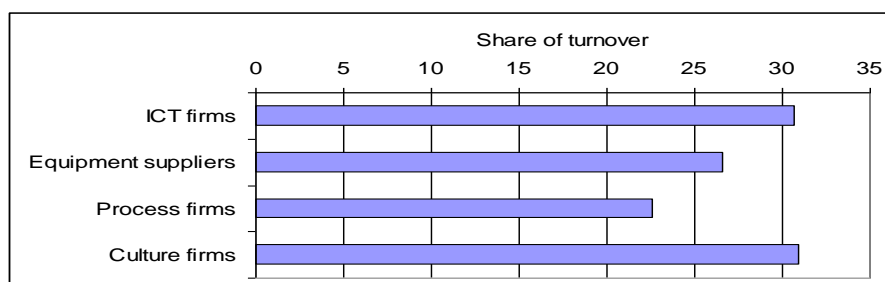
Source: The VRI survey

Innovation activity and forms of learning

The surveyed firms are also in general innovative. This includes in particular the ICT firms and the equipment suppliers. Thus, all ICT firms and 90 percent of the equipment suppliers report having introduced new or significantly changed products or services on the market over the last three years. The corresponding figures for the culture firms and the process firms are 60 and 37.5 percent. About 25-30 percent of the turnover in the sectors comes from new or significantly improved products or services in the last three years. This is a standard indicator in innovation studies, such as in the Community Innovation Survey.

Figure 1.4 demonstrates much higher figures in Agder than found in, for example, the manufacturing industry in Norway, in which 11 percent of the turnover in 2006 came from new or significantly improved products the last three years¹⁰. However, the higher innovation activity reported in the VRI survey may reflect the type of industry studied. Thus, some industrial sectors in Norway, in particular manufacture of communication equipment (NACE 32), have a high share of turnover from new or significantly improved product, as much as 51 percent for NACE 32.

Figure 1.4. Share of turnover in new or significantly changed products/services the last three years (2005-2007)



Source: The VRI survey

Other innovation indicators in the survey also point to the fact that the survey consists of a group of fairly innovative firms. A majority of the firms have started to use new or significantly changes processes, components or materials the last three years, and have been innovative as regards new or changed strategies and organisational structures.

The process firms have formal organisations for innovation activity. Seven out of eight process firms (88 %) have employees that devote most of their time to develop new products, services or solutions (see table 1.13, column A). These seven firms also have an R&D department or unit (see column B). Most of the ICT firms also have employees devoted to innovation activity, however, less than half of these have an R&D unit. Half of the equipment suppliers and culture firms have employees working with innovation activity.

Table 1.13. Organisation of innovation activity and R&D in the firms (2007)

| Industrial sector | A: % share of firms with employees devoted to innovation activity | B: % share of firms in A with an R&D department or unit |
|---------------------|---|---|
| ICT firms | 81 | 41 |
| Equipment suppliers | 50 | 60 |
| Process firms | 88 | 100 |
| Culture firms | 49 | 13 |

Source: The VRI survey

When analysing how firms in the four industries learn and innovate, some key characteristics emerge. The most important factor in developing core competence in all industries is individual learning in daily work (Table 1.14). Knowledge flow between employees is important among ICT firms and process firms, in particular. Most process firms also perform systematic R&D. Beyond that, the process firms report that external cooperation is of little importance in developing their core competence. These are Agder plants of externally owned firms that seem to have few external links locally (besides to other firms in the corporation, cf. table 1.14).

The equipment suppliers are quite different in this respect. These firms maintain that recruiting, and the cooperation with customers/suppliers and other firms are important, and for some firms also information through local buzz. The ICT firms and the cultural firms also report some importance of external contacts and local buzz for the development of core competence.

Table 1.14. Factors seen as very important for firms for developing and maintaining core competence

| | Share of firms seeing each factor as very important | | | |
|--|---|---------------------|---------------|----------------|
| | ICT firms | Equipment suppliers | Process firms | Cultural firms |
| Knowledge flow between employees | 75 | 45 | 63 | 33 |
| Individual learning in daily work | 83 | 91 | 88 | 63 |
| Cooperation with customers/suppliers | 83 | 91 | 25 | 3 |
| Recruiting | 47 | 64 | 25 | 33 |
| Long term cooperation with other firms | 47 | 55 | 13 | 37 |
| Systematic R&D in the firms | 36 | 45 | 63 | 33 |
| Pick out good ideas locally (local buzz) | 17 | 36 | 0 | 37 |
| Cooperation with R&D-inst/univ | 28 | 27 | 25 | 3 |

Source: The VRI survey

The same picture occurs when asking firms about important knowledge sources in innovation activity (Table 1.15) Most firms report that knowledge sources inside the firms are very important, and for process firms also other firms within the industrial enterprise. Next follows customers, except for cultural firms. This is roughly speaking the result found in most quantitative innovation surveys. All other knowledge sources are seen to be of less importance in the VRI survey.

Table 1.15. Very important sources of knowledge for firms' innovation activity the last three years

| | Share of firms seeing each factor as very important | | | |
|-------------------------------|---|---------------------|---------------|----------------|
| | ICT firms | Equipment suppliers | Process firms | Cultural firms |
| Inside the firm | 88 | 83 | 100 | 80 |
| Other firms in the enterprise | 13 | 17 | 57 | 10 |
| Customers | 63 | 78 | 71 | 27 |
| Component suppliers | 19 | 22 | 14 | 20 |
| Suppliers of machinery etc. | 16 | 22 | 0 | 20 |
| Competitors | 6 | 22 | 0 | 7 |
| Other specialised firms | 13 | 17 | 0 | 3 |

| | | | | |
|-----------------------|----|----|----|----|
| Consultants | 9 | 6 | 0 | 10 |
| Universities | 16 | 17 | 14 | 0 |
| Research institutes | 13 | 11 | 29 | 0 |
| Conferences, journals | 22 | 22 | 14 | 33 |
| Trades, exhibitions | 9 | 28 | 0 | 27 |

Source: The VRI survey

Forms of learning

To judge more systematically how the firms innovate, we distinguish between the STI (Science, Technology, Innovation) mode of innovation and the DUI (Doing, Using, Interacting) mode. The team used five indicators from the survey in trying to distinguish between the two analytical categories (see Table 1.16).

Table 1.16 Indicators used to measure an STI or a DUI mode of innovation in the Agder region

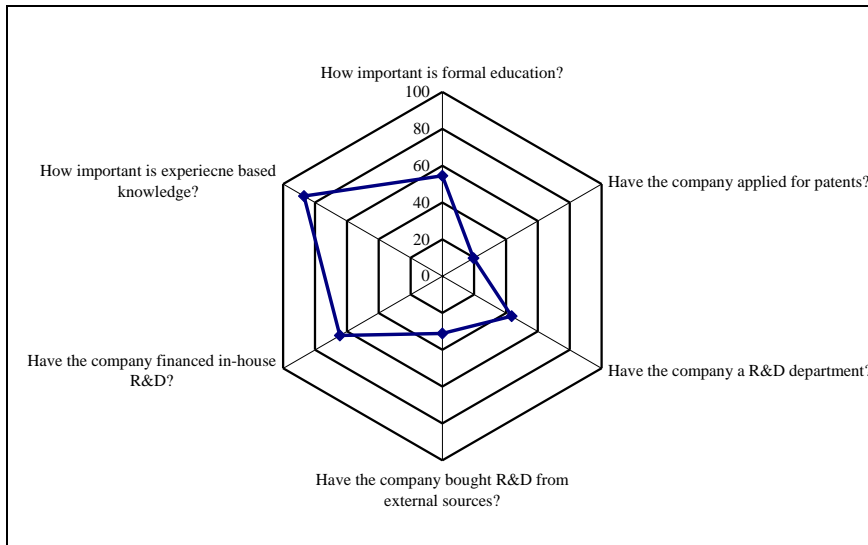
| STI ← | → DUI |
|---|--|
| High importance of analytical knowledge | High importance of experience based knowledge |
| Patent applications 2004-2006- Yes | Patent applications 2004-2006 - No |
| Research department – Yes | Research department – No |
| Have the company bought research from research institutions? – Yes | Have the company bought research from research institutions? – No |
| Have the company financed in-house research and development the last years? - Yes | Have the company financed in-house research and development the last years? - No |

The first indicator measures how important the firms judge analytical (R&D based) knowledge versus experience based knowledge. The other questions basically divide between firms that have a research strategy or not. If the firms have a research strategy they would answer yes on all or most of the questions. Firms with such characteristics (apply for patents, have a research department) innovate most probably according to the STI model. Firms that judge experience based knowledge as important and answers no to all or most of the other questions most probably innovate according to the DUI model.

The firms' answers on the questions in Table 1.16 are shown in Figure 1.5. The four industries are grouped together. The answers clearly demonstrate that the dominating mode of innovation in the four industries at Agder agrees mostly with the DUI model. Experience based knowledge developed in work life is very important for most of the firms (86.9%). However, this does not mean that formal knowledge gets a low score. 54.5% of the firms answered that formal knowledge is very important and 40.4% that it is of some importance. Only 5.4% of the firms mean it is less important. This indicates that firms see formal knowledge as a necessary but not sufficient part of their core competencies. The firms also need employees with practical experience from work and/or development projects.

An 'STI indicator' that gets a low score is application for patents as only 19.6% of the firms have applied for patents. Patenting is not common in all industries, such as in software development. However, a low score on patent application does not mean that firms show little interest in research and development. As stated in Table 1.13 above, many of the companies (43.5%) have research departments and do in-house research and development (64.4%). There is probably less weight on research and more on development since only 31.1% of the companies buys research and development from external sources.

Figure 1.5. Indicators of STI and DUI mode of innovation in Agder

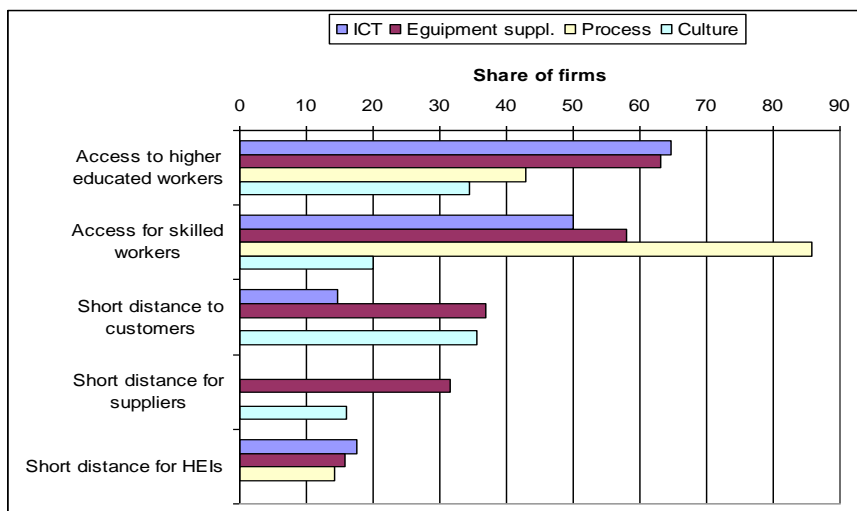


Source: The VRI survey

Importance of factors in Agder for firms' innovation activity

Firms first of all assess access to higher educated and skilled workers as *regional factors* that stimulate their competitiveness (see Figure 1.6). Short distance to customer and suppliers are most important for the equipment suppliers, which indicates that equipment suppliers, in particular, are incorporated in some local production networks. Short distance to higher education institutions are seen to be of little importance by most firms.

Figure 1.6. Very important factors in Agder in stimulating firms' competitiveness



Source: Percentage of firms seeing each factor as very important

Source: The VRI survey

The survey thus points to the fact that higher education institutions (and research institutes) are of little importance as direct sources of knowledge in firms' innovation activity and as innovation partners. Higher education institutions are, however, indirect sources of knowledge for the regional firms. This statement is supported by the fact that firms mainly recruit from the regional labour market. Thus, more than three quarters of the firms in each of the four branches recruit most of their higher educated, as well as their skilled, workers the last three years in Agder.

The firms assess most often technology as a very important subject at external knowledge actors, however, culture and art are seen as most important by the cultural firms (see Table 1.17). However, other aspects are also seen as important, mostly market and organisation for the equipment suppliers.

Table 1. Percentage of firms seeing different subjects in their relation to external knowledge organisation as very important for the firms

| | ICT firms | Equipment suppliers | Process firms | Cultural firms |
|----------------|-----------|---------------------|---------------|----------------|
| Technology | 52 | 56 | 43 | 13 |
| Economy | 0 | 22 | 14 | 10 |
| Organisation | 3 | 44 | 0 | 10 |
| Culture, art | 12 | 11 | 0 | 50 |
| Social science | 9 | 28 | 0 | 10 |
| Market | 18 | 50 | 29 | 37 |

Source: The VRI survey

Remaining questions about RIS

The analyses in this report demonstrate that Agder has a fairly weak innovation system. The knowledge infrastructure is dominated by the University of Agder, and relatively few firms co-operate with universities and R&D-institutions. Most innovation activity in firms takes place in-house and in collaboration with customers. Thus, although the VRI survey shows that many firms perform innovation activity and report innovation results, they do not collaborate with the regional knowledge infrastructure. The regional innovation system is thus fragmented in the sense of little direct knowledge flow between the two sub-systems. The importance of the regional knowledge infrastructure is first of all in the education of skilled and higher educated workers.

A further question is to what extent the mainly 'doing, using, innovating' (DUI) mode of innovation found in many Agder firms is sustainable in the long term. The mode seems successful in the equipment supplier industry, in particular. However, more systematic R&D and more cooperation with knowledge organisations may be necessary for these firms to remain competitive. There is also a question of how knowledge flows between the University of Agder and local firms can be stimulated when the firms mainly rely of the DUI mode of innovation.

APPENDIX A: STATISTICS OF THE AGDER REGION

Table A.1.: Population in the two Agder-counties (1 January 2008)

| | Population 1.jan. 2008 | Population 1.jan. 2008 | |
|-------------------------|---------------------------|---------------------------|----------------|
| 09 East-Agder | 106 130 | 10 West-Agder | 165 944 |
| 0901 Risør | 6 888 | 1001 Kristiansand | 78 919 |
| 0904 Grimstad | 19 809 | 1002 Mandal | 14 400 |
| 0906 Arendal | 40 701 | 1003 Farsund | 9 392 |
| 0911 Gjerstad | 2 519 | 1004 Flekkefjord | 8 910 |
| 0912 Vegårshei | 1 884 | 1014 Vennesla | 12 776 |
| 0914 Tvedestrand | 5 874 | 1017 Songdalen | 5 728 |
| 0919 Froland | 4 853 | 1018 Søgne | 10 050 |
| 0926 Lillesand | 9 238 | 1021 Marnardal | 2 178 |
| 0928 Birkenes | 4 503 | 1026 Åseral | 905 |
| 0929 Åmli | 1 836 | 1027 Audnedal | 1 613 |
| 0935 Iveland | 1 211 | 1029 Lindesnes | 4 557 |
| 0937 Evje og Hornnes | 3 327 | 1032 Lyngdal | 7 533 |
| 0938 Bygland | 1 242 | 1034 Hægebostad | 1 597 |
| 0940 Valle | 1 326 | 1037 Kvinesdal | 5 629 |
| 0941 Bykle | 919 | 1046 Sirdal | 1 757 |

Source: Norwegian Official Statistics (NOS)

Table A.2: Numbers employed with Agder as place of work, distributed on industries for years 2000-07. Percentage of total employment in Agder for each industry (NACE 2002) and the corresponding percentage for each industry on national level (in parentheses).

| Industry | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|--|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| 01-05 Agricult., forestry and fishing | 3333 2,90 (3,96) | 3175 2,75 (3,72) | 3135 2,70 (3,68) | 3106 2,66 (3,73) | 2898 2,44 (3,52) | 3189 2,65 (3,46) | 3453 2,77 (3,35) | 3167 2,41 (3,17) |
| 10-37 Manufacturing and mining | 19944 17,34 (14,54) | 19826 17,15 (14,40) | 18750 16,17 (13,91) | 17799 15,25 (13,34) | 17831 15,01 (13,03) | 17944 14,90 (12,87) | 18609 14,94 (12,86) | 19442 14,81 (12,80) |
| 40-41 Electricity and water supply. | 1187 1,03 (0,79) | 1027 0,89 (0,75) | 1033 0,89 (0,71) | 689 0,59 (0,68) | 594 0,50 (0,69) | 621 0,52 (0,65) | 597 0,48 (0,65) | 777 0,59 (0,62) |
| 45 Construction | 8406 7,31 (6,57) | 8791 7,60 (6,68) | 8873 7,65 (6,74) | 9164 7,85 (6,59) | 9238 7,78 (6,67) | 9557 7,94 (6,84) | 10163 8,16 (7,02) | 11307 8,61 (7,30) |
| 50-55 Trade (wh.sale/ retail), hotels/rest. | 20925 18,19 (18,27) | 20860 18,04 (18,17) | 20923 18,04 (18,27) | 21206 18,17 (18,28) | 21967 18,49 (18,45) | 22171 18,41 (18,42) | 23079 18,53 (18,22) | 24590 18,73 (18,43) |
| 60-64 Transport and communication | 8154 7,09 (7,49) | 7801 6,75 (7,31) | 7821 6,74 (7,17) | 7903 6,77 (7,03) | 8054 6,78 (6,87) | 8081 6,71 (6,87) | 8060 6,47 (6,68) | 8466 6,45 (6,68) |
| 65-67 Financial intermediation | 1851 1,61 (2,07) | 1908 1,65 (2,09) | 2118 1,83 (2,08) | 1914 1,64 (2,00) | 1821 1,53 (1,98) | 1809 1,50 (1,97) | 1849 1,48 (1,95) | 1957 1,49 (1,95) |
| 70-74 Real estate, renting and consulting | 7636 6,64 (9,86) | 8362 7,23 (10,31) | 8908 7,68 (10,34) | 8556 7,33 (9,95) | 9116 7,67 (10,18) | 9804 8,14 (10,56) | 10712 8,60 (11,07) | 11504 8,76 (11,43) |
| 75 Public administration | 7828 6,81 (7,51) | 7913 6,85 (7,28) | 7513 6,48 (7,13) | 7939 6,80 (7,22) | 7445 6,27 (6,94) | 6948 5,77 (6,50) | 7054 5,66 (6,42) | 7543 5,74 (6,28) |
| 80 Education | 10482 9,11 (7,66) | 10346 8,95 (7,73) | 10334 8,91 (7,77) | 10654 9,13 (8,16) | 10812 9,10 (8,15) | 10547 8,76 (7,89) | 10456 8,39 (7,75) | 10828 8,25 (7,64) |
| 85 Health and social work | 20729 18,02 (16,81) | 21093 18,25 (17,22) | 21831 18,82 (17,71) | 23038 19,74 (18,50) | 24140 20,32 (18,92) | 24747 20,55 (19,37) | 25100 20,15 (19,32) | 26176 19,94 (19,06) |
| 90-99 Other social and personal services | 3699 3,22 (3,73) | 3732 3,23 (3,74) | 3972 3,42 (3,81) | 3929 3,37 (3,89) | 4138 3,48 (4,02) | 4328 3,59 (4,08) | 4637 3,72 (4,15) | 4946 3,77 (4,19) |
| 00 Not available | 849 0,74 (0,73) | 766 0,66 (0,62) | 764 0,66 (0,66) | 793 0,68 (0,62) | 741 0,62 (0,58) | 684 0,57 (0,52) | 790 0,63 (0,55) | 597 0,45 (0,45) |
| 00-99 All industries, Agder | 115023 | 115600 | 115974 | 116690 | 118795 | 120430 | 124558 | 13130 0 |

Source: Norwegian Official Statistics (NOS)

Table A.3: Gross product (in mill. NOK) for all industries, Agder 1995-2006. Percentage distribution Agder / Nation in parentheses

| Industry | 1995 | 1997 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|--|---------------------------------|---------------------------------|----------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------------------|----------------------------------|
| 01-05 Agricult., forestry & fish. | 811 2,28 (3,23) | 734 1,83 (2,70) | 907 1,93 (2,81) | 897 1,83 (2,83) | 892 1,77 (2,34) | 868 1,59 (2,16) | 821 1,51 (1,92) | 859 1,55 (2,08) | 950 1,58 (2,06) | 911 1,37 (2,07) |
| 10, 12-37 Manufacturing and mining | 7211 20,26 (15,78) | 8088 20,14 (15,29) | 11156 23,69 (14,82) | 9292 18,93 (14,48) | 9901 19,61 (14,19) | 9491 17,43 (13,75) | 8180 15,03 (13,64) | 9834 17,75 (13,51) | 10440 17,36 (13,48) | 12282 18,51 (14,02) |
| 40-41 Electricity and water supply. | 1966 5,52 (3,41) | 2243 5,59 (3,24) | 1950 4,14 (2,76) | 2069 4,21 (2,68) | 2253 4,46 (2,89) | 3361 6,17 (3,14) | 2877 5,29 (3,33) | 2749 4,96 (3,06) | 3198 5,32 (3,47) | 4256 6,42 (3,58) |
| 45 Construction | 1621 4,55 (4,69) | 2047 5,10 (5,19) | 2801 5,95 (5,48) | 3061 6,23 (5,44) | 3003 5,95 (5,32) | 3573 6,56 (5,55) | 3645 6,70 (5,43) | 4137 7,47 (5,84) | 4696 7,81 (5,97) | 5078 7,65 (6,15) |
| 50-55 Trade (wh.sale/ retail), hotels/rest. | 4178 11,74 (14,75) | 4635 11,54 14,63) | 4783 10,16 (13,92) | 5234 10,66 (13,80) | 5846 11,58 (13,37) | 5918 10,87 (13,26) | 6538 12,02 (12,75) | 6405 11,56 (12,66) | 6663 11,08 (12,69) | 7454 11,24 (13,03) |
| 60-64 Transport and communication | 3639 10,22 (10,65) | 4423 11,02 (10,87) | 4863 10,33 (9,39) | 6054 12,33 (9,64) | 4949 9,80 (9,98) | 4709 8,65 (9,45) | 4597 8,45 (9,15) | 4879 8,80 (9,02) | 4886 8,12 (9,01) | 4839 7,29 (8,89) |
| 65-67 Financial intermediation | 1371 3,85 (5,15) | 1349 3,36 (4,71) | 1132 2,40 (4,63) | 1305 2,66 (4,65) | 1510 2,99 (4,42) | 1593 2,93 (4,23) | 1930 3,55 (4,76) | 1857 3,35 (5,55) | 1896 3,15 (5,32) | 1881 2,84 (4,70) |
| 70-74 Real estate, renting and consulting | 5120 14,38 (16,18) | 5897 14,69 (16,59) | 6392 13,57 (17,92) | 6960 14,18 (18,56) | 7696 15,24 (18,94) | 8306 15,25 (19,39) | 8690 15,97 (19,38) | 8279 14,94 (18,53) | 10120 16,82 (18,80) | 10962 16,52 (18,72) |
| 75 Public administration | 2277 6,40 (6,45) | 2436 6,07 (6,31) | 2997 6,36 (6,61) | 2985 6,08 (6,43) | 3013 5,97 (6,51) | 3241 5,95 (6,38) | 3084 5,67 (6,21) | 3174 5,73 (6,18) | 3149 5,23 (5,91) | 3448 5,20 (5,89) |
| 80 Education | 2175 6,11 (5,50) | 2372 5,91 (5,50) | 2954 6,27 (5,68) | 3076 6,27 (5,65) | 3414 6,76 (5,78) | 3747 6,88 (5,86) | 3873 7,12 (6,09) | 4012 7,24 (6,04) | 4223 7,02 (5,95) | 4311 6,50 (5,72) |
| 85 Health and social work | 3708 10,42 (9,81) | 4211 10,49 (10,16) | 5109 10,85 (10,26) | 5551 11,31 (10,25) | 6021 11,92 (10,64) | 7383 13,56 (11,19) | 7127 13,10 (11,48) | 7329 13,23 (11,58) | 7925 13,17 (11,60) | 8591 12,95 (11,50) |
| 90-99 Other social and personal services | 1126 3,16 (3,57) | 1250 3,11 (3,53) | 1607 3,41 (4,01) | 2374 4,84 (4,13) | 1878 3,72 (4,12) | 2121 3,90 (4,28) | 2108 3,87 (4,31) | 1899 3,43 (4,25) | 2031 3,38 (4,23) | 2325 3,50 (4,05) |
| 00-99 All industries(excl. oil/ gas) in Agder | 35600 | 40152 | 47099 | 49097 | 50498 | 54449 | 54410 | 55412 | 60155 | 66336 |
| Percentage of gross product, continental Norway | [4,98] | [4,99] | [5,05] | [4,92] | [4,74] | [4,94] | [4,74] | [4,61] | [4,68] | [4,75] |
| 00-99 All industries, continental Norway (in bill.) | 715 | 804 | 933 | 997 | 1066 | 1102 | 1149 | 1203 | 1286 | 1396 |

Source: Norwegian Official Statistics (NOS)

Table A.4: Gross product / value added in current prices (1000 NOK) for industrial subgroups in Agder. Gross product pr. employed (1000 NOK) in Agder and at national level (in parenthesis)

| Industry | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|--|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 01-05 Agricult., forestry and fishing | 269 (315) | 281 (295) | 277 (286) | 264 (261) | 296 (313) | 298 (333) | 264 (361) |
| 10, 12-37 Manufacturing and mining | 466 (480) | 499 (507) | 506 (530) | 460 (575) | 552 (608) | 581 (649) | 660 (714) |
| 40-41 Electricity and water supply. | 1743 (1500) | 2194 (1814) | 3254 (2150) | 4176 (2474) | 4628 (2343) | 5150 (2971) | 7129 (3218) |
| 45 Construction | 364 (365) | 341 (373) | 402 (400) | 398 (419) | 448 (463) | 491 (487) | 500 (512) |
| 50-55 Trade (wh.sale/ retail), hotels/rest. | 250 (333) | 280 (345) | 283 (353) | 308 (355) | 292 (363) | 301 (384) | 323 (418) |
| 60-64 Transport and communication | 742 (567) | 634 (640) | 602 (640) | 582 (662) | 606 (694) | 605 (731) | 600 (778) |
| 65-67 Financial intermediation | 705 (988) | 791 (991) | 752 (988) | 1008 (1209) | 1020 (1479) | 1048 (1507) | 1017 (1410) |
| 70-74 Real estate, renting and consulting | 911 (830) | 920 (860) | 932 (911) | 1016 (990) | 908 (963) | 1032 (992) | 1023 (988) |
| 75 Public administration | 381 (377) | 381 (419) | 431 (435) | 388 (438) | 426 (471) | 453 (507) | 489 (536) |
| 80 Education | 293 (325) | 330 (350) | 363 (367) | 364 (380) | 371 (392) | 400 (420) | 412 (431) |
| 85 Health and social work | 268 (269) | 285 (289) | 338 (307) | 309 (315) | 304 (324) | 320 (336) | 342 (348) |
| 90-99 Other social and personal services | 642 (489) | 503 (516) | 533 (546) | 536 (563) | 459 (560) | 469 (578) | 501 (569) |
| 00-99 All industries (excl.oil/gas) | 425 (446) | 437 (475) | 470 (492) | 466 (515) | 466 (534) | 500 (565) | 533 (593) |

Source: Norwegian Official Statistics (NOS)

Table A.5: Gross product (value added) pr. employed (in 1000 NOK) for all industries 2000-2005, Agder and national level (in parentheses).

| Industry | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 01-05 Agricult., forestry and fishing | 269 (315) | 281 (295) | 277 (286) | 264 (261) | 296 (313) | 298 (333) | 264 (361) |
| 10, 12-37 Manufacturing and mining | 466 (480) | 499 (507) | 506 (530) | 460 (575) | 552 (608) | 581 (649) | 660 (714) |
| 40-41 Electricity and water supply. | 1743 (1500) | 2194 (1814) | 3254 (2150) | 4176 (2474) | 4628 (2343) | 5150 (2971) | 7129 (3218) |
| 45 Construction | 364 (365) | 341 (373) | 402 (400) | 398 (419) | 448 (463) | 491 (487) | 500 (512) |
| 50-55 Trade (wh.sale/ retail), hotels/rest. | 250 (333) | 280 (345) | 283 (353) | 308 (355) | 292 (363) | 301 (384) | 323 (418) |
| 60-64 Transport and communicatio n | 742 (567) | 634 (640) | 602 (640) | 582 (662) | 606 (694) | 605 (731) | 600 (778) |
| 65-67 Financial intermediation | 705 (988) | 791 (991) | 752 (988) | 1008 (1209) | 1020 (1479) | 1048 (1507) | 1017 (1410) |
| 70-74 Real estate, rent-ing and consulting | 911 (830) | 920 (860) | 932 (911) | 1016 (990) | 908 (963) | 1032 (992) | 1023 (988) |
| 75 Public administration | 381 (377) | 381 (419) | 431 (435) | 388 (438) | 426 (471) | 453 (507) | 489 (536) |
| 80 Education | 293 (325) | 330 (350) | 363 (367) | 364 (380) | 371 (392) | 400 (420) | 412 (431) |
| 85 Health and social work | 268 (269) | 285 (289) | 338 (307) | 309 (315) | 304 (324) | 320 (336) | 342 (348) |
| 90-99 Other social and personal services | 642 (489) | 503 (516) | 533 (546) | 536 (563) | 459 (560) | 469 (578) | 501 (569) |
| 00-99 All industries (excl.oil/gas) | 425 (446) | 437 (475) | 470 (492) | 466 (515) | 466 (534) | 500 (565) | 533 (593) |

Source: Norwegian Official Statistics (NOS)

CHAPTER 2

PEOPLE AND THE LABOUR MARKET

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Introduction

The purpose of this chapter is to outline the skills development and labour market needs of the Agder region in relation to the formulation of a strategy to underpin a strong innovation and entrepreneurship system. It is organised into four main parts: i) A review of general policy issues and good practices. ii) Strengths, weaknesses, opportunities and threats in the Agder region. iii) Recommendations for policy development in the Agder region. iv) Three learning models that will help to illustrate how to address the recommendations.

Policy Issues

There are typically two hallmarks of regions that are successful in building strong economic development that is based on high levels of innovation and thriving entrepreneurial activity. These are an efficiently functioning labour market that responds quickly and directly to changes in the conditions under which it is operating, and a skills-development system that underpins the provision of a highly-skilled labour force that is able to take advantage of the mix of opportunities open to it. All regions are searching for the mechanisms that will bring such an optimal infrastructural environment into place, and it can safely be said that none has yet uncovered the policy-mix that will bring it about, if indeed such exists (Asheim, 2007). Contexts vary markedly, there are strong trade-offs between objectives, which also vary between regions, and even what constitutes the optimal solution is not homogeneous across regional boundaries, nor universally accepted within regions.

Some factors are common, however. Most notably, it is widely accepted that there is a positive correlation between the level of skills held by a region's workforce and its propensity for innovation and entrepreneurial activity (Arundel et al., 2006). Of especial importance are general or transferable skills - skills that are useful in a wide range of organisational settings. Such skills not only allow workers to move easily between activities in response to changing economic circumstances, but they also underpin an orientation to innovative and entrepreneurial activity that is both broad in scope and more conducive to the higher levels of change that underpin long-term competitive advantage. Such activity is also seen to be related to the possession of what are called "softer" skills - skills that are not scientifically or technologically focused, but concern the environment in which the more technical skills are developed and deployed (Nielsen, 2007). Examples are management skills (particularly in the human resource management area), communication skills and team-working skills. These skills are seen to be crucial in putting in place an environment to underpin strong innovative and entrepreneurial endeavour, though they are sometimes downplayed relative to the so-called "harder", technical skills.

Tether et al. (2005) suggest that management or leadership skills are of particular importance for the generation of a high innovation regime. Drawing on the distinction between older models of technological innovation and more modern models based on "strategic intent", they state that

the latter requires innovation that involves a wide spectrum of actors both within the innovating organisation itself and across its suppliers, commercial partners and customers. High level management and leadership skills are seen to be required to draw the disparate parts of this process into a coherent whole. It is also suggested that the link between skills and innovation in the modern economy is likely to be different in the manufacturing and services sectors and across the product life-cycle within each sector. Service industries are seen to require higher organisational skills and less likely to value research-based skills. In short, the skills mix that is optimal for high innovation activity is highly context specific. Pavitt (1984, 1990), for example, distinguishes between science-based, scale-intensive, specialist supplier, supplier-dominated and information-intensive industries, all of which are seen to have different skills requirements for high innovation activity. Tether et al. (2005) sum up the key public policy implications as the need for skills formation to be more extensive, more organisationally focused and more generic in content. Organisations are encouraged to be more collaborative, to adopt better practice rather than search for “best” practice, and to use organisational slack to encourage innovative behaviour.

Also strongly linked to the existence of high levels of innovation and entrepreneurial activity is a labour market that is responsive to the changing pressures on it, notably those coming from the demand-side of the market and relating to changing levels of economic activity and product market demands. There is widespread recognition that the impact of globalisation on labour markets has been intense. The off-shoring of production in Western industrialised countries, changes in technology that have permitted new modes of production, faster changing tastes and fashions, and generally increasing levels of product market competition have all increased the pressure on labour markets to reconcile imbalances in labour supply and demand. All countries and regions within them have had to review the efficiency with which their labour markets respond to the new demands upon them.

Not only are the twin demands of labour market functioning and skills development hard to attain in their own right, but they also conflict. Strong skills development often requires the development of organisational structures that slow the responsiveness of the labour market. This is most notable in terms of general skills formation. The hallmark of such skills is that there is no strong incentive for employing organisations to provide training in such skills for their workers (Becker, 1964). Once trained, such workers are more productive not only in the organisation in which they acquired their training, but also elsewhere. Unless the training organisation increases the rewards for the newly-trained worker, it is possible that he/she will move to another organisation. This could be countered by increasing the wages of the trained worker, but this is in effect double-payment for the skills acquisition process. A strictly rational organisation would therefore not engage in general training but would “poach” those trained elsewhere. Such “poaching” is seen to be particularly problematic in highly-innovative, high-technology industries (Tether et al., 2005). A consequence is that in a free labour market there is likely to be an under-provision of training in general skills – the so-called “free rider problem” (McNabb and Whitfield, 1994). This could invoke responses by the organisations concerned in terms of trying to reduce the turnover of their workers, eg by providing “golden handcuffs” (Sengupta et al., 2007), or by policy-makers in terms of putting in place labour institutions in place that internalise the free rider problem, eg by requiring organisations to engage in minimum levels of training, or by imposing a levy on organisations that is used to finance industry training (Baker, 1994; Ross and Whitfield, 2008). Both sets of policy will reduce the responsiveness of the labour market to supply- and demand-side changes.

More generally, a great deal of efficiency-oriented organisational activity will also reduce labour market responsiveness. For instance, policies to encourage the commitment of individuals to the organisation’s goals and values as part of a high commitment management policy (Wood and de Menezes, 1998) typically reduce the degree to which it can change in response to external pressures. Such a policy, particularly if it involves reductions in financial well-being, could well be seen as the organisation going back on its psychological contract with its workforce (Guest and

Conway, 2004). Organisations in search of obtaining competitive advantage in ever more complex product markets have increasingly been attracted to putting in place such policies, despite their negative labour market side-effects (Whitfield and Poole, 1997).

One of the key factors that has underpinned organisational policies that have blunted the operation of labour markets is the intensified search for higher level innovation that has increasingly characterised the corporate world in recent years. There has been growing recognition that the key to long-term success lies in the harnessing of the larger scale opportunities that present themselves as opposed to the smaller scale incremental changes that flow seamlessly from day-to-day activities (Bessant and Francis, 2005).

To illustrate what this means in general terms, a contrast can be made between what is commonly called *steady-state innovation* and *higher-order innovation* (Bessant et al., 2008). The former involves relatively incremental innovations of products or processes, for example slightly altering a product to create a new or improved version, or streamlining a process to enhance efficiency. However, the fundamental approach to production and technology remains unchanged. These forms of innovation are important for economic success, but because everyone is doing them and they can be copied readily, they cannot be a source of long-term competitive advantage. At most, they offer short term advantages of a limited kind.

Higher order innovation, on the other hand, can have a dramatic and long-term impact on a firm's competitive advantage, if successful. Two of the hallmarks of higher-order innovative activity are discontinuous innovation and management innovation. *Discontinuous innovation* occurs when a disruptive event occurs that changes markets, industries or even societies (Bessant and Francis, 2005). A good example is the advent of the internet. This gave rise to a wave of discontinuous innovation across many industries. It had a disruptive effect for established firms. *Management innovation* can be defined as a marked departure from traditional management principles, processes and practices, or a departure from traditional management principles or organisational forms that significantly alters the way the work of management is performed. Examples given are General Motors' invention of the divisionalised organisation in the 1920s, Procter and Gamble's development of brand management in the 1930s and Toyota's work on employee based problem solving in the 1970s (Bessant et al., 2008).

Higher-order innovation and entrepreneurship are not easily promoted, and both need particular types of support from the labour market and the skills-development system. Of prime importance, they require that the labour market is structured so that it can respond quickly and appropriately to changes in the demands made upon it, and is as free from structures that impede its operation as is both feasible and desirable. In terms of the skills-development system, there is an especial need for institutions that promote the development of general and transferable skills, and which promote a culture of lifelong learning. Allied to both of these, is a need for the culture underpinning the system to be as inclusive as possible, so that no social groups are excluded from making the strongest contribution to the higher-order innovation and entrepreneurship process that is possible. It is also possible that the system is as open to external ideas as possible, because the forces that initiate bouts of higher-order innovation come from a wide variety of sources, and not always those that are linked to conventional wisdoms.

Among the major factors that can prevent labour markets from responding swiftly and directly to the pressures upon them are social and political pressures for welfare considerations to dominate economic imperatives. Structures can be put in place, for example, to over-ride labour market adjustments that yield outcomes that are deemed socially sub-optimal or to orient training systems towards responding to supply-side pressures at the expense of demand-side. Many of these structures have widespread social and political support, and underpin the development of what is locally seen to be the "good society". However, they often have attendant costs, not least in terms of constraining the operation of the labour market. This may be deemed a cost worth

paying, especially in times of economic downturn. However, they need careful management by policy-makers to prevent them promoting the onset of labour market sclerosis, to the cost of prosperity in the society as a whole.

Attention also needs to be paid of the provision of labour market structures that mitigate the “free rider problem”. Most productive in this respect is the development of collective organisations by employing organisations themselves to put in place training provision in general and transferable skills, akin to the system that has underpinned the advent of the modern German economy (Casey, 1991). Less successful have been attempts by national or regional governments to impose high levels of general skills training, either by law or levy (Baker, 1994). This is, however, a key area that needs addressing in all economies if the benefits of discontinuous innovation are to be reaped.

A further factor that is germane to the development of a successful general skills development system is the harnessing of the large volume of movement that is currently taking place across national and regional boundaries. The scale of these changes is unprecedented, even by very recent standards (Dustmann et al., 2005). Immigrants into an economy bring with them a skill-set that is by its very nature different from that of its local population. This both poses a problem and offers an opportunity. The problem is that these skills might not be those that are wanted in the local economy, or of the precise type that can be used locally. This suggests the need for training, re-training and, most crucially, the recognition of what the related needs are. Opportunities flow from expansion of the skills base that comes from people originating in different economies, societies and cultures. Diversity can yield economic benefits, but not without the putting in place of supporting structures and incentives. These need to be based on evidence of what structures and incentives are appropriate. In few regions does this evidence-base exist in any meaningful way.

A further issue is the exposure of the local economy and society to ideas from outside its boundaries (Bessant and von Stamm, 2007). In general terms, the more a region is linked to other parts of the world, the greater its propensity to embrace new ideas, and thereby higher-order innovation (Haskell et al, 2002). This can be facilitated in a number of ways – via the active encouragement of inward investment, the development of joint ventures and strategic alliances with overseas organisations, active policies by indigenous organisations to give their workers international experience and involvement in international activities, particularly by the higher education sector.

Challenges and Opportunities

Strengths

A Labour Market that is Delivering Economic Success

In terms of its human capital resources and key labour market outcomes, the Agder region is in a position of considerable strength. Its labour market and related institutions have underpinned a thriving and successful regional economy that enjoys considerable economic success, on both the national and international stages. Unemployment is low and labour force participation rates are high. The workforce has a high level of education and skills, and its various institutions are working well within a consensual decision-making process that involves a wide range of stakeholders. In such a situation, the need is clearly not for radical change, but to build on the institutional structures already in place, and make them more conducive to the development of a strong innovation and entrepreneurship system.

The flexicurity system that underpins the labour market provides a firm foundation for promoting innovation, particularly as it has broad support across a wide range of stakeholders.

Workers are much more likely not to resist change if they feel that their economic prospects are not strongly threatened by its consequences, and are more likely to engage in general skills formation if they feel that opportunities will be available to use the skills so acquired.

A Highly Qualified Workforce, particularly in the Engineering Area

The Agder region possesses a large stock of highly qualified workers, especially in the Engineering and Technological areas. This has been the basis of its recent success in the world-leading oil- and gas-platform and mineral processing industries and the IT related activities that are prospering therein. Moreover, the flow into this stock is seemingly becoming stronger with the creation of the unified University and increasing interaction between it and the relevant industry groups. The advent of the mechatronic subject-area out of these interactions is especially promising for future prosperity. This workforce is potentially the basis of a new wave of innovatory activity that either develops out of the current areas of regional business strength or autonomous of them. The key to harnessing this opportunity lies in the provision of structures that broaden the skills-set and vision of the highly-qualified workers and support their venture into new areas of engagement.

The Upper Secondary/Apprenticeship VET (2+2) System Underpins a Strong Intermediate Skills Base

The 2+2 vocational and education system offers a strong base in intermediate skills formation that allows strong innovation at organisational level. Young people enter the workforce with a high level of skills; this offers a strong foundation for further job- and firm-specific skills development. This clearly has a strong impact upon innovation at firm level.

The vocational education and training (VET) system is firmly embedded in the vocational curriculum at secondary level and the work-based apprenticeship system that flows from it. The evidence is that it yields a constant supply of workers who are highly trained in the intermediate skills area, the foundation of a group of highly trained technical workers who underpin the advanced technology used by organisations in the region's key exporting industries, helping the Agder region to be leading Norway's export performance. Most importantly, the VET system tends to attract a high quality of trainees, being much less blighted by the stigmatisation that accompanies such training in some other industrialised countries (Crouch et al., 1999).

Creation of University of Agder offers Opportunities for Stronger Knowledge Transfer

The higher education system is focused on the various university colleges that have merged and been up-graded to become the University of Agder (UiA). These colleges make a significant contribution to the innovation and entrepreneurship process in Agder, some more than others. Particularly influential in this respect is the campus at Grimstad, with its strong technological focus and links to the technology-driven industries that have been fundamental to Agder's recent business success story. The advent of the new University clearly offers opportunities to broaden and deepen this impact, and a carefully-developed strategy is essential to underpin this, particularly with regard to the less technologically-oriented parts of the institution.

The creation of a unified university offers opportunities for the consolidation and enhancement of knowledge transfer processes in higher level skills. Most importantly, this allows a much greater degree of integration in the higher education system's activities than was formerly the case and the development of a stronger strategy for knowledge transfer. Such opportunities need to be grasped; they will not occur without careful thought and action.

Local Business Community Becoming Aware of Need for Greater Collaboration

The business community in Agder is increasingly aware of the need for collaboration in a wide range of areas, and is putting in place structures to facilitate even greater collaborative activity. The development of the NODE and Eyde networks is especially promising in this respect. These emerging processes have the potential to have a strong impact on Agder's skills-development processes, and need to be integrated into related developments in the region and supported. Crucially, such collaborative activities can help overcome tendencies within Agder's current skills development system towards the creation of skills that are extremely specific to a particular organisation and/or job, and not very conducive to the development of the general/transferrable skills that normally underpin strong innovation and entrepreneurship systems. This could have a fundamental impact on the region's ability to compete internationally across a much wider spectrum of industries.

Policy Community Interested in Strengthening Support for Innovation

The recognition by the policy-making community that future economic development requires that the region's innovation and entrepreneurship systems must be strengthened, and that many of the key issues therein require more coordinated policy delivery offers the foundation for substantial progress. This has the potential to overcome some of the problems caused by Norway's highly fragmented political milieu. There has been much constructive work in this direction, but it needs to go further and crucially become embedded within the behaviour of key actors in the region. Developing the structures and more crucially the ways of working that cut across the excessive fragmentation in the Norwegian political system is not going to be easy, and we are aware that there is a long way to go in many areas.

Above all, there is a growing recognition at all policy levels of the need for the Norwegian society and economy to embrace higher-order innovation and entrepreneurship. Such activity is increasingly seen as being fundamental to economic success in the commercial environment that is evolving both within the country and internationally. Not only was this OECD team invited to review Agder's innovation and entrepreneurial capacity, but other teams within OECD have recently been asked to make recommendations in relation to the country's innovation system and its economic infrastructure (Kuczera et al., 2008, OECD, 2008). Along with the strong labour market and educational foundations already in place, this offers the basis for developing a regional system that is conducive to strong and broadly-based economic development in the region in coming years. It also suggests that policy initiatives emanating from within the region will be received in a constructive way by those at higher policy levels, thereby further freeing constraints on the region.

It also offers the opportunity to have a greater impact on policy-change at the national level. To the extent that the Agder policy community identifies areas for change at national level that can help it achieve its objectives, it can use the national reviews in support of its suggestions for change. This will undoubtedly give it greater leverage over the national policy agenda.

Large Immigrant Population Offers Potential for Broadening Skills Base

The presence of a large and varied immigrant population offers the potential for a major expansion of the skills base, and thereby higher levels of innovation and entrepreneurship. The annual net immigration of over 2,000 persons into the region should be embraced as a positive development, allowing it to reap the rewards that such populations have given to so many regions throughout the industrialised world. Persons coming from different backgrounds to the indigenous population often offer skills that contribute to higher-order innovation activities.

There is also considerable activity within the region to harness this opportunity, most notably the *Global Future* pilot project that took highly-qualified immigrants and trains them to take on management positions and seats on boards of directors. The pilot project ran over the period June 2007 to December 2008 and has had good media coverage. There is a distinct possibility that it could form the basis of an emerging policy agenda aimed at harnessing the skills and competencies of the immigrant population.

Weaknesses

Insufficient Attention to Harnessing Broader Aspects of Innovation

The reviews undertaken by the local team and discussions with key local actors point to the conclusion that Agder is trapped in a type of *narrow innovation equilibrium*, akin to Finegold and Soskice's (1988) low skills equilibrium. There is substantial evidence that businesses in the region focus on innovative activities that require the intense use of a narrow set of skills rather than the use of a wide range of skills across a broad range of activities. For example, the local team's survey found that knowledge sources inside the firm were most important for innovative activity and that the emphasis was on the "Doing, Using, Interacting" type of innovation rather than the "Science, Technology and Innovation" type. If it is to move from its current position towards one that allows it to operate as a successful regional economy across a wider range of industries, it needs to break out of this equilibrium.

Breaking out of such an equilibrium is unlikely to be easily accomplished. It most likely will require the enactment of a number of mutually-reinforcing policy initiatives that together change attitudes, behaviour and expectations. Agder is in this equilibrium trap for very good and positive reasons – the current system is delivering good returns to large numbers of its citizens, for whom the incentives to change are not strong. Equally, those not so fortunate seem to have accommodated to their situation and are also not pushing strongly for change. Some form of circuit-breaker is therefore needed that will provide incentives for change. The keys to its success are its operating across a number of fronts rather than in a small area, the interaction between its parts and the mix of positive and negative incentives that it involves.

The 2+2 VET System is too Supply-side Driven

The school-based part of the 2+2 Vocational and Educational Training system is more heavily influenced by the wishes of the students than those of the employers, and therefore over-supplies trainees to the apprenticeship part of the process in some areas and under-supplies in others. The immediate consequence is that more trainees do the school-based second part of the training than is likely to be optimal for the system as a whole. In the longer term it is likely to result in some trainees not being able to obtain work of the type for which they are trained, and apprenticeship places not being filled either at all or by the most appropriate persons. This is certainly related to the major skills shortage problem that Agder currently faces.

A major concern is the high and continuing shortages of particular types of skilled worker. During our visit we were informed that at that time there were 6,500 unfilled jobs in a wide range of occupations in East Agder alone. Given that the unemployment rate was even lower in West Agder, the likelihood is that this would be at least as big a problem there. Shortages on this scale require high levels of recruitment from overseas, especially from Poland, Germany and Portugal. The necessity for such activity needs to be clearly assessed, and any local impediments to the response of the labour market to them identified.

There are, however, some concerns being expressed about the ability of the VET system both to deliver workers in the areas needed to respond to the continuing shortages of workers in certain key areas of skill, and to put in place a platform that will assist the regional economy's long-term

development. Most notably, a recent OECD report on the Norwegian VET system (Kuzcera et al, 2008) recommended a number of key changes, and we suggest that the Agder regional policy-makers must take these on board in the near future. These recommendations must be viewed in conjunction with the information on the Danish VET system, which is much more demand-side driven, inclusive and seamlessly linked to other parts of the education and training system than its equivalent in Norway.

The VET System is Not Sufficiently Responsive to Later Career Needs

The 2+2 VET system undoubtedly delivers a supply of highly qualified workers into the regional economy, but is very focused on the transition from school to work. In the modern globalised economy, skill needs are changing more rapidly than ever before. Workers can expect to change their career trajectories more frequently and the skills that they use in the employment setting. Organisations also need to be more flexible and adaptable to changing market circumstances. This requires that skills training needs to extend well beyond the school-to-work transition, and well beyond the boundaries of the organisations themselves.

The mid- and late-career VET provision in the Agder region seems to be less strong than in other parts of the industrialised world, notably its near-neighbour, Denmark. This would seem to reflect a lower level of concern with these parts of the system and the lack of existence of structures that would bring into place a system of skills training for those attempting either to develop their skills-sets or move to new areas of activity. This is particularly important given the increasing evidence that there is a high drop-out rate within the 2+2 system, and that many train in areas for which there is not strong demand.

There is also an issue of social inclusivity inherent within this area. Given the evidence that there are substantial numbers of Agder residents not playing as full a part in its economy as in equivalent regions elsewhere (notably recent immigrants and women), there is an urgent need for structures that will form a bridge between inactivity/partial activity and full participation in the workforce. Strong vocational education and training opportunities can form such a bridge.

Too Little Policy Attention is given to Opportunities Offered by Large Immigrant Population

The level of migration into Agder from a wide range of locations offers the prospect of a major broadening of the region's skills base. However, the integration of skills learnt elsewhere into the regional economy requires policy attention based on a strong evidence base. Both elements seem at a lower level than is desirable.

Recent years have seen a massive increase in movement across national boundaries, resulting from changes in the cost and availability of transport options and the expansion of the European Union. The scale of these changes has caught many national/regional governments unawares. There has also been a rather negative reaction in some quarters that has focused on the prevention of entry of economic migrants from less developed parts of the world into developed economies. Gradually a more positive policy agenda is emerging in some countries that is aimed at harnessing the increasing movement into the country/region to its economic strategy. However, this agenda is not an easy one to put together, and needs to be based on a strong evidence base because of the high level of heterogeneity of the population in question and the issues involved. At present, Agder does not have a sufficiently strong evidence base to put in place a policy agenda to increase the contribution of the immigrant population to its innovation and entrepreneurship strategy.

High Levels of Expenditure on Support for Sick and Disabled

In common with the rest of Norway, a large proportion of the budget of the Norwegian Labour and Welfare Administration (NAV) is spent on support for the sick and disabled, a much

higher level than is found in other Western industrialised countries. Mechanisms are needed to address this, and possibly turn the expenditure into more productive channels.

An area of concern to many actors within the Agder system (eg people from the Labour and Welfare Administration), and to those reviewing the capacity for innovation within the region (for example, OECD, 2008) is the high level of persons on various forms of disability benefit. Figures supplied to us indicated that in relation to a workforce of 2.4M people, 298,000 are on a disability pension, 28,000 on a temporary disability pension, 60,000 on social welfare, 120,000 on social welfare, 66,000 on occupational rehabilitation, 58,000 on unemployment benefit, 44,000 on rehabilitation benefit, 12,000 on transitional benefit and a further 10,000 on individual and severance benefits. These are very high by any standards.

The currently on-going reform of the Labour Administration and the Welfare Administration might help to bring this issue under closer scrutiny, but we feel that regional actors must intervene to make sure that the issues underpinning this situation are placed under evidence-led policy investigation. On the positive side, the reforms are aimed at offering regional and sub-regional actors more autonomy by moving the decision-making process closer to the end-user, and this offers an opportunity to address the weaknesses that are clearly already apparent to key persons within the region.

Lack of Rigour in Provision and Assessment of Apprenticeship Training

A recent OECD study of Norway's Vocational Education and Training System suggested that there was a lack of rigour in both the training of apprenticeship trainers and the assessment of apprenticeship element of the 2+2 system. This needs addressing at both national and county levels. Consequently, there needs to be a two-headed approach involving articulation with the national debate and using local autonomy to ensure that the Agder VET system leads the rest of Norway in introducing positive change.

Absence of Knowledge Transfer Mechanisms in Higher Level Skills

The advent of the University of Agder offers the opportunity for the integration and enhancement of the knowledge transfer mechanisms in higher level skills. While this is happening to some extent in the technological skills area, it is much less evident in the so-called softer skills that are essential for the development of strong higher-order innovation and entrepreneurship activities.

Universities undergoing the type of major change that the University of Agder is currently experiencing typically take a considerable time to develop their new strategies. The early stages of development are often focused on developing new operational systems and ensuring that a wide constituency have a say in how their roles evolve as part of the change. At this time, there is a tendency for compromises to be made that do not link neatly with any overall strategic vision that has been put in place and for attention to be diverted from longer-term strategic issues. It is therefore inevitable that certain areas, especially those that are about broader and longer term issues, might not get the attention that they deserve. There consequently needs to be a major strategic initiative when the immediate issues around the forging of the new institution have been settled. The time for this could well be now.

Lack of Provision of General and Softer Skills

It has been noted in a number of places that there is a strong tendency for the Norwegian labour market to deliver skills training of a highly specific form, rather than the more general type that are seen to be most compatible with innovation and entrepreneurship. These tendencies relate to the high emphasis placed on in-firm training within the VET system and the particular form

that it takes in Norway (Kuczera et al, 2008), and the nature of the flexicurity system (OECD, 2008). This partly reflects the lack of a formal assessment regime for the apprenticeship part of the 2+2 system and the need to reduce the incentives for trained workers to leave the firms of their training for higher salaries once the training is complete. In such an environment there is an urgent need for policies with accompanying incentives that encourage training in general/transferable skills. A prime example is the work undertaken in Denmark to develop a range of vocational colleges and enterprises that are linked to and supported by the VET system. These colleges provide not only VET as part of the initial VET system, but also vocationally-oriented technical and commercial education programmes, short-term higher education and adult vocational training. The colleges are approved by the Ministry of Education, but are independent public institutions (National Education Authority: Danish Ministry of Labour, 2005). This is an area in which the higher education system also has a key role to play. The absence of a strong Business School with a broad remit within the University of Agder is something that needs urgent consideration. It is notable that many local firms use a Department of the BI Norwegian School of Management for broadening the skills of their managers rather than the University.

While there are some examples of higher-order innovation in the Agder region, notably in the oil and gas equipment supply industry and the ICT industry, there is generally an absence of such activity across the board, and this is certainly limiting high-level competitive success across the region's firms. This could well reflect an under-provision of the sort of skills that are typically associated with higher level innovation, such as the general and soft skills that underpin creative responses to discontinuous innovation and management innovation. The latter are particularly absent due to the lack of presence of a strong tradition of management education. Indeed, it is notable that institutions from outside the region seem to have a stronger role in the provision of such skills than those emanating from within it.

Evidence of a Primary/Secondary Labour Market Divide

While there is evidence that the region has, in general, a labour market that is delivering high quality outputs, there are also indications that this does not apply across the board. Certain groups do not seem to be participating as strongly in the economy as the white, male, Norwegian workers who populate many of its key areas. Of especial note are the low participation rates of women in Agder (employment rates almost three percentage points below that of Norway as a whole), the high numbers of younger persons on benefits and the high out-migration rates of many young workers, and the marginal labour market position of many recent immigrants. Indeed, there is evidence of the existence of the vicious and virtuous circles that have been associated with the creation of segmented labour markets (McNabb and Whitfield, 1998). In particular, there are indications that access to training for skills development is considerably greater for those at the upper end of the skills distribution than for those further down. While this is not unusual in a modern economy (Whitfield, 2000), it is not conducive either to equity in the distribution of economic benefits or the broad-based development of an area.

To some extent, these problems are a reflection of the emphasis placed on the core activities that take place in the region, and are thereby a side-effect of the nature of what has underpinned its success stories. Because the knowledge creation domains have delivered high quality workers to the areas key industries, there has been less attention paid to those who do not naturally fall into this area, possibly because they leave the labour market at some stage, either voluntarily or not, or possibly because they are entering into areas of the labour market during their mid- or late-careers. Public policy is often needed to ensure that such people are given similar opportunities to those who fit more naturally into the mainstream system.

Opportunities

Labour market and skills development system that has widespread support and local involvement

The Agder labour market has, in general, been operating at high levels of excess demand for a considerable period, as evidenced by the extremely low unemployment rates that have been experienced and the widespread shortages of skilled worker. This makes it imperative that the labour market is working as efficiently as possible to reconcile supply and demand pressures and provide incentives for skill-acquisition. Along with the rest of Norway, the Agder region has a labour market that has many of the key features of the flexicurity system that is present to greater and lesser extent across Scandinavia, that is one which combines freedom for employers to adjust their workforces to the external circumstances facing them and a high level of job security for employees. There are grounds for suggesting that, relative to the rest of Scandinavia, the emphasis is typically more on the security element rather than the flexibility element. This has certainly underpinned a great deal of the economic success that the region and the country as a whole have enjoyed. Moreover, there is increasing evidence from around the world that such a system is very conducive to the development of innovation processes within organisations. Nonetheless, like all economic systems, the Agder flexicurity-based labour market needs continual re-appraisal to determine whether it is meeting the needs of its main actors. The key here is to ensure that the security elements of the labour market system do not constrain the flexibility elements, but rather support them. There is a tendency in social democratic areas for social policy concerns to override more economic considerations in the development of labour market related policy interventions.

The labour market and skills development system commands widespread support in the regional community, allied to extensive involvement in decision making by local actors. This can be harnessed to underpin the changes that are needed to make this system work much more effectively for the economic and social development of the region. There is also a high degree of local autonomy within the system, such that many of the changes identified above can be made without needing to lobby for change at the national level. Moreover, the widespread involvement of the local stakeholders within the system means that the changes can be given a high level of operational detail, given those with the task of implementing them have a very strong steer. Against this, however, is a possibility that some stakeholders might holdup any changes that are not in their own particular interests.

Exogenous supply of skilled labour that adds significantly to region's skills base

The attractiveness of the region to a wide range of immigrants offers a major broadening of the skills-base within the region, and can underpin a major diversification in its economic activity. There is much evidence that the region is proving attractive to a wide range of immigrants who possess a high level of skills and the characteristics to integrate well into the regional community. This offers an opportunity to develop new areas of activity that can be part of the emergence of an economy that is much less reliant on the prosperity of a small number of (albeit world-leading) industries. Such a process can be helped by the putting in place of a set of structures that help guide and support the immigration process, such as focussing the inflow in areas of local need, thereby ensuring that the immigrants have a greater opportunity to integrate into the labour market, and the opening of access to local training and employment opportunities to the immigrant population.

Recognition by local policy-makers of need to collaborate

The widespread recognition that the overly fragmented policy domain can lead to ineffective and inefficient policy delivery offers the possibility for the region to lead the country in the development of collaborative arrangements that overcome the legacy of Norway's political and administrative past. Many of the policy changes suggested in this study are best delivered at

regional level, and the region will be a more powerful voice in attempting to promote change at national level.

The integration of two separate counties into a true regional policy-making body is, however, not easily accomplished. The history of separate activity will not be overcome immediately, and other organisations will continue to operate on a separate basis. Strong leadership is required for the changes currently in place and anticipated to lead to genuine all-Agder decision- and policy-making. This is exacerbated by the geography of the region, with its distinct sub-regions centred around the main cities.

University searching for a strategy that will make a regional impact

The newly-formed University of Agder is currently looking to develop its role as a leading university. This means that it is open to new ideas as to how it can develop its role, and therefore more likely to be receptive to fresh thinking on how it might develop its regional economic and social role.

Moving from a set of university colleges into an integrated and dynamic single university will, however, take time and strong strategic leadership. Simply to move beyond the day-to-day operational will take time and commitment, let alone putting in place the structures that will move the university to being a strong presence in the regional economy. In particular, there needs to be a vision that clearly identifies the role of the university in a region such as Agder. This vision needs to evolve not just from the internal discussions of the university but from the wide range of stakeholders in the region.

Potential to Develop Culture of Lifelong Learning

The Agder region has many of the characteristics that underpin the development of a culture of lifelong learning. There is the ever-strengthening university, industry groups that clearly see both the importance of skills development and the need to work in unity, a population that has a high level of basic skills, and many institutions that are involved in skills formation activities. There is also a growing level of cultural activity throughout the region that could encourage its population to broaden the scope of their interests. These largely disparate phenomena need active integration, involving a wide range of organisations, but especially the regional policy-making authorities.

Threats

Global economic downturn

The financial crisis currently sweeping the Western industrialised world will severely limit the potential for making strong economic advance. While the Agder region enters this downturn in a more positive situation than many other regions across the OECD, it will not be immune to many of the negative impacts coming out of the global markets. How it handles these will determine how well it is able to grasp the opportunities available in the next upturn.

A particular threat relates to the approach taken to entrants into the region from overseas. These entrants have the potential to make the regional economy more responsive to the external pressures upon it, and they need to be integrated into its activities rather than excluded from them. Such integration is best accomplished during high levels of economic activity, but are much more difficult to enact when attention turns to more immediate local concerns relating to a fall in consumer demand.

Increasing interest in immigration by economic migrants

The global downturn could well lead to an increase in the number of economic migrants crossing borders from poorer countries and regions into the Agder region. While such a flow offers many opportunities to the region, it needs to be at a level that is readily absorbable by the region's infrastructure. The lack of past attention in this area suggests that this limit might be close to being met.

An increasing number of regions and nations are putting in place frameworks that underpin policy-making in relation to immigration. These are typically based on evidence-gathering activities that examine migration flows, skills-sets and the impacts of migrants on their adopted countries. The need for evidence-led policy is particularly strong in this area, as the scale of migration has grown so rapidly as to make data from even the recent past a poor guide to present and immediate future policy. Moreover, this is an area around which myths and half-truths abound. Evidence is needed to support policy initiatives that might seem less than optimal from the perspective of such inaccurate information.

Disjointed university structure

The University is dispersed across a number of sites that are geographically distant, have differing subject-foci and located in towns with distinct and to some extent competitive histories. This will make it hard for the University to forge a strong identity and to develop a high level of integration in its activities.

This is not an easy issue to solve, given the proud traditions that the two main parts of the university have and the distinct subject-areas on which they focus. There is very much an air of two distinct cultures within the two main campuses, and this could well prevent the development of a strong and clearly-defined university strategy. It may well be that there are two different universities in existence in Agder.

Recommendations

Strengthen the Culture of Lifelong Learning

The Agder region raises a number of important policy issues in the people and labour market area for the development of a strong innovation and entrepreneurship system. Most notable among these is how the current education and training system can be developed to embed a stronger culture of lifelong learning, particularly in the acquisition of the generic and transferable skills that generally underpin successful innovation and entrepreneurship systems. There is also a need to make the vocational education and training system both more rigorous in its operation, and more responsive to the demand side of the labour market. This will involve, among other things, changes in both the various vocational education and training institutions and the newly-formed University of Agder. It also requires that more attention is paid to the large and growing immigrant population, which has the potential to add to both the breadth and depth of the Agder region's skill base, but which is currently not being used as effectively as it might.

A recent OECD review of innovation in Norway outlines what it calls the "Norwegian puzzle", namely that, despite weak innovation inputs and even weaker outputs, Norwegian per capita incomes are very high in international comparisons (OECD, 2008). The study states that, "Norway is a rich country, but it would be even richer if innovation activity were more intense, as it could be, given that framework conditions for innovation activity...are relatively favourable." (OECD, 2008, p.56).

The survey undertaken by the local Agder team further developed this theme. It found that firms in Agder's four core industries are generally innovative, but that this innovation is largely of the small-scale incremental type, using knowledge sources that are available inside the firms themselves rather than external to them. The most important factor in developing core competence is "individual learning in daily work", and that knowledge sources inside the firm are very important for innovative activity. The local team concluded that the dominant mode of innovation in the four core industries in the Agder region conform to the Doing, Using, Interacting (DUI) model, rather than the Science, Technology, Innovation (STI) model.

Embrace the Reform of the 2+2 VET System

The 2+2 Vocational Education and Training system must be made much more responsive to the needs of the demand side of the labour market. At present, the emphasis in the first (academic) stage is much more on meeting the needs of the students than on those of the employers, leading to a mismatch between the specialisms of the students and the availability of apprenticeship places. The 2+2 system could also benefit from a greater degree of rigour in the apprenticeship stage, especially in relation to the training of the trainers and the conduct of the final examination. At present, the trainers do not need qualifications and the assessment process is quite informal. The Danish system is much more market-oriented and rigorous in the manner of its operation than its Norwegian counterpart. It is also much more closely linked to other parts of the education and training process. The Agder authorities could well benefit from examining the nature of the system operating at the end of its ferry link.

The recommendations of the recent OECD review of the Norwegian VET system (Kuczera et al., 2008), and examination of the operation of the Danish VET system could assist in this area. They offer the basis of an agenda that could promote the emergence of a VET system in Agder that puts in place a skills base that allows it to respond to the new opportunities that emerge as the world economy comes out of the current financial crisis. To improve the match between VET provision and labour market needs, student choice should be better guided and channelled. In particular, VET provision at upper secondary level should be guided more strongly by the availability of apprenticeship places. Counties should reduce programmes that attract few apprenticeships and improve the quality of career guidance at upper secondary level. The problem of dropout within the system should be directly addressed. This requires that the system's flexibility is used to keep VET students in school, and better data is acquired on the flow of students through education and on the labour market performance of dropouts. Steps should be taken to ensure that the quality of apprenticeship training is commensurate with the generous subsidies that employers receive for its provision. The assessment procedures for apprentices' practical skills should be reviewed and made more rigorous. Workplace supervisors and trainers of apprentices should receive some obligatory training. The collection and analysis of data on the performance and operation of the VET system needs up-grading to underpin stronger policy development in this area.

The development of and active support for public colleges that can spread the vocational education and training system beyond its current areas is urgently needed. In this regard, the example of the Danish VET colleges is instructive. These are autonomous of government, though regulated by public bodies, and not only engage in provision for the initial VET system, but seek opportunities in related domains. Such institutions can readily put in place learning arrangements that are identified by labour market players, and offer a pro-active element within an area that is strong in its mainstream provision but slow to adapt to new scenarios.

Increased Involvement of the Business Community in the Skills Process

The business sector must lead the region in developing skills acquisition and transfer processes. They have much expertise to underpin such a development. One of the most positive

aspects of the way that decision-making is undertaken in the region is the tripartite nature of a great deal of the process. This gives the business community a strong influence in determining the nature of the system within which it operates, and in articulating its needs. This must be used to underpin the development of a more all-encompassing system of skills development. The advent of industry-wide lobby groups, such as NODE and Eyde, in the key sectors additionally offers a platform for developing ideas that can be presented in those places where resources are available and key decisions are made. It also allows a strong and united position to be presented to those organisations that can influence the skills supply process, such as the new university. The networks must take a more pro-active role in driving the skills development process, both within the VET area and at the higher education level.

Investigate the Low Participation by Women in the Agder Labour Market and Take Corrective Action

The low participation rate of women in the Agder labour market, both relative to men in the Agder region and to women in other parts of Norway should be investigated. Many of the main actors in the region recognise the problem, but there seems to be little consensus as to its causes and consequences. This is an area where evidence-led policy intervention is possibly extremely important for the well-being of the Agder economy. It is possible that the problem lies in the area of the school to work transition, the return to work after childbirth or in access to skills training in mid- to late-career. Alternatively, it could be something that is rooted in the very culture of the region. In each case the solution will be different. However, in each case the solution is likely to involve considerable heterogeneity of action. In this case, the effectiveness of the policy response will depend crucially on the degree to which it fits the context. The better the evidence on which it is based, the more effective the policy intervention is likely to be.

Stronger Integration of Immigrant Population

The Agder region administration should also investigate the potential to integrate the incoming immigrant population much more strongly into the labour market. The most fundamental area that requires urgent investigation is the nature of the long-term skills shortages within the Agder labour market that need to be filled by immigration. This might be underpinned by the development of a points-based system that allows the regional authorities to determine where to allocate their resources in this respect. Such an investigation would focus the search in overseas markets for workers who are likely to integrate rapidly into the Agder labour market, and make a strong contribution to its well-being. The recent work by the UK Migration Advisory Committee (Migration Advisory Committee, 2008; Metcalf, 2008), and the broad evidence-led policy stance taken by the UK authorities is instructive here.

The regional authorities also need to examine the support that is given to immigrants and their families in the process of integration. This needs to go beyond employment-related factors, to include issues related to housing, education and social inclusion. Failure to address such issues can have a negative impact on the individual immigrant's productivity, and in the extreme may lead to a higher than optimal out-migration rate, which can be costly for the region and its organisations. It is increasingly recognised that the more pastoral aspects of re-location can be more important in determining whether a migration process is successful than the more technical, and that the welfare of a migrant worker's dependants can be more important than that of the worker him- or herself. The impact of immigrants on the country in which they settle can be substantial. They bring fresh ways of seeing opportunities, new skills, and typically a desire to succeed that is greater than for the population as a whole. However, the harnessing of this positive impact requires a pro-active approach from the authorities where they settle. Policies and practices that are well-suited to the indigenous population may not work so well for immigrants. For example, there may need to be more emphasis on language courses than on more subject-specific provision. More fundamentally, immigrants may respond more readily to persons from

their own backgrounds when undertaking activities linking them to the education system and labour market. Such persons in turn might be more responsive to the immigrants' needs.

Development of an action plan for the University

The University of Agder must draw up an action plan to improve the knowledge transfer flows between itself and the regional economy. The University has made some crucial early steps in its development. Understandably, this has focused on bringing its constituency together and building internal mechanisms that allow its disparate parts both to work together more effectively and for workers therein to recognise the implications of its new status. The next stage in its development is crucial. It will need to be more externally oriented. Most importantly, the University needs to articulate a vision for its long-term development. This vision must be both inspiring and grounded in the reality of its location. Of key importance here is the continuation of a funding regime that is more congruent with its previous situation than its new situation. That limits its opportunities, but does not extinguish them.

It should also explore the potential for greater links between its activities and key actors in the region, in terms of joint research projects and the flow of personnel in both directions. The transition from a group of largely discrete university colleges to an integrated university with strong links to the local economy is not easy, as testified by the experiences of the UK polytechnics in their transitions to fully-fledged universities. Of particular importance in this respect is the plan developed by Professor Roland Lewinsky for the University of Plymouth (a university with similar needs to the University of Agder and sited in a not dissimilar geographical area). Such experiences could usefully be drawn on by the University of Agder.

An area in which the University could make a strong contribution to the skills development and transfer process is in the area of business/management studies. Many of the leading local organisations use non-Agder-based institutions for management education and training rather than the University. This is a missed opportunity. There is a strong demand for education and training of this type within the region, both from business organisations and public authorities, and considerable expertise on which to draw from both the organisation and provision of the courses concerned. Moreover, such activities can also lead to the development of other initiatives, including the development of knowledge-creation opportunities. The process could best be started by a meeting between the university and the groups that are emerging to present their positions in key areas.

One area in which the university might help the region is by expanding its provision of programmes that appeal to international students. This not only brings a flow of revenue into the university, but it also increases the potential inflow of high quality residents. Indeed, those wanting to stay in the region are likely to be those whose attitudes and behaviours are most congruent with those of the indigenous population. The programme can therefore act as a low cost but effective form of screening device. For such a system to work effectively the programmes will need to be taught in the medium of the English language, as many other European universities are discovering. The scope of these programmes could be further enhanced by the University linking with the Agder industry (well-positioned abroad) and with other universities following the same path. In this regard, it should endeavour to join European and international university networks and get involved in their activities.

Reform of the Welfare System

Attention needs to be paid to the operation of the welfare system. The extremely high level of claimants is suggestive of a problem. Such high levels are typically associated with areas where there is a high level of excess supply of labour rather than excess demand, particularly where there is a high structural component to unemployment. While the Agder region has undergone

considerable structural change in recent years, this has been accompanied by high levels of demand for labour and the continual existence of shortages in key labour market groups. This is possibly suggestive of problems in the labour market with regard to matching supply and demand pressures.

The recent reforms of the labour and welfare system that aim to bring the two parts together and link it more to local provision offer the opportunity for it to become more pro-active and locally-oriented in its decision-making. We would encourage those with responsibilities for policy-development in this area to examine some of the changes that are currently taking place in the United Kingdom in relation to the Dame Carol Black's Review of the health of the working-age population, *Working for a Healthier Tomorrow* (Black, 2008). Of especial importance in this regard is the idea that involvement in work activities typically contributes to employee well-being, and that workers who are ill might recover more strongly while in employment rather than separate from it – “work is good for health”. It is therefore suggested that there needs to be a fundamental change in the perception that it is inappropriate to be at work unless 100% fit. The UK Government responded by introducing the “electronic fit-note” to replace the paper-based sickness certificate. Such a change signifies a complete change of approach to health that is not only directing at reducing the costs of sickness absence, but also improving recovery rates.

Learning Models

Danish Vocational Education System

Background

The Danish vocational education system has much in common with that in place in Norway. It is also a dual system combining periods of schooling and in-firm training, and there is both initial training aimed at 16 to 25 year-olds (IVET) and continuing training (CVET) aimed at those aged 25 and over. The system is divided into two parts – a basic course typically of 20 weeks in length and a main course averaging from 3 to 3.5 years. It is administered by the Ministry of Labour and is based on cooperation with labour and business. This involves the identification of training needs and the development of course content in over 50 sectors/occupations. Delivery involves 24 independent AMU centres. Social partners are involved via an advisory council, trade committees for sector-specific skill-set development and local training committees that promote cooperation between colleges and local labour markets.

The outcomes of the system are good, with the vast majority of those completing a programme finding employment within their chosen field within a year. Slightly less impressive are completion-rates, with just over one-half completing a basic course in technical training. This may reflect the heavy emphasis on in-firm training, in that those showing an ability to progress may be taken out of the formal training process into productive work; the downside to this is that the training of those so affected may be less deep than would otherwise be the case. Nonetheless, there is evidence that the Danish system, combining state intervention and cooperation between the social partners, offers a vocational education and training that is both deeper and broader in scope and much more general than is found in the bulk of Western industrialised economies, though there is some evidence that it is becoming more specific in its orientation through time (Nyholm et al., 2001).

One of the most important aspects of the Danish system is the degree to which it integrates differing elements of the VET system together. This not only involves education and training in the universities and technical schools, but also elements from IVET and CVET. The result is a system of training that allows workers to move in and out of education and training as and when it suits them, thereby allowing both the optimal life-cycle timing for such activities and the construction of a skills mix that fits with the trainees' needs.

The Danish Ministry of Education exercises strong regulatory control over the system. It is responsible for putting in place the framework within which the stakeholders operate, approving new VET qualifications, approving new colleges, inspection and quality assurance. The social partners are involved in the system at all levels, and crucially have a role of adapting it to local needs. Typically, the Ministry of Education takes prime responsibility for the school-based part of the training, and the social partners for the work-based part.

VET is provided by colleges and firms. The colleges are independent public institutions, with their own boards of directors, including representatives from the county councils. They have a high degree of autonomy, and are typically involved in activities going well beyond the VET programme. The practical training takes place within approved organisations. In both IVET and CVET enterprises are able to customise their programmes to meet the specific needs and demands of their local labour markets.

The system is highly flexible, offering a wide range of possibilities for trainees. A key element in this is the funding regime. The colleges receive taximeter grants per trainee, which leaves them with a wide scope for autonomy. The result is a demand-led system in which the colleges compete on provision and quality. There are two access routes to the system – the school pathway and the company pathway. School periods (one-third of the programme) alternate with in-company periods. Each programme has a short basic course and a main course in which the trainee specialises in a trade. Most enter via a basic course, and apply for an apprenticeship once they have finished it. The main course requires a contract with an employer; however, a lack of apprenticeships is a problem, despite subsidisation.

The Danish system has been the subject of continual reform with a view to increasing its labour market responsiveness, attractiveness, flexibility, inclusivity, college/firm interaction, and pedagogical methods.

Relevance to Agder

The Danish VET system has three key elements that might be usefully transferred into the Agder VET system. The first is that it is much more strongly driven by the demand side of the labour market and the needs of the employers. The second is that it involves more formal control over its assessment procedures by the Ministry of Labour than is the case in Norway. There is an opportunity here for those with a responsibility for more local schemes to introduce changes in the assessment regime that more closely mirror those of Denmark than is the norm in Norway. Thirdly, the high level of tripartite decision-making has resulted in a much greater attention being paid both to the seamlessness of its operation and to overcoming the free rider problem that tends to bedevil vocational education and training throughout the Western industrialised world.

These are all issues that have been brought up by the OECD team examining the national VET system. Their attention was firmly focused on policy change at national level, but many of the points that they raise can also be addressed at a regional level. There is considerable autonomy for policy action at the local level. The national guidelines under which the system operates are extremely broad, and there is much scope for policy in this area to be led from below rather than above. It is therefore suggested that Agder begins a process through which it can become the leader in making the VET system in Norway more demand-driven, rigorous in its assessment procedures and more seamless in its activities.

Results of the Approach

Approximately one-third of each youth cohort starts a VET programme after basic schooling (National Education Authority, 2005), though this is dropping relative to the numbers entering the general and vocationally-oriented academic upper secondary programmes. There is a close

gender balance overall within the VET system, though not within individual programmes. For example, the social and health care programme has a 9:1 female/male split.

The average age of trainees in the basic course is 20 and in the main course 25. Eight per cent of trainees are immigrants or from ethnic minority backgrounds. Completion rates vary from programme to programme, with technical training having just over half completing the basic course and commercial training having nearly eighty per cent completing. The high level of dropout in some areas is a key problem that the Danish system is currently trying to address. The vast majority of those completing a VET programme enter the labour market immediately and eighty per cent are employed in a company within a year.

Reasons for Success

The Danish VET system has achieved international acclaim as a model for other countries to follow in addressing the widespread shortages in the areas of intermediate skills. It is a comprehensive system that has strong incentives embedded within it, and complementarity to the country's labour market structures and widespread stakeholder involvement and support. Moreover, there has been a concerted attempt at governmental level to make the system as effective as possible and particularly to make it responsive to labour market demands.

Obstacles Faced and Response Taken

The Danish VET system is not without its problems. Most notable among those mentioned by those reviewing it are its high cost, evidence of the increasing skill-specificity of parts of the system and the completion rates in particular areas. Efforts are being undertaken to mitigate these. However, the second and third may be inherent in the structural design of the system itself and almost inevitable by-products of the way in which the system has evolved. Increasing skill-specificity, for instance, could well reflect the growing use of GTS institutes (not for profit technology consultancies that are largely financed by the sales of their services as intermediaries between research and firms); these may be best placed to focus their activities on firm-specific issues. Similarly, low completion rates may be inevitable in a system that places so much reliance on firm-based training.

Considerations for Adoption

The Agder VET system has many of the key elements of the Danish system already in place. However, there are three key areas in which it seems less strong. The first concerns the degree to which the system reflects the pressures coming from the demand side of the labour market. Secondly, there is less concern relating to quality assurance within the Norwegian system, especially in relation to the apprenticeship phase. Thirdly, the Norwegian system is less tightly integrated into other parts of the education and training system.

The suggestion is that key policy-makers in the VET area commission a study of the VET system in a related region of Denmark, that compares it and contrasts it with its Agder counterpart, and recommends ways in which the latter can make a more effective contribution to enhancing the breadth and depth of the Agder skills-base, especially in the area of general/transferable skills, thereby increasing the region's propensity to pursue higher level innovation across a wider spectrum of activities. The recommendation is therefore not for wholesale change but simply a tightening in some areas and a consideration of how the current system can deliver high levels of general skills across a wider spectrum of the Agder workforce, both potential and actual.

There are clearly elements within the Danish VET system that cannot be considered for the Agder system in that they will need national level decisions for their implementation. In that

respect, there is likely to be no short- or medium-term solution. However, such issues can form the basis of a case that can be taken to the national level for consideration.

Further Information

Danish Ministry of Education, Vocational Education and Training System website: <http://pub.uvm.dk/2005/VET/kap01.html>.

The Lewinsky Plan for the University of Plymouth

Background

The University of Plymouth (UoP) originated as a polytechnic in the far South-West of the United Kingdom. It had three main campuses, the main one in the city of Plymouth, a teacher training college (Rolle College) near Exeter, about 40 miles from Plymouth, and an agricultural college (Seale-Hayne College) near Newton Abbot, about 25 miles from Plymouth. In 1992, it was awarded university status along with other polytechnics and absorbed the formerly independent Plymouth School of Maritime Studies, a leading school in its field. The so-formed University of Plymouth was among the more progressive “new universities”, and not only became the largest university in the south-west of England, but the fifth largest in the United Kingdom (in terms of student population).

It appointed Professor Roland Lewinsky as Vice-Chancellor in 2002, and he developed an ambitious plan to establish UoP as a leading university in both teaching and research. This ambitious plan aimed to link the university much more strongly with its hinterland, via the University of Plymouth colleges programme, build on Plymouth’s already strong reputation as a first-rate teaching university, focus the university’s activities onto the Plymouth campus, and aligned the university’s research strategy with that of the regional development authority, investing in marine science and technology, biomedicine and health and creative arts.

Despite opposition in a number of places, especially on those campuses being moved to Plymouth, the plan moved ahead rapidly and very quickly achieved strong results; the university moved from 73rd place in one leading university league table in 2005 to 35th in 2007. In another, it was placed 55th, the second highest of the ex-polytechnics in the UK. However, Professor Lewinsky was tragically killed by a live power cable brought down in a storm on New Year’s Day, 2007, and was therefore unable to complete his mission. There followed an interregnum, during which key elements of the Lewinsky Plan either fell by the wayside or were less strongly pushed that would otherwise have been the case.

Central to the Lewinsky Plan was the establishment of the University of Plymouth Colleges (UPC), one of Plymouth’s five Centres for Excellence in Teaching and Learning. Modelled on the University of Wisconsin System, the University of Plymouth Colleges binds twenty partner further education colleges into a collaborative arrangement by making them a faculty of the university, giving college lecturers parity with university academics and giving their students access to the same resources as those on the main campus. Every college has someone on the UPC faculty board and the colleges have been formally integrated into the university’s quality assurance mechanisms. There has also been the establishment of subject-groups to host conferences and develop curricula. UPC offers two-year foundation degrees in over 100 subjects. This foundation degree programme has grown to over 10,000 students by 2008.

The University of Wisconsin System is based on the so-called “Wisconsin Idea” that was formulated by the president of UW-Madison, Charles Van Hise, over a century ago. Stripped to its fundamentals, it declares that the boundaries of the university should be the boundaries of the state and that its work should be focused on improving the quality of life and environment of all

citizens of the state. This idea has helped to forge close working relationships between its key stakeholders and the putting in place of an administrative structure that is extremely inclusive.

The most controversial part of the Lewinsky Plan was the restructuring of the university into groupings of cognate subjects and the centralisation of activity on the Plymouth campus in order to reduce duplication of activities, create critical masses for research purposes and promote cross-disciplinary interaction. This was strongly resisted by those linked to the institutions being closed in the outlying areas, to the extent that threats were made against Professor Lewinsky's person. However, he saw this as vital to creating a unified university, rather than a federal dispersed campus with markedly differing agendas.

Research funding within the university was centrally determined to a considerable degree, and focused on areas that had both shown past excellence and linked closely to the region's economic development agenda. Plymouth was following a common theme here that was to be found among a number of other "new universities" in the UK, notably the University of Glamorgan in the South Wales valleys. Such a strategy made it clear that the university was part of its local community and not separate from it, thereby permitting it to draw resources from local as well as national sources.

Relevance for the University of Agder

The creation of the University of Agder out of a number of constituent university colleges has much in common with the creation of the University of Plymouth in 1992. It is likely that UiA will experience many of the same pressures and problems as UoP, particularly as the surrounding region bears many similarities to the far South-West of England. Essentially, UoP made slow but steady progress in the ten years following its status up-grade, but transformed itself very quickly once Professor Lewinsky brought his expertise to the task of guiding it forward. UiA should try and avoid the slow progress of its early university years by developing a clear and coherent plan that both clarifies its strategic direction and links it firmly with its hinterland. Most importantly, it needs to build strong links to its allied colleges and make as seamless as possible transitions between itself and them. It should also think about the effect of its multi-campus dispersion and how this might be made to work better for it. Research links to established Agder businesses should also be promoted.

Results of the Approach

The main result of the Lewinsky Plan is that the University of Plymouth is now much more of an integrated university, with a clearer view of its mission and vision. The main campus has witnessed a considerable amount of new building, and thereby has a stronger visual identity. As this is very close to the city centre of Plymouth and to other cultural amenities, the campus is a real presence for many of the city's populace. UoP has also made a much stronger claim to being the university of the far south-west (Devon and Cornwall). At the same time, it has continued to support its traditional areas of excellence, and has kept a profile that goes well beyond that region.

Reasons for Success

The Lewinsky Plan was carefully developed by someone who had achieved considerable success in developing strong research groups out of different backgrounds in the face of strong opposition. These changes often also involved new buildings that gave a visual identity to the new institutions. This clearly gave the plan a greater prospect of success. Furthermore, many of the structures that the plan built on were already in place, but either not strongly supported or not sufficiently integrated into other activities being undertaken simultaneously. The existence of the University of Wisconsin federal model that integrated a disparate set of colleges into a united body with a strong local vision was also important for the development of the University of

Plymouth Colleges concept, along with the support that was given by key players within that system.

Obstacles Faced and Response Taken

The major obstacle faced is clearly the premature death of Professor Lewinsky. This not only caused there to be an interregnum when progress slowed, but meant that there was a change of leadership and vision. It also brought into play a situation in which many of the sponsors of the original plan re-considered their positions, so causing there to be a hole in the plan's finances. At the same time, some of those having doubts about the plan were able to strengthen their opposition. The response has been that the new Vice-Chancellor has tightened the university's purse-strings and has made a number of staff redundant.

Even before Professor Lewinsky's death, there were problems relating to the plan. The main problem was his idea about focusing the campus on Plymouth. This meant relocating departments from places where they had a long history and strong links to the local community. This did not make for a smooth and cost-free transition. Professor Lewinsky's response was to listen and to try and persuade, but he ultimately backed his judgement as to what was best for the university.

Considerations for Adoption

Key considerations for the development of a plan for the future development of the University of Agder are whether the multi-campus strategy is viable, particularly with its major divide on subject-type lines. Much more than in the UoP case, UiA is spread over a number of sites, rather than having a hub and spoke type of arrangement. It is highly likely that there is no potential for centralisation. This makes it even more important that the university has a strategy in place for integrating its disparate campuses into a unified whole. In short, the University of Wisconsin model is probably even more apposite for UiA than for UoP.

The fundamental idea that the university needs to be integrated into the activities of its partner colleges and that the transition from one to the other should be as natural and seamless as possible is something that UiA needs to explore. Otherwise, it is unlikely to make the depth of impact in the local community that allows the development of the strong culture of skills development that typifies the regions with powerful knowledge economies.

The overriding need is for the university to define its role clearly. It will not be able to make the transition to becoming a university like the Universities of Oslo, Trondheim or Bergen, each of which has had considerable time and funding to establish their particular positions within the country's higher educational system. However, the new university has emerged at a very important time in the region's development, during which there is much activity with which it can become involved and a clearly defined need for a body to play a role in broadening and deepening the region's knowledge base. It is important that it grasps the associated opportunities and plays a strong regional role, for this is the base from which its super-regional ambitions can best develop.

Further Information

Website for the University of Plymouth: <http://www.plymouth.ac.uk/>

Website for the University of Wisconsin: <http://www.wisc.edu/>

United Kingdom Migrant Advisory Committee

Background

The United Kingdom has until recently been experiencing severe skills shortages in key occupations, and has put in place a number of bodies to advise on how it can best respond to this problem. Among these is the Migration Advisory Committee (MAC). The MAC was established in late 2007 under the chairmanship of Professor David Metcalf of the London School of Economics' Centre for Economic Performance to provide transparent, independent and evidence-based advice to the UK Government on where skilled labour market shortages exist that can sensibly be filled by migration. Its initial task was to produce shortage occupation lists by June 2008 to be used in conjunction with a new Points-Based System for migration that was introduced at this time. The MAC's advice on this occasion was very practical, focusing on the production of lists of skilled occupations that could sensibly be filled by enabling employers to recruit from outside the European Economic Area (EEA).

The MAC's approach was firstly to consider whether individual occupations or categories of jobs are sufficiently skilled for the shortage occupation list, then to assess whether there is a shortage of labour within each skilled occupation, and finally consideration is made of whether it is sensible for migrant labour from outside the EEA to be used to fill a skilled shortage. The first step was to undertake a "top-down analysis" involving the interrogation of national labour market data to determine whether an occupation satisfies the skilled, shortage and sensible criteria. This involved, examining among other things, the qualifications and average earnings of people within an occupation (*skilled*), earnings, vacancies and unemployment (*shortage*), and whether efforts are being made to fill a shortage by means other than non-EEA migrant labour, including up-skilling the UK workforce and attempts to recruit from within the EEA (*sensible*). This top-down analysis revealed various data-related and practical limitations, including a limited degree of disaggregation that is possible within the key data sources, time lags in the data, and a lack of a counterfactual. Largely due to these limitations, the committee also undertook a bottom-up micro-level analysis relating to specific groups of jobs and sectors. The information for this came from localised analyses of individual sectors. The MAC also took evidence from the Sector Skills Councils and developed strong links with the also newly-established Commission for Employment and Skills. The final part of the "bottom-up" analysis involved visits to employers that have specific plans for identifying and recruiting skilled labour, or where a skilled labour shortage has become evident.

The UK's Points-Based System is being introduced by the Border and Immigration Agency on an incremental basis following extensive public consultation during 2006. It will set the criteria under which nationals of countries outside the EEA can come to the UK to work, train or study. The system consists of five tiers, each of which represents a route by which suitably qualified persons may come to work in the UK. Tier 1 is comprised of highly skilled individuals who can contribute to growth and productivity. Tier 2 is comprised of skilled workers with a job offer to fill gaps in the UK labour force. Tier 3 is comprised of low skilled workers to fill specific temporary labour shortages. Tier 4 is comprised of students. Tier 5 is comprised of persons coming to the UK to satisfy primarily non-economic objectives, such as those coming on youth mobility schemes and temporary workers.

Tier 1 was implemented in 2008, first for workers already working in the UK, then for workers from India and then worldwide. Tier 2 was introduced in the second half of 2008. It involves applicants needing a job offer from an employer who is an approved sponsor. For this to be activated, employers need to satisfy a number of criteria, and the MAC were asked to advise on what these should be, specifically to produce lists of shortage skilled occupations.

While the public authorities in the Agder region do not have the same control over immigration as their national counterparts, they do have some influence over the flow of immigrants into the area, via their overseas marketing activities and missions to areas from which they expect to recruit skilled workers. These activities can be better focused if they are based on a strong body of evidence that identifies the areas of long-term and chronic skills need.

Relevance to Agder

Agder has a sizable inflow of immigrants from a wide range of countries and with a broad range of skills. The report prepared by the local team suggested that net migration into the region is in the order of 2,000 persons. This is substantial in a region with an overall population of 270,000. Migrants pose special problems for a region, in terms of the recognition of their skills, their integration into the local community, their training needs and their inclusion into the working population. They also have a very heterogeneous backgrounds and skills needs. Their involvement therefore needs to be carefully planned and any policy interventions in this area need to be implemented.

The UK has clearly recognised the problems associated with a large and growing immigrant population and the potential that it offers to the society concerned. The Migrant Advisory Committee is seen as a fundamental part of the process of linking the immigrant population to the needs of the home labour market. Rather than develop the new points system on an *ad hoc* basis, the UK Government decided to put in place a group of researchers who could supply the evidence for the effective implementation of the system. The Agder authorities also need to base their activities (albeit of a different kind from those of the UK) on a strong evidence base. The complexity of the underlying issues and the heterogeneity of the immigrant population suggest that, unless such a base is put in place, Agder's attempt to respond to long-term skills shortages by increasing immigration could well prove very costly and ineffective.

Agder's large and growing immigrant population suggests that a much more thought-through and holistic approach is needed in relation to the immigrant population. Given the substantial and continuing skills shortages suggested by Norwegian Labour and Welfare Administration (NAV), this could well start with a local variant of the MAC, but could well go beyond this to consider issues relating to the inclusion of the immigrants already in the country.

Results of the Approach

The MAC's careful analysis and detailed proposals have been highly acclaimed in UK policy circles. It will allow the new points-based system to be developed on the basis of evidence rather than opinion, and will therefore make its operation much more efficient and effective.

In a paper for the UK Home Office in November 2008, Professor David Metcalf (Chair of MAC) summarised the MAC's key findings, giving examples of occupations that are deemed to be skilled, in shortage and for which it would be sensible to recruit from outside the EEA (Metcalf, 2008). Examples of those included in their lists are civil engineers, ship and hovercraft officers, quantity surveyors, maths and science teachers, specialist nurses. Examples of those not included are, because of insufficient "bottom-up" evidence, welding trades, midwives, social workers, architects, IT, most skilled construction trades, and because of evidence that immigrants would undermine efforts to train, recruit and retain UK workers, various technical trades, qualified veterinary nurses.

Reasons for Success

The main reason for the success of the MAC's initial work is the quality of the personnel who are involved with it. Professor Metcalf is a well-respected economist who has spent his

working life on the interface between rigorous academic research and policy formulation. Until recently, he was a Low Pay Commissioner advising the UK Government on the National Minimum Wage – a very contentious area of policy in a country that did not possess any such institution until the late 1990s. The LPC became a leading exponent of evidence-based policy advice and the academic commissioners became renowned for not only undertaking and commissioning research of relevance to their roles, but also advising the national statisticians on how they could improve upon their own data-collection activities. Working with Professor Metcalf were two economists with strong track records of undertaking detailed research in the skills area – Professor Jonathan Wadsworth and Professor Rob Wilson.

The MAC was also given a very clear and straightforward mandate. Its job was therefore not to interpret what its brief was, but how it could best respond to it.

Obstacles Faced and Response Taken

The MAC faced a number of problems in undertaking their analysis. The first concerned insufficient disaggregation of the data used. This was partly because most national data-sets are only available up to the 3 and 4 digit level. This is not the level at which employers think about skills shortages. The Committee gives the example of an electrical engineer; this is occupation 2123 in the Standard Occupational Classification. However, only sub-sets of this group are in shortage, and many are clearly not. Furthermore, even when the data can be disaggregated to the appropriate level, the sample sizes may be too small to give reliable results. A second issue highlighted is time-lags. There may be significant delays between the collection of data and its availability for publication, during which time the shortage may have been eradicated. Also data are collected only periodically. The response taken was only to suggest that there was a shortage if both “top-down” and “bottom-up” evidence point in the same direction. In the absence of the former, the latter is used to determine whether the three criteria are supported.

Considerations for Adoption

The development of an evidence-led policy process in relation to immigrant workers is something that needs careful consideration, especially in relation to issues that can have major social and political consequences. Moreover, each part of the process must be linked to other parts, so that the overall framework is working coherently and consistently. Agder needs therefore to develop a more holistic view of its approach to immigrant skills and a detailed analysis of how it can best intervene to achieve its key objectives.

Of key importance in this respect is the putting in place of a strong evidence base. The heterogeneity of the migrant population, the misinformation that abounds in this area and the rapidly changing environment in the area make it even more important than in other areas of policy that a strong evidence base is gathered. This should not be too problematic in a small region such as Agder, that already has a strong information base in place in the labour market area.

Further Information

Migration Advisory Committee website: www.ukba.homeoffice.gov.uk/mac.

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CHAPTER 3

THE BUSINESS SECTOR

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Introduction

The business situation of Agder is favourable to prepare the future. However, it needs a strong policy commitment to support initiatives to develop Research and Innovation in a well-diversified fabric of SMEs, to support already existing relations between enterprises and public research, and to develop new initiatives. The public-private relations may not only build bilateral links (one company/one laboratory for one project) but could also initiate collective projects (groups of enterprises designing multi factorial projects involving different labs from different disciplines – ‘hard and soft’). In doing so, in association with other anticipative aspects (e.g. development of long-life training schemes) and in addition to a strong co-operation between the different intermediary field actors, the economic situation and the competitiveness of Agder could be preserved and improved.

This chapter aims at highlighting the regional assets, connectivities and capabilities of regional actors for entrepreneurship and innovation activities. It provides an analysis of the current situation of the business sector and recommendations on how to enhance the role of the business community in the innovation and entrepreneurship system. It is organised into four main parts: i) A review of general policy issues and good practices. ii) Strengths, weaknesses, opportunities and threats in the Agder region. iii) Recommendations for policy development in the Agder region. iv) Four learning models that will help to illustrate how to address the recommendations.

Policy issues

The question addressed to the policy bodies in Agder is how to support and facilitate the improvement of the integrated competitiveness of their region of which the business sector is a determining element, together with the questions of governance, knowledge creation/transfer and social capital development, which constitute the elements of the Regional Advantage¹¹.

The challenges for a good policy are to shape, implement, monitor and assess a comprehensive consensual policy to support business development, which concerns the largest part of the economic fabric. The main streams of the literature related to economic development, identify some good practices¹² which affect six main areas:

1. Design a strategy (driven by supply or demand) and share it;
2. Create framework conditions (legal, administrative, fiscal, financial);
3. Design and implement support services or tools;
4. Accompanying measures (awareness, investment readiness, hands-on management);
5. Monitoring and evaluation system;

6. Continuous improvement mechanism.

These steps must be applied to several complementary domains which deal closely with business development. These areas are to be treated simultaneously in a coordinated way. No sector is more important than another. Depending on the pre-existing situation, however, the political priorities, the current potential, the will of such and such a person, the financial means, the different domains must be implemented at different speeds and degrees of completeness. The only cornerstone of such a business development programme is to be sure that it is always in line with the global economic development programme. The main domains concerning business development are described below.

Improvement of business life

A vivid business fabric shows an active turnover of its constitutive elements in terms of companies themselves:

- creation of new companies;
- merging and acquisitions – and disappearance;
- transfer (especially with the current age pyramid of the business owners);
- start-ups non particularly technology or knowledge intensive;
- academics start ups;
- corporate spin-outs.

This domain requires adapted methods and tools to be improved. The public policies are interesting where they help in launching the momentum but the private sector (consultancy, lawyers, brokers...) do have a major place in the landscape.

Support to knowledge transfer

- Top down activities - facilitate the irrigation of the business fabric by the knowledge created in the academic sector: detection of transferable results; translation (adaptation) to the different levels of acceptance by the companies (normally, large companies know how to integrate research results which is not always the case for SMEs) and to the professional language; demonstration (important for new knowledge/technologies); adapting a financial system to support transfer activities, both at laboratory level and company level;
- Response to companies needs – facilitate the expression of their needs by the companies for knowledge/technology (especially important for SMEs) translation of the companies needs into a scientific problematic; analysis of the common needs and implanting collective solutions when possible; adapting a financial system to support transfer activities, both at company level and laboratory level. This question of the companies is of great importance, as it is not true that one-size-fits-all. Another question deals also with the capacity of anticipation of the entrepreneurs, especially for the SMEs, which represent the most important part of the job deposit (size, activities, personal strategy of the entrepreneurs, of his family, age); capacity of the environment to identify these needs. The Appendix B shows an example of the result of a survey carried out in a French Region.
- Creation, if necessary, of specific intermediaries either embedded in the University bodies or in a semi-public system with clear missions: a strong co-ordination among

them; strong and coherent activities and impact indicators and goals; clear financing rules;

- Co-ordination of the many public and semi-public field actors from different organizations and playing the roles devoted to their parent bodies; also accepting to respect common rules (sharing of information; focusing on their own core business; confidentiality).

Support to anticipation capabilities

Taking good decisions in the as soon as possible is crucial for entrepreneurs. To achieve successfully such a decision-making process, entrepreneurs need, among other, the following information: the identification of the key issues to be addressed; access to relevant data; the translation of these data into information; the exploitation of this information by the company, taking into account the current company situation; decision-making methods to respond to a concrete and formalized process. This is usually known as the Mastering Information process.

The design and implementation of a set-up (or of different set-ups oriented towards the key regional sectors) are important. The cost of such set-ups cannot be supported by SMEs individually and this is the reason why a public policy is needed. Part of the Process to Master Information is easily sharable and leaves the companies the individual costs which become affordable even for an SME. Strategic intelligence also concerns the internal knowledge management of the company which addresses their existing human and technical capabilities. Both internal objective knowledge and external organized knowledge constitute the strategic framework of a better decision-making process.

These methods and tools are complementary to foresight studies led at International, European, National or Regional levels. These foresight activities can take different forms and must be interpreted and put into the perspective of the current situation of the relevant economic sector, particular company or cluster.

Promotion of innovation management techniques

It is important to emphasize that, as far as innovation is concerned, it should be considered not only the technological aspects of the innovation process of companies needs, but also all non-technological aspects. Comprehensive innovation policy, which is part of an economic development policy, must pay as much attention to the Innovation Management Techniques (IMT) as to knowledge creation and transfer. For years now it has been assumed and demonstrated that innovation provides the key to harmonious, successful economic and business development. But innovation is too often considered only by its technological angle. Thus, a scientific result and even a technological success need to be backed by Innovation Management Techniques. An active innovation policy must take this aspect into account. The Appendix C shows a figure illustrating this issue.

Networks and clusters

Networks and clusters do not only concern large companies and/or advanced technological activities. As long as mutual interests, needs and perspectives are identifiable, there is room for networking activities. A systematic analysis of the possibilities to create 'co-ompetition' activities must be undertaken by the field actors and the possibilities of supporting mutual activities must be explored.

Financial set up

The above items depend of course on accompanying measures, of which the financial set up is the most important. Certain of these concerns depend clearly on public money, some of them on private money and others on a mix of public and private money.

A clear picture is necessary for all the economic actors, be they public or private, intermediaries or academic, industries or commerce sectors. The role, the level of financing possibilities, grants, loans, equity, the counterparts and the origin of the funds must be cleared for all the field players in order to optimise the support to the economic fabric.

Challenges and opportunities

Considering the different meetings undertaken with representatives of the Agder region business sector we would like to propose an analysis of the situation.

Strengths

A positive and optimistic global atmosphere of the situation of Agder

It is remarkable that almost everyone met during the study visit mission tells the same story. It is the one of the successful historical entrepreneurs, of the potential benefits expected from the cluster policy, of the promising situation of the University of Agder, etc. Sometimes, it is possible to hear some comments on the conservatism of the regional population and some other drawbacks of the situation but they are immediately moderated by a full description of the advantages. This impression is comforted by the good general indicators of the economic and social situation in Norway, Agder being globally in one of the best situations of a wealthy country.

The recent history helps maintain the trust in future of the region: the success stories tell the adventure of local heroes starting from scratch and being now at the head of industrial empires. There are good reasons for that: again, the good global situation of the country and of the region, the leading position of certain sectors at world level, the leading position of the process companies in their respective niches, excellent performance of shipping activity, leading position in terms of export, permanent attractiveness from well-educated people, good touristic image, a newly-created University which qualifies Agder as a full 'exercise region'. However, this collective optimism may sometimes affect the sense of realism on the actual situation, or hinder the use of objective tools to analyse the situation.

Favourable situation of the current activity and perspectives for the businesses in Agder

In spite of its small size in terms of population, the region of Agder has leading companies which represent sometimes up to 90% of the world niches market. This is the case for the emblematic concentration of oil and gas production and drilling platforms manufacturing companies gathered in the NODE cluster. The slogan says: Norway represents 1/1,000 of the world population, 1/100 of the world trade, 1/10 of the world shipping and 1/10 of the world oil exports (sometime it is also said 1/1 of world dried cod fish). The oil and gas industry in Agder is representative of this situation. The NODE cluster accounted for about 5,000 jobs in 2008.

Other jewels are also found in non-ferrous materials industry historically located in Agder because of the proximity of mines and low-cost energy sources. The mines are now closed, energy is still abundant and a large number of factories belonging to world players maintain a high level of activity. The process industry clustered in the EYDE network (more or less still under construction), represents an annual turnover of NOK 14 billions (Euro 1.5 billion) for 3,000 employees.

Strong presence of local families in the business sector

In the Agder context, the Ugland and Skeie families have played a major role in the economic landscape. They structured and still drive the shipping and international trade activities of Agder, and act as business angels. Their headquarters are based in Agder which is not the case for most of the other large plants operating and this is certainly an asset for the region's future. Various projects in the region have been made possible thanks to the financial support of these families.

A new active cluster policy

There are three main sectors more or less formally clustered: oil and gas – NODE, metal elaboration or transformation – EYDE and information and communication technologies – ICT. These three key sectors represent approximately 8,000 jobs out of a total of 19,000 in manufacturing and mining, and out of an approximate total of 70,000 in the overall private sector. These are described below.

- NODE cluster

Thanks to a national and regional history of sea-related activities, the Agder region has in recent years become the cradle of the world offshore and drilling engineering companies. The fast-growing turnover and number of employees led the enterprises clustered in NODE to the forefront of this international market. The turnover was multiplied by six between 2005 and 2008 to reach USD 30 billion and the total employment by a factor 2.8 (5,000 people of which more than 60% are engineers). NODE companies (46 companies when visited) represent some 90% of the global market of offshore drilling solutions and of offshore loading and unloading facilities, and 70% of compensated cranes. But, globally speaking, this activity represents only 5.57% of the Norwegian gross product of 'Ship and platform building'.

The NODE cluster is clearly geographically concentrated and assembles companies which are strong competitors as well as strong partners. This is a good example of 'co-ompetition' spirit. As an entity, NODE is able to show a self-confident spirit, a highly positive image of its assets and a high general ambition. These characteristics seem to be shown by companies individually.

Like other industrial sectors or more general economic activities, this cluster is facing difficulties in recruiting skilled people and, more specifically, engineers. This question of importing manpower from European or non-European countries is a permanent preoccupation for the public bodies and specific measures could be put in place to support efficient solutions.

Oil and gas platforms require, on the one hand, a high level of skills for complex projects management and, on the other, advanced research and development for mechatronics applications¹³. Together with the University of Agder and/or with other universities, the NODE Cluster is involved in different collective projects concerning all the 46 NODE companies. These projects prepare the future and concern different aspects of preparing the future with different time scales:

NODE Foresight: Scenarios and strategies

NODE Public: To be an active part in regional development

NODE Competence Centre: Provide relevant courses and education

NODE Environmental Footprint: Face the environmental challenge

NODE Mechatronics: Establish a world leading centre in mechatronics

NODE ART: R&D: Advanced riser tensioning

This is certainly one of the first times a Triple Helix could explicitly appear in Agder. It was not really possible to analyse the way the three groups involved in the Triple Helix (policy bodies, academic institutions and enterprises) actually interact in the identification, selection (ex-ante analysis), design, implementation and monitoring of the projects. It seems clear that the NODE cluster does not concentrate specifically its academic relations with regional research teams. It finds its research and development and innovation partners where they are the best for its purposes and needs. The projects related to mechatronics are also of great interest for the enterprises of the process sector (EYDE cluster).

- EYDE cluster

In 2006, the General Manager of an industrial plant (Elkem Aluminium), together with a Head of Projects at Agder Research (Agderforskning), agreed on the importance of trying to cluster plants of large companies involved in the process industry. After gathering 12 companies in order to gain legitimacy and a representativeness of the sector, the initiators met public bodies of both counties and municipalities to get their support. It was easily accepted and globally around 1M NOK (Euros 0.11 M) was engaged to concretise the public support while 200K NOK were spent by companies in cash plus their contribution in kind. Between 12 and 14 companies are involved in this cluster and they represent around 3,000 employees for a turnover of NOK 14 billions (Euros 1.5 billion).

The EYDE companies are involved in a wide range of activities: from metal elaboration and transformation of ferrous and non-ferrous materials, to reagents for health care, paper mills, fibreglass or wafer for electronic applications. These plants belong to world leaders, not necessarily Norwegian.

Table 3.1. EYDE cluster key information

| Name of company | Location | Jobs | Owner | Products |
|----------------------------|-------------------|------|-------------------------------|---|
| Casting Technology Farsund | Farsund | 240 | International Venture Company | Founding aluminium parts for car industry |
| Elkem Aluminium Lista | Farsund | 300 | Elkem/Alcoa | Aluminium |
| Elkem Research | Kristiansand | 130 | Elkem | Research |
| Elkem Solar | Kristiansand | 270 | Elkem | Silicon for solar cell industry |
| GE Healthcare | Lindesnes | 390 | General Electric | Contrasting liquid for medical X-ray |
| 3 B(ex Owens corning) | Birkeland | 159 | International Venture Company | Fibreglass for wind mill wings |
| Vestas Casting | Kristiansand | 250 | Vestas International | Iron founding of wind mill hubs |
| Vigeland Metal Refinery | Vennesla | 29 | Hydro/ Alcan | Super-pure aluminium |
| Xstrata Nickel Refinery | Kristiansand | 550 | Xstrata | Nickel(and other precious metals as by-products) |
| Tinfos Jernverk | Kvinesdal | 228 | Eramat | Silico-manganese |
| Metallkraft | Kristiansand | 50 | Limited Company | Silicon for solar cell industry |
| Saint Gobain CM | Lillesand/Arendal | 260 | Saint Gobain | Refined silicon carbide for solar cell and car industry |

Source: Eyde cluster

The plants depending on international companies are reputed very profitable thanks to the quite low cost of energy in Norway and to the permanent productivity efforts made by the companies. Confronted by the international situation, it seems that the companies do not

anticipate big difficulties for the plants installed in Agder, even if the situation is not as easy as it has been¹⁴.

The issue of the energy cost which is progressively reaching standard prices compared to other developed countries should remain a competitive advantage. The Norwegian government is preparing a new regulation framework which will allow large energy consumers to pool their needs and negotiate as ‘consortia’ with the power companies. The balance between consumers and suppliers is moving towards consumers’ interests. This is a key concern for some of the plants of the EYDE cluster.

The EYDE companies are individually highly innovative. For example, ELKEM, together with ALCOA spent 5M NOK to innovate in a new aluminium elaboration process consuming 30% less energy and without any emission of CO₂. A pilot plant is starting next year in Grimstad. Furthermore, after a first period of exchange of experience between companies, EYDE launched mutual R&D projects on common concerns. For example, a project on monitoring of high temperature processes is implemented with the Norwegian Research Council. Another project concerns all the companies of the EYDE cluster and deals with the introduction of lean manufacturing¹⁵ in their activities.

A project on mechatronics, which also interests the NODE cluster enterprises, is undertaken in close collaboration with the University of Agder. The EYDE cluster is looking for closer co-operation with the University of Agder and wants to improve its level of co-operation as it is evolving rapidly towards the configuration of an innovative cluster. Its intentions are to enlarge the possibilities of knowledge exchanges between the University of Agder thanks to internship programmes, to give support to Masters students’ projects and research to employees of the companies giving lectures at the University. The EYDE cluster will very soon be completely operational, with the hiring of a high-level person as director of the cluster.

- ICT cluster

ICT firms represent a little less than 2,000 jobs in Agder. Originally mainly concentrated in Arendal/Grimstad (1,200 jobs in 2000) and less in Kristiansand (436 jobs in 2000) the situation seems to be evolving towards a more balanced situation. However, globally, from 2000 to 2006, only 76 jobs (less than 5% of the existing jobs in 2000) were created in an activity sector which is still experiencing international growth. In 2006, the ‘manufacturing ICT’ sector lost 20% of the jobs existing in 2000 (see Table 3.2.).

Table 3.2. Evolution of the ICT sector in Agder (2000-2006)

| | 2000 | | 2006 | | DIFFERENCE |
|----------------|-------|---------|-------|---------|------------|
| | MANUF | SERVICE | MANUF | SERVICE | 2006/2000 |
| KRISTIANSAND | 35 | 401 | 67 | 542 | 173 |
| ARENDA/GRIMSAD | 800 | 406 | 627 | 438 | -141 |
| REST OF AGDER | 33 | 103 | 0 | 180 | 44 |
| TOTAL OF AGDER | 868 | 910 | 694 | 1160 | 76 |

Source: Special translation of a Norwegian paper: Johnsen, H. C. G. and Isaksen, A. (2007), Innovasjonsdynamikk i IKT-næringen på Agder. FoU-rapport 3/2007. Agder Research, Kristiansand.

An important number of the ICT companies were created following the Ericsson ‘avatar’ of the end of the ‘90s (see Box 3.1): Maritime Communications Partners, Devoteam, Infotain, Indico

System, InterMedium, Diagraphit. Some of them were created by Ericsson spin-off people. This shows that there is an entrepreneurial spirit in the population that is probably underexploited.

The ICT network certainly does not yet seem to be a cluster able to create synergic effects. The presence of the University of Agder is positive but only if the mechanisms of knowledge transfer – other than by producing well-educated people corresponding to the needs – are appropriately designed and actually implemented.

Box 3.1. The Ericsson case¹⁶

In 1997, the Ericsson group decided to group the two departments it had in Norway (one close to Oslo, one in Agder-Arendal). This plan would have made 400 highly-qualified jobs in Agder disappear and would have left a poor image. Politicians, as well as entrepreneurs, considered that the application of this plan would have a strong impact on the future development in the ICT sector and the industry in general. This would have reinforced the impression of a region where it was difficult to recruit highly-skilled people because of a weak knowledge base and inappropriate infrastructures for international companies.

This situation led the different public bodies (municipalities and counties), together with workers and staff at Arendal, to oppose to the delocalisation project. They discussed the benefits of both locations and enhanced the advantages for Ericsson to keep two different locations in Norway and the interest of the Arendal situation: attractiveness to skilled people drawn by the lifestyle, lower wages, good environmental conditions for the ICT sector (fast growth in numbers of businesses and jobs, education, etc.), few people accepting to move to Oslo and thus loss of skills for the Ericsson group.

The discussions held around this crisis showed that the Ericsson research centre in Arendal was not locally embedded. Indeed, there were too little interaction with other firms and too few relations between firms and knowledge organisations. Some reasons can explain this situation: questions of secrecy and intellectual/industrial property not clearly addressed made the relations difficult, no public research institution (thus, no knowledge transfer), little co-operation between companies and the college. To overcome these concerns, in 1997 Ericsson and nine other firms opened a 'Technology Forum' for local enterprises. This forum, lobbying organisation and meeting place, stimulated collaboration and learning culture between firms and the local technical college. It initiated the creation of a local incubator as well as a local venture capital fund.

Ericsson, Telenor (the local department) together with two other firms, created an ICT department at the college to stimulate mutual research projects and new training courses. A specialised course at the local technical college was revised and national resources were allocated to create a specialised Masters in ICT. Eventually, the Ericsson group decided not to delocalise its department in East Agder and just moved it to Grimstad (15 km) on the University campus. Ericsson favoured the outsourcing of 50 people. Ericsson and the College (now part of the UiA) are at the centre of a new technology park in Arendal-Grimstad which attracts progressively projects other than just ICT ones.

The Ericsson case is clearly a success in terms of job preservation and creation, in terms of dynamism and in demonstrating the importance of a collective reaction in face of an emergent situation. It is also 'psychological' advantage to the different actors, private or public, which explains the positive and optimistic vision of the different people met during the OECD study visit.

A world leadership anchored in tradition

Both oil & gas rigs activity (NODE) and the process industry (EYDE) are certainly important assets of the Agder region. Their world exposure makes this region visible and is a good argument to put forward in terms of territorial marketing. They give legitimacy for attempts to attract talent in both the private and in and the public sector.

They have an effect on the quality and on the health of the sub-contractors which serve their 'large' clients but also are present at a different level in other segments of industrial activities (e.g. electricity). They employ highly-skilled people with good salaries, often from abroad, and these employees bring with them high salaries (which is good for local business) and other cultures (which is good for the societal evolution of the region).

Both sectors ask for higher education services (lifelong training for example) in various disciplines, as well as possibilities for co-operation in R&D. But at the same time they declare they will not choose the University of Agder, just because of its proximity or by 'regional citizenship'. This position shows the absolute necessity for the academic system to make choices in terms of research projects and programmes and in terms of education. The challenge is for the University of Agder to be at the top Norwegian/ European levels in a limited number of domains corresponding to the needs of the international companies of today and of tomorrow.

A new and active university eager to take its responsibilities in economic development

The newly created University of Agder wants to play its part in the regional development. This desire is even one of the reasons and of the challenges of the transformation of the different colleges into one University (see chapter 4). This challenge is of great importance for the future of the university and for the local harnessing of businesses in the region. A good indicator of success will be the evolution of the share of money coming from the local companies in the budget (currently this share is around 1%).

In 2007, the National Research Council revamped the former research programmes on 4 strands of projects reflecting a strong will to support the regional assets:

- ICT
- Oil & Gas Equipment
- Process Industry
- Business Culture

A recently created interface, Teknova, is the result of a strong co-operation between the University of Agder, Agder Research and the large companies implanted in the region. Up to now, Teknova has registered interesting results in testing technologies and related questions such as functional analysis to identify products able to address robustness. Teknova has an expertise in fault and vulnerability analysis. It has also got interesting results in the solar energy activity. But possible next possible evolution may lead Teknova to reach a step further.

Teknova may be in situation to create a technological platform for photovoltaic applications. Instead of providing 'only' researcher able to address development of industrial applications, these projects supported by VRI Agder, will install physical installations (PV panels or solar radiation instrumentation). Actual data will be available for students and researchers and research projects will be implemented. This project interests of course Elkem solar systems and involves different research units in Agder but also concerns international co-operation with Kenya and a NGO. This initiative is supposed also to enhance the interest of citizens and pupils in school for alternative energy sources and wants to stimulate local industrial activities.

A diversified business support system

Coventure is the regional operator of the Industrial Development Corporation Programme (SIVA). Created 10 years ago, Coventure has supported the creation of 45 start-ups which accounts for the creation of approximately 400 jobs. The current portfolio represents 18 companies of which a large part deals with the health sector, other being involved in ICT (sometimes ICT for health) and others for applications to mobile phones. Coventure staff is formed by 9 people.

Coventure is financed by the main national and regional bodies (Norwegian Research Council, Innovation Norway, both counties and municipalities, Agder University). However, according to Coventure, the main difficulties encountered concern both the quality of the ideas of new business and the difficulty to raise funds to support the different phases of the evolution of the projects. Another difficulty quoted by Coventure is the entrepreneurship skills of people involved in business creation. On its side, EVA Centre supports the creation of more traditional SMEs from the early stage of idea analysis and validation, support to business plan elaboration and creation.

Moreover, there are various businesses financial actors sourced by public and private funds that operate in Agder. Among others, Nordea (Scandinavian fund) and Skagerak Venture Capital (2006), based in Kristiansand, were met during the mission. The investors in SVC are the main regional public and private financiers: Sorlandet Kompetanse Fond, Agder Energy Venture, Skeie Investment Funds, JB Ugland Holding, and Sparbanken.

Weaknesses

Attention of the key actors focused almost exclusively on only one aspect of the business sector

The business sector seems to be characterised by three main strands structuring the Agder economy.

1. The 'historical entrepreneurs' strand (e.g. the Ugland and Skeie families). They are key actors of the economic situation of Agder, present in traditional sectors, shipping and maritime activities and in new industrial sectors related to oil and gas. Some of them have been key entrepreneurs for centuries (Ugland's first sailing ship in 1772) and play a regional role as investors, business angels and regional benefactors (e.g. the Grimstad 'campus' land is owned by Ugland).
2. The traditional and new large companies: oil and gas, non-ferrous metals. Networking in existing formal clusters (NODE for oil and gas) or under construction (EYDE for process industry – metal elaboration and transformation, or for ICT).
3. The rest, which could be called the 'traditional sector' in which different economic actors could be found harvesting natural resources (hydro-electricity production, sea exploitation, agriculture, forest, tourism); trade and transport; craft and services activities. These activities are difficult to delocalise either because of their dependence on natural resources or because of the proximity of the consumer fabric. This sector looks like being 'invisible' for many of the different agencies or intermediaries envionring or supporting the business sector.

In spite of the importance of the historical entrepreneurs' strand and of the traditional sector for the regional economy, it seems they are not clearly at the agenda of the preoccupations of regional policies. They represent, however, a large part of the workforce market and for some of them, especially the service activities to people, are not easy to delocalise.

An unclear and complex 'system' of actors supporting business development

As indicated in Chapter 1, one of the characteristics of the regional landscape is the multiplicity of actors. About 20 out of the 150 identified are named in the report. But this profusion does not mean a system exists. On the contrary profusion may lead to confusion.

The fabric of public and semi-public intermediaries and of NGO or private organisations dealing with innovation development, economic development or globally regional development

looks very dense and complex and does not seem to be clearly identified in terms of roles, space, responsibilities, targets, financing. What could be an impressive network could more certainly be a source of complexity, conflicts and generates entropy¹⁷. This situation is usual in a lot of countries and regions when new challenges emerge and need specific solutions to face. But in the region of Agder, this situation seems to be extreme.

If the political bodies are in their normal institutional place, of course, a number of intermediaries without, always, a critical mass in terms of people involved, budget and role must be questionable. For that matter, only few of them have been systematically or almost are systematically named when others do not appear in the range, in spite of their own opinion of their importance in the system.

A clear positioning is needed. Their 'market place' must be known by everyone and especially by SMEs and crafts, in terms of geographical intervention domain, specific role in economic development, targets, etc. It is quite difficult to get clear and objective information on the activities of the intermediaries in terms of: objectives, budgets, projects and/or enterprises supported origin of the financings.

A mapping exercise based on an 'objective and independent analysis' could easily improve the global efficiency of this complex fabric and facilitate the necessary organisation of the different actors currently acting separately, certainly sometimes in competition, even if all of them declare knowing their role and sticking to it. There are for sure overlaps between these different organisations. Hopefully, there certainly is no gap, but it is not sure since it seems to give a clear picture of the multi-layer, multi-partner set-up.

Weak global entrepreneurship and innovation development vision

It has already been published that Norway has no comprehensive entrepreneurship policy.¹⁸ At national level, however, Norway was one of the first countries to introduce a national strategic plan for entrepreneurship in the education system (a plan currently under evaluation). In fact, three main actors are identified at national level: Innovation Norway, Industrial Development Corporation of Norway (SIVA) and Junior Achievement – Young Enterprise, plus other organisations such as The Research Council of Norway and Start Norway.

Gaps in the financial support system

During the discussions with the business support actors and the financial institutions, it was highlighted that the schemes to support financially the creation and development of businesses is complex and presents some gaps. The best projects having successfully passed the proof of concept stage (with Coventure or EVA) find good money and means for their development from the 'historical' entrepreneurs who act as business angels in the region. However, for the classical projects not supported by the regional business angels, the situation is good for the early stages when entering the public/private system of support to business creation but there are difficulties to get risk capital and development capital. The too small size of the region is certainly a reason for these difficulties.

Poor knowledge of the actual situation of the SMEs (and crafts) and of their needs

In spite of a wide array of actors in the business support system in the region, the real needs of enterprises are not identified. There is no clarity in their situation, their demands, their projects and their actual needs. This is of great importance because the only way to support businesses effectively is to know their initial situation, understand where they want to go and put these elements in perspective with the knowledge which development organisations have on evolution at a higher scale and the different tools which can be used to support them.

This difficulty is reinforced by the recent creation of many initiatives or structures which must find their own place and their own ways of working. This is the case of Teknova, for example, which is certainly an interesting initiative, with already promising initial results. The relatively low level of networking complicates the exploration of possible co-operation.

The vision of innovation too much targeted only toward technology

Globally speaking, main actors, knowledge creators, transfer organisations and somehow companies consider innovation only from the technological side. Of course, science and technology are of great importance to create competitive conditions but also the conditions under which scientific and technological advances are implemented in the economic sector. The technological questions need to be supported by relevant Innovation Management Techniques (IMTs). Under IMTs are grouped different 'soft' techniques which are summarised in Appendix C¹⁹.

Opportunities

Global collective orientation to support innovation in enterprises

As already said, the global atmosphere on the situation of the economy in Agder is positive. Traditional sectors with key actors in shipping, for example, are somehow the first detectors of potential profitable companies and are more or less considered as business angels and even sometimes as the real incubators. Other traditional companies, depending largely on foreign industrial groups or international investors, currently represent an important source of jobs and of potential development.

On the other side of the regional landscape, the University of Agder shows a strong willingness to play its part in the regional development and future preparation. A wide range of different professionals exists who could be the best link between the knowledge creation level and the business layer. All the ingredients are more or less present. Alongside these general considerations, some ideas could be explored.

Envisage diversification of strong and wealthy sectors to prepare the future

The experience and the reputation of the companies of the oil and gas sector, individually or gathered in NODE, are strong and could certainly enter new domains which are not in their core business. For example, their most obvious evolution could be related to sustained energy production from oceans. Wind, tides, streams and waves are potential energy sources and the NODE companies know how to design, build, transport, implant and maintain complex plants in hostile regions and milieus. This domain represents together with biomass the main producer of patents for the last five years in value and in growth, as far as sustainable energies are concerned²⁰.

This evolution can accompany the evolution of the clients of the NODE cluster. The NODE cluster knows the oil and gas operators, their standards, their way of working, and their way of negotiating. They evolve for the last years from activities centred on the products (oil, gas and their derivatives) towards larger domains such as energy in general. This evolution is also considered attentively by the nuclear operators.

There are also interesting possibilities in promoting inter-disciplines, especially when speaking of innovation. Many market successes are linked to the mixing of diverse techniques and competences. For instance, complementarities between NODE experience and minerals (process) companies for the exploitation of sub-marine metallic nodules or between NODE experience and agro-food industries (algae, micro-algae for example). This opens new fields of

potential innovation where combination of competences is precious. The advantages of being a small region, where distances between actors are small, if well used may be an opportunity to create synergic effects for these new fields of innovation.

In addition, the Lead Market Initiative of the European Commission²¹ (DG Enterprise and Industry) has identified a short list of high potential future markets: e-Health, sustainable construction, protective textiles, bio-based products, recycling and renewable energies. There are interesting connection between the ICT cluster and some start-ups supported by Coventure which could be concerned by the e-Health market and there are opportunities for them to take part in EU programmes, networks and projects.

Threats

Innovation investments decrease?

The figures available concerning the GERD and BERD are difficult to interpret. The dramatic change of the situation in East Agder (- 49% man-year 2005/2001) is not compensated by the growth of West Agder (+ 40% man-year 2005/2001). In total, the loss for both counties is of 10% in four years. The effect of the Ericsson case is not clear but this situation being not too different from the Norwegian situation²² needs questioning. If confirmed by a closer analysis it may, in the long run, boost the capacity of the industry to move from the exploitation of natural resources advantages to more transformed products.

The national report on the Norwegian situation (OECD) could be applied to Agder: 'Failure to diversify, in terms of energy sources and industrial structure, is widely recognized as a significant threat to future welfare, in light of the inevitable depletion of the oil and gas reserves and the demographic needs trend towards ageing. Government research and innovation policy, building on dynamic entrepreneurship in certain fields, actively promotes the development of new energy sources and industries. The risk of being locked into established industries, at the expense of new ones, should not be underestimated.'

Many of the different actors met do not seem to address clearly the strategic question of evolution of the current industrial and economic situation. Heavy industry looks like concentrating its creativity, efforts and money on core business projects. This kind of strategy works as long as technologies and markets do not evolve quickly. The rapid realization of the emergency of environmental challenges at European level with recent political decisions, and the investments announced by the new US administration will accelerate the momentum.

New investments localisation for heavy industry

If the existing plants of heavy industry are certainly not concerned by a risk of delocalization, it is not certain that new plants (new processes, new products) will be located in Agder. The low cost of energy is certainly a competitive advantage but the geographic evolution of the repartition of the needs in high-tech materials moving it from western countries (typically Europe, North America and Japan) towards eastern countries (China and India) may modify the balance and the business models of new high-tech plants to be created. The Ericsson 'success-story' might make regional actors too confident in their future and mask the importance of working on these questions right now.

The ICT sector is not very healthy

Almost all of these firms have shown negative results for the last five years. There is a notable exception with the case of Devoteam which is in a good economic situation. This is certainly a weakness of the network and of the companies themselves. The firms – mostly start

ups – are taking off and finding their market. They could be in cash difficulties if the financial system surrounding them does not follow. They may be confronted with an external solution, the entry of new shareholders with no geographical concerns for Agder. The current situation is quite different from the one when the Ericsson question appeared 10 years ago. The ICT companies are mostly SMEs and the individual effects of the delocalisation of a small unit will not mobilise the different actors as they did in 1997. The companies hired people from abroad and could be less concerned by the regional aspects of the question and even may accept easily to move to another region or country.

Feeble local embeddedness of the industry

As stated before, most of the companies in the region do not have their decision centres in Agder and very little is done to embed these firms in the region. In spite of certain undeniable regional advantages, this situation could lead to the delocalisation of the activities. The case of Ericsson could illustrate this (see Box 3.1). Indeed, as a department of a firm whose decision centres are not located in Agder or in Norway, and as the world leader in its competences, the Ericsson research centre in Arendal did not constitute the heart of a local pro-active network for the ICT development. Too little interaction among firms, too few relations between firms and knowledge organisations were the characteristics of the ICT fabric in 1997.

Generally not considered as a hot topic, delocalisation must be analysed and taken into account by entrepreneurs, public authorities and politicians in order to prevent it. Embedding the international companies in the regional economy and maintaining close communication to ensure that the companies' needs are met could contribute to creating the conditions to make delocalisation difficult.

Recommendations

The analysis below provides some policy recommendations to support and improve the business sector contribution to the innovation and entrepreneurship system in Agder.

Understand the needs of the different business segments

A common first goal given to the various intermediaries could be to organise the collection and the analysis of the actual needs of the large, medium, small and very small enterprises in their different activity segments. Different actions could take place to achieve this.

- Specific attention to the business situation

Building on the numerous intermediaries present in the region, it would be possible to organise a survey of the enterprises, including craft and services to the person, and to know more precisely their current situation (economic and financial challenges, human resources, goals) and their development strategy in terms of growth, export plans, new products, new markets, etc. The questionnaires could be prepared by the business intermediaries together with the regional authorities and the academic staff in order to reach a full global understanding of the common goal and share the aims and methods. The target audience and sample should be decided collectively.

The processing of the data, made with the support of the academic bodies, will reflect the needs of the business fabric with a maximum of details, of segmentation and cross analysis. To debate and come up with an appropriate set of support measures, open communication events could be organised locally or by activity sectors to favour exchanges with the economic actors and share the vision with them.

- Foresight and key technologies

A collective systematic prior questioning of the applications of the oil and gas sector know-how is advisable with the support of foresight methods and specialists. These methods will identify less obvious possible tracks of which will depend on internal and external analysis of the companies or of the cluster. The construction of NODE sub-clusters will help in solving ‘co-competition’²³ questions as well as in designing R&D projects liable to be supported by public money. The same kind of reasoning could be applied for EYDE. For example, an analysis of the possibilities of multi-materials elaboration (e.g. brazing), shaping of innovative materials (e.g. powder caking), or the elaboration of functional materials are considered internationally as promising and less dependent on the proximity of the user than more ‘classical’ materials. The University could very usefully be associated to these exercises preparing the future.

A key technologies exercise could also be interesting to undertake at the Agder region level. A key technologies exercise²⁴ is a foresight activity which gathers specialists of scientific domains, people from the enterprise side, from the market side, from the society side and from the administration, and makes them converge towards understanding on the possible evolutions for the next period. This kind of exercise starts from the idea that technologies modify the conditions of the market and thus modify the established situations. Mastering key technologies means preserving competitive advantages. Usually undertaken at national level, such exercises can be implemented at regional level with different objectives, one of it being the common vision of the current situation and its potential evolution and the other being to create a common impulse towards a common goal.

- New fields of innovation/diversification, interfaces

Another way to create collectively the impulse towards a common vision of the situation is to organise a common reflexion on the potential new fields of innovation. Instead of starting from the final products, processes or services which usually structure the way of representing the economic activity in Agder, other type of segmentations could be used such as digital economy, materials economy, environment and sustainable development, health, etc. This segmentation has an impact on the traditional way of analysing the sectors. For instance, health can be linked to the ICT sector, the agro-food sector or the environment sector. This kind of exercise makes apparent different arrangement between the existent technologies, the economic fabric and the market and social demands.

Pay more attention to the smaller enterprises and more traditional activities

During the study visit, it was not possible to meet SMEs representatives. However, various actors interviewed, notably representatives of the business support sector and the financial system, expressed that SMEs are facing the same kind of problems usually encountered in western countries: aging of entrepreneurs; aging of employees; labour shortage; lack of innovation leading to new products, processes, services, organisation, market approach; limited technological and non-technological support; lack of financing, etc.

SMEs and other traditional sectors such as fishing, agriculture or services (including tourism) in Agder are those which are creating the majority of jobs accounting for an important source of labour demand. These are also the most difficult activities to delocalise as are more strongly embedded in the regional economy. These sectors are also cradles of innovation and transformation. Thus, these sectors should be systematically monitored and considered more importantly when defining the interventions and actions of the regional business support network.

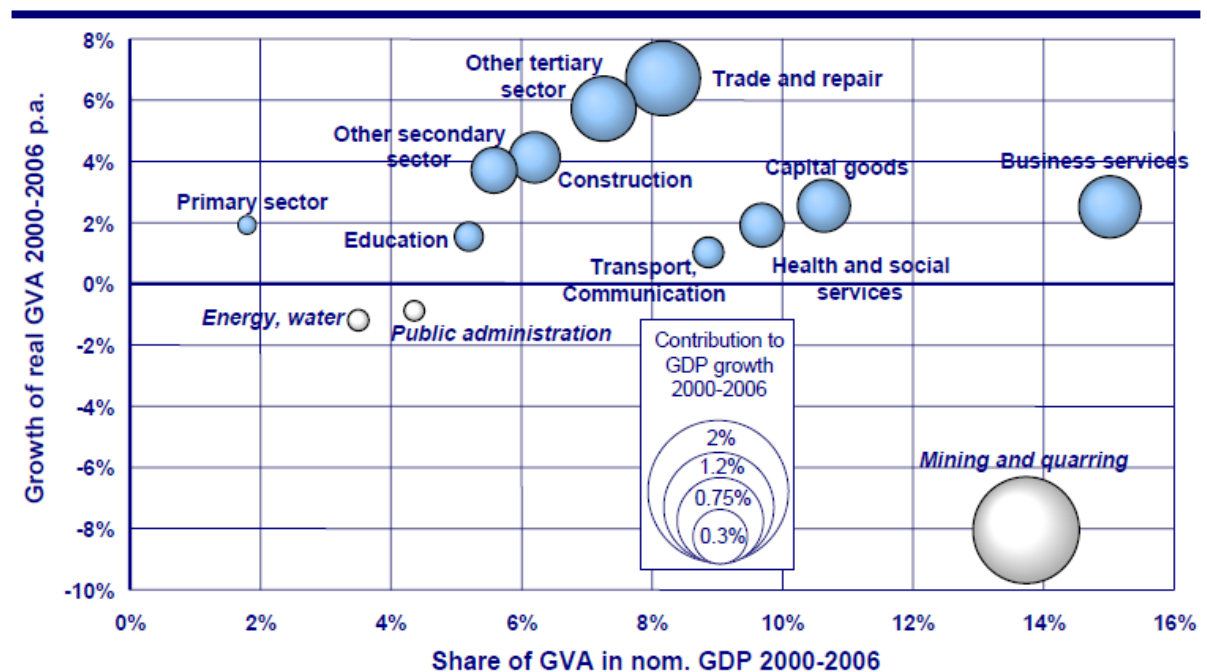
Know Agder's real situation

In strategic intelligence, it is said that the external landscape is easy to understand if there is a good knowledge of the internal situation. Following this statement, it is possible to recommend working on the real internal knowledge situation of the region's economy to understand its real situation and its positioning as compared to other regions.

Figure 1 shows an example of the representation of the respective contribution of the GVA (Gross Value Added) of the different segments of the economy in the formation of the GDP.²⁵ This kind of representation, accompanied by benchmarking activities based on objective data, helps towards understanding the actual situation of the regional economy. This exercise is also useful in identifying the real pressing issues affecting the region (prioritisation) rather than addressing those which seem the most obvious or which are the most popular.

Figure 3.1: Example of data processing supporting an economic situation understanding

Contribution of Agder's sectors to real GDP growth 2000-2006
based on USD at 2000 prices and 1997 PPP



Source: BAK Basel Economics special computing for the author

The figure above is an excellent mean of identifying the main challenges of a region in terms of size and of trends. To understand the process, let's take the example of the Mining and Quarrying sector. Over the period 2000-2006, this sector represented 2% of the GDP growth and 14% of the GVA the Agder region. This is indeed an important sector. However, its evolution in terms of real value added shows a decrease of 8%. With this information, the graph invites the decision makers to analyse what is behind these figures, because this sector pays a large contribution to the regional economy. If the decrease of the contribution of the real value added is only due to the increase of the contribution of the other sectors, then there is no major stake. However, if not, the sector must be questioned: is it only a matter of currency parities, is it a matter of reduction of technical productivity, is it a matter of tension of the international prices?

Moreover, these figures may also suggest that, in spite of their relative low contribution to the regional GDP, the contribution of the Business Service sector to the GDP represents more than 15% of the regional value added, with a positive growth rate of the real value added. These indications could be interesting indicators for those who are in charge of training and education, and that could invite them to create adapted learning and training programmes.

It is important to clarify that this exercise is not exclusive and that other tools can be applied to represent the real situation. The figure above is only an example to illustrate one of the tools that could be used to better understand the real situation of the business sector in the region and to prioritise targeted actions.

Create knowledge networks based on multi-users technological platforms to embed firms

One of the answers explored by regions to embed firms in a territory or make a region attractive is to create multi-users technological platforms. These platforms concentrate expensive devices in one or few sites, served by experimented and trained people whose profitability and payoff are impossible to reach even for large companies. The creation of technological platforms targets different time horizons. These platforms facilitate the exchange with academic or transfer people meet SMEs, solving some of the concerns of large, medium and small-sized enterprises. Smartly managed, these platforms help in structuring mutual needs and in finding mutual solutions. Progressively, innovative projects emerge. The example of Teknova is interesting in this regard.

Putting together future concerns, it is possible to create a community of practices and of future thinking. Long-term shared innovative and industrial research projects are possible in such platforms where large companies and smaller companies can meet and interact (cf. competitive cluster policy in France). These platforms are the concrete evidence of the Triple Helix at work. Another example is the Kompetenz Netze (*Competence Networks*) framework developed in Germany. This is a national framework fed with regional (Länder) initiatives. The Kompetenz Netze are the combination of innovative companies, innovation intermediaries and academic bodies gathered to operate collaborative advanced project. The public authority supports financially and facilitates the demonstration operations.

Implement an Agder Small Business Act (SBA)

Inspired by an already existing policy in the United States of America, a recommendation by the European Council (March 2008)²⁶ invites European Member States to introduce such a framework in their policies, the aims of which are to facilitate access of SMEs to public markets (see Appendix D). It is certainly possible in Agder, without contradicting national and international laws and regulations, to implement a similar Small Business Act at regional level for public purchase to introduce such regulations, imposing for order greater than a certain ceiling to have systematically the presence of at least SMEs in the proposing consortium.

Learning models

Formalised the Triple Helix at work, Lorraine, France

Description of the model

This example starts in 2001 when the Regional Council of Lorraine decided to explore the possibilities of supporting the creation of a Cluster for Aeronautics and Space activities. The aim of this example is not to speak about cluster building but to show how public authorities, academic transfer systems and businesses (SME quasi exclusively) work together in pro-active and synergic effects²⁷.

Since the implementation of the Competitiveness Cluster Policy in France in 2005, it is not that easy to show the Triple Helix at work. Some of the R&D+I projects were not considered as targeting the Aerospace cluster companies, and therefore the academic Helix looks uneven. This does not mean that this Helix does not work any longer.

Relevance to Agder

This concrete example shows the three segments of the Triple Helix:

1. The *business sector* is the only one responsible for the global industrial strategy; it chooses its targets and partners; it looks for internationalisation and for applications of its processes and products in industrial sectors other than Aerospace (medical devices, automotives...);
2. The *academic sector* plays its role in supporting innovative projects and transfer activities, teaching, researching and transferring people. It also contributes to the long-term thinking but does not interfere in the choices;
3. The *regional authorities* finance most of the initial costs for governance, strategic monitoring, participation to Air shows, etc. and are a key lobbyist between SMEs and OEM or sub-contractors of layer 1; the regional authorities also co-finance trans-regional and cross border activities (some of them together with the companies and the European Commission).

Results of the approach

Lorraine was not considered initially as an aeronautics and space region and is still not, but as of December 2007 some figures are interesting to highlight: the companies involved in this network, accounting for 2,300 employees with a total turnover of 285 M€, had the part of their activities evolving from 50 M€ in 2003 to 100 M€ in 2007. Another result is the recent decision by an aircraft manufacturer, GEICI Group, to locate its Skylander manufacturing unit in Lorraine (300 jobs at the beginning) in a location competition against Portugal.

Reasons for success

There are two main success factors. On the one hand, the public sector has ensured a permanent political support in spite of a change of regional majority at mid-term. It also made a clear choice of leaving the strategic decisions in of the cluster in hands of the entrepreneurs. On the other hand, the strong initial implication of a regional entrepreneur already deeply involved in this specific sector of aeronautics has been key in achieving the successful outcomes of the cluster.

Obstacles faced and response taken

The main obstacles were essentially the time spent between the first decision and the first effects. It took around two years to find the right administrative support (the aerospace sector had its specific requirements). It took another two years for the first new kind of order for the entrepreneurs and somehow two years more to meet clearly a consensus of the positive effects of this construction.

To move things forward, large investments were engaged. At regional level, the initiative was immediately accepted by the politicians and an important budget was spent quite quickly (in total, from 2001 to 2008, 1 M€ was spent by public bodies and 440,000 € by the entrepreneurs). At national level, the government did not support this initiative since it had its national Productive

Local Systems policy and were concentrated on that. Later, the Competitiveness Cluster Policy had the same effect.

Considerations for adoption in Agder

Globally, it is interesting to identify clearly how the three Helices interfere, co-operate or ignore each other. It could be interesting particularly to analyse the Triple Helix model in action to support the ICT cluster in Agder currently under construction.

The Agder region is in a similar situation as Lorraine was as far as ICT and aerospace industries are comparable. In fact, Agder is not identified as a leading region for ICT. But, as was the case in Lorraine for aerospace, there are some interesting nuggets in the ICT fabric in Agder which could lead and share a positive momentum of interactions with academic institutions (education and research) with the support of local authorities.

Further information

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The cluster policy in the Basque Country, Spain

Description of the model

The cluster policy in the Basque Country is well known and has been described in many publications. It certainly remains one of the most interesting in Europe. Lasting for more than 15 years now, this cluster policy initiated by the Basque Government has been supported by the municipalities as part of a Regional Competitiveness Programme.

The Basque cluster policy²⁸ started in the early 90's, largely inspired by Michael E Porter. A group of priority clusters in the Basque Country was decided on, and in the following years the different Cluster Associations were created:

- Automotive (1993)
- Household Appliances (1992)
- Environmental Industries (1995)
- IT and Telecommunications (1994)
- Aeronautics (1997)
- Paper (1998)
- Ship Building Industry (1997)
- Port of Bilbao (1994)
- Energy (1996)
- Knowledge in Management (1996)
- Audiovisual (2004)

These 12 clusters span approximately half of the Basque industry.

The main information given in this chapter come from various publications made by Juan Manuel Esteban Gorostiola (see contact details at the end of the chapter). The following development summarizes the rationales of the cluster building and monitoring.

The rationale of the Basque cluster policy is: improving the competitiveness of Basque companies through co-operation, focusing on the competitive strategic challenges that cannot be addressed by individual actions carried out by the companies. In this sense, the cluster associations act as net servers with a catalytic function, which try to intensify the number and speed of communication and interaction among members.

The activity fields for each cluster association must be related to the strategic challenges which require co-operative actions:

- Internationalization;
- Technology/innovation;
- Quality/excellence in management;
- Logistics;
- Energy efficiency;
- Training;
- Competitive intelligence;
- Miscellaneous.

The main key success factors are:

- Company involvement;
- A good facilitator;
- Shared vision;
- Cluster membership open to all the organisations in the ‘natural’ cluster;
- High level of consensus on the actions to be launched.

The cluster policy is supported at a level of 200,000 €/year per cluster. The rest of the costs are supported by the companies. It has been accompanied from the same years on by the creation of a network of technological centres and of other support centres.

Relevance to Agder

The Basque cluster policy is a good return on experience of a long-lasting cluster policy in a small European region. This example shows a learning process from the first cluster created in 1992 and the last one in 2004 and covers a large range of economic sectors: from ICT and audio-visual to ship building and even the Port of Bilbao as a cluster itself. The long run of this policy is interesting for the Agder case. Agder policy explicitly wants to support cluster creation and has already some results. Learning from the Basque Country may help Agder to spare time and accelerate the already existing clusters and to identify, shape, launch and monitor others.

Results of the approach

Intangible results, although difficult to measure, are of great importance:

- The trust existing among agents;
- The public-private collaboration as the main axis of progress;
- The cooperation between competitors;
- The strategic orientation of the clusters towards specific objectives, however complicated or long-term they can be.

But there have also been tangible results:

- The creation of several Export Consortiums;
- Technological projects ‘interclusters’ (Electronics for Automation, Automation-Machine Tools, Energy-Environment, etc.);
- Impressive results in Excellence in Management evaluated according to the EFQM model, the larger companies having a driving effect on the smaller ones.

Reasons for success

The analysis of the different sources and examinations of the cluster policy in the Basque country shows converging conclusions: (1) a cluster policy needs a strong and sustained political support, even in case of political change; (2) a cluster policy is based on a high demanding consensus policy; (3) all the money must not come from the public sector even at the early stages – the private sector must demonstrate its willingness to get involved by supporting it financially; (4) a cluster policy is not a top-down approach and a same-size-fits-all: each cluster has its own objectives, its ways of working and networking and its business model.

Considerations for adoption in Agder

For Agder, as for other regions or countries, the example of the Basque country is interesting as long as it is understood that each policy and each cluster must be embedded in the local reality and specificities. An interesting measure noticeable in the Basque cluster policy is its evaluation policy based on qualitative and quantitative indicators of the clusters effects:

- the politicians must get ‘return on investments’ of their involvements in terms of jobs created, of attractiveness of the region and at the end in terms of electoral results;
- the cluster itself and their constitutive enterprises must improve their economic and financial situations (better position on the same market, better position to enter new markets, better margin).

Further information

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Network of competence in North-Rhine-Westphalia, Germany

Description of the model

One focus of the network's activities is on merging existing know-how in science and industry in a specific domain where already exists a relative potential compared to other regions. In addition, the network seeks to identify and integrate further competencies, such as companies

and institutes that have not yet worked in the selected domain, but are able to make valuable contributions to the development of the technology.

Competence Networks offer a large variety of services to their members. Among these services are working groups on topics related to the domain chosen, the arrangement of delegation trips to visit enterprises, and the organisation of joint stands at fairs in Germany and abroad. However, their most important task is initiating cooperation projects. Here, the network helps by proposing topics and finding project partners with special expertise.

For the Network of Competence for Fuel Cells and Hydrogen Development in North Rhine-Westphalia, around 340 members contribute to 81 fuel cell projects financed together by the companies, the region, the federal government and the European Commission. The range of topics covers single system components as well as complete systems for the stationary and mobile sectors.

The fuel cells development is not a laboratory result but it is close to the market. The heart of the network is not the institutes but companies. In the case of this network, two-thirds of the network members are companies, roughly 20 percent are institutes. The majority of companies are small and medium-sized and come from the machinery and the electrical engineering sector.

In order to demonstrate the economic viability of fuel cells it is important to set up demonstration projects and the participating companies have adapted their original products to the special demands of fuel cell systems. This helps to improve the efficiency and reliability of fuel cell systems. Examples of system components are compressors, pumps, and special inverters, membranes, chemical engineering plants, electricity integrators and adaptors in general electricity distribution networks.

Fuel cell applications for early markets constitute another project focus. These are markets where the user is willing to pay prices of the fuel cell because it offers an additional benefit. Examples are the logistics sector, protection against grid failures, and the leisure sector. Current developments are cargo bikes, midi busses and uninterrupted power supplies. Other development such as remote housing, isolated uses (in desert areas or space) or very small power installed such as portable computers or mobile phones are promising for fuel cells applications.

Relevance for Agder

This example shows that it is possible to cluster initiatives of different origins (companies, intermediaries, institutes, public bodies) around a common project which does not promise a return on investment at a close horizon. Moreover, it is an example of a cluster which works for a non-already existing industrial or economic branch. The participation to this cluster is not linked to immediate effects but to potential interesting effects for the whole area. It also shows that it is possible to encourage SMEs to enter long-term projects. This is important for the development of new industrial sectors.

If such an initiative starts with the adapted level of communication, encouraging better relations between institutes and enterprises for focused basic and applied research, it may support actions in directions of large industrial groups with their decision centres out of Agder to invite them to invest in these projects and to not look systematically for delocalisation. This kind of example may support territorial marketing for inward foreign investments.

If Agder is willing to explore new ideas of diversification of traditional energetic industries towards the development in innovative new renewable sources of energy (e.g. geothermic) interesting lessons could certainly be drawn from this example.

Results of the approach

This network has significantly contributed to the fact that North Rhine-Westphalia is increasingly considered one of the leading fuel cell locations in Europe. This can be seen in the close cooperation of the network and its members with partners from the USA, Canada and Asia. The network has become an important location factor. The fuel cell companies Idatech (USA), Dynetek (Canada) and CFCL (Australia) stated that the existence of the network played an important role in their decision to settle in North Rhine-Westphalia.

Reasons of success

The initiative was launched in 2000 and is still supported by the different stakeholders (public and private). A long-term support is crucial for such programmes. The initiative to launch a Network of Competences in NRW is embedded in regional strengths on energy and part of fuel cells compounds and supported by a clear regional strategy which targets 4 main objectives: international identification of NRW as leading location for hydrogen technology; target mass market through early markets; support the development of fuel cells by a targeted basic research; support the establishment of an economy based on hydrogen energy (as one of the various sources of sustainable energy). Membership is free, and the network is open to non-regional members.

The Fuel Cell and Energy Network is part of the Regional Energy Agency. That is to say that this project does not run in silo, but it is connected with other initiatives and participates in the regional elaboration of the energy policy together with activity related to solar energy, biomass energy, etc looking for synergic effects with the others.

Obstacles faced and response taken

The main difficulties facing this kind of initiatives are of two main orders. Firstly, the implication of the academic sector in this kind of organization could be difficult to get because of different time horizons, different culture, different core activities, issues of appropriateness, issue of performances, etc. In order to address these issues, a good communication system could be defined, not only based on ICT and virtual set-ups, but also based on the assessment of individuals. Secondly, the issue of economic security arises: as far as the works undertaken in such mutual platform are somehow strategic, since they prepare the future, many businesses responsible are reluctant to share their projects. To address this concern, specific attention should be paid and procedures should be put in place to sensitize and train people to these questions.

Considerations for adoption in Agder

Agder has already a large cluster policy which is considered as successful, but the identified clusters do not really take advantage of the academic sector. The necessary evolution brought by the current crisis modifies the landscape and could be a good opportunity to organize analysis and evaluation of various promising fields: global and sustainable energy systems, exploitation and valorisation, etc. This kind of analysis works with different regional potentials: academic – research, technology – development, transfer – innovation, financing – private/public, complementarities with neighbouring regions, countries, potential supply chain, etc.

Further information

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Research platforms serving innovative enterprises in Midi-Pyrénées, France

Description of the model

In 2006, with European co-financing (Regional Programme of Innovative Actions), the Region of Midi-Pyrénées initiated a programme aiming at building research platforms put at the disposal of innovative SMEs. After a call for proposals, six platforms fulfilling eligibility criteria were selected: Genomics; Cells imagery; Analysis and processes; Tran genesis, zoo technique and functional exploration; Grid and clusters of processors; and Modelling and intensive computing facilities (CALMIP). The example focuses on the last one.

CALMIP²⁹ is the name of the existing platform devoted to Modelling and Intensive Calculations. Thanks to this initiative, the CALMIP platform received new advanced computers and software. The counterpart to these investments is the acceptance of CALMIP to open these new computing capacities to SMEs in the Midi-Pyrénées Region. Almost 20% of the new capacities must be accessible for SMEs at a special price (until the end of 2011) with compensation by public bodies for financial losses.

The aim of this initiative is twofold. On the one hand, the regional authorities seek to increase significantly the R&D capacities in the Region in the domains of digital simulation and numeric computing by:

- Increasing the scientific publications production by the academic partners;
- Increasing the attractiveness of the laboratories or the industrial sector in order to obtain research contracts and increase the number of researchers in SMEs;
- Improving the education of the young PhD researchers in advanced computing and increasing their access to the work market.

On the other hand, the regional authorities seek to facilitate the access of regional SMEs to a system with an affordable and large computing capacity. By doing so, they promote:

- The competence transfer to regional SMEs;
- The capacity of these enterprises to innovate;
- The patent production.

CALMIP is relevant in various domains of numeric modelling and intensive computing with its supercomputer devoted to scientific computing only, a set of basic software, compilers, a full environment for development and metrology as well as specific libraries. Two graduate engineers serve the platform.

SMEs can use the platform for many purposes: e.g. to test a software before buying it; to find support from specialists to solve complicated applications, or to be trained to specific applications. The total cost of this programme is 527,000 €. The programme CALMIP started at the end of 2007.

Relevance to Agder

This kind of project, at the same time reinforcing research capacities and, by contract, imposing a certain level and type of relations between the laboratories and SMEs in exchange for public investment, is certainly adaptable in a region such as Agder. At the same time, this kind of project reassures the academic sector discussion with its environment and facilitates mutual understanding. It also facilitates the emergence of collaborative projects and increases the

production of territorial knowledge. The relevance of the industrial projects attracts talent to the laboratories and the companies, and thus to the region.

Results of the approach

It is too soon to fully appreciate the actual results of the CALMIP platform. But thanks to the analysis undertaken one year after its launch, it is possible to identify some bottlenecks and solutions to improve the efficiency of the system:

- Before starting this kind of project, do know the actual needs of enterprises;
- Take into account the environmental conditions (e.g. the limited access to broadband confined the use of the platform to certain areas of the regional territory);
- This kind of platform needs a larger accompanying personnel to support earlier the projects of the SME;
- The communication policy and commercial approach around this kind of project is crucial and all manifestations of interest are not systematically endorsed.

If the interactions between SMEs and the R&D laboratories are not yet satisfactory, at least the investments have improved significantly the computing capacity of the platform and of the Midi-Pyrénées Region and thus their attractiveness to high-tech academic and business people.

Reasons for success

If the success of CALMIP is still under construction, other platforms have demonstrated their interest in the business sector (Analysis and processes, Tran genesis, zoo technique and functional exploration, for example). The main reasons of their success are a pre-existing collaboration between laboratories and enterprises. Thus a common definition of the investments to make and of the services to offer is easier.

Obstacles faced and response taken

In addition to the difficulties described above, it may be important to consider that a progressive and pragmatic approach of the platform concept would have been preferable. However, the time constraints of the Regional Programme of Innovative Actions imposed a rapid decision process and implementation without return of experience.

Considerations for adoption in Agder

As Teknova is closely linked to the industrial fabric, with the objectives to identify, design and operate industrial Research and Development projects, and to support its innovation processes, this intermediate structure is at the right place. This structure could provide a platform to address the needs of individuals and to a group as a whole – for instance a cluster. Agder could adopt this model in several ways: by supporting a mutual platform for analysis, control and characterizations of complex materials (e.g. metallic alloys or composite materials) or a mutual platform devoted to multiple renewable energy sources systems (design, demonstrators building, optimization), or a mutual platform capable to accelerate innovation in services (final consumers panels, qualitative and quantitative analysis).

Further information

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APPENDIX B: COMPANIES NEEDS

Figure B.1. Results of a survey of SMEs needs in a French region



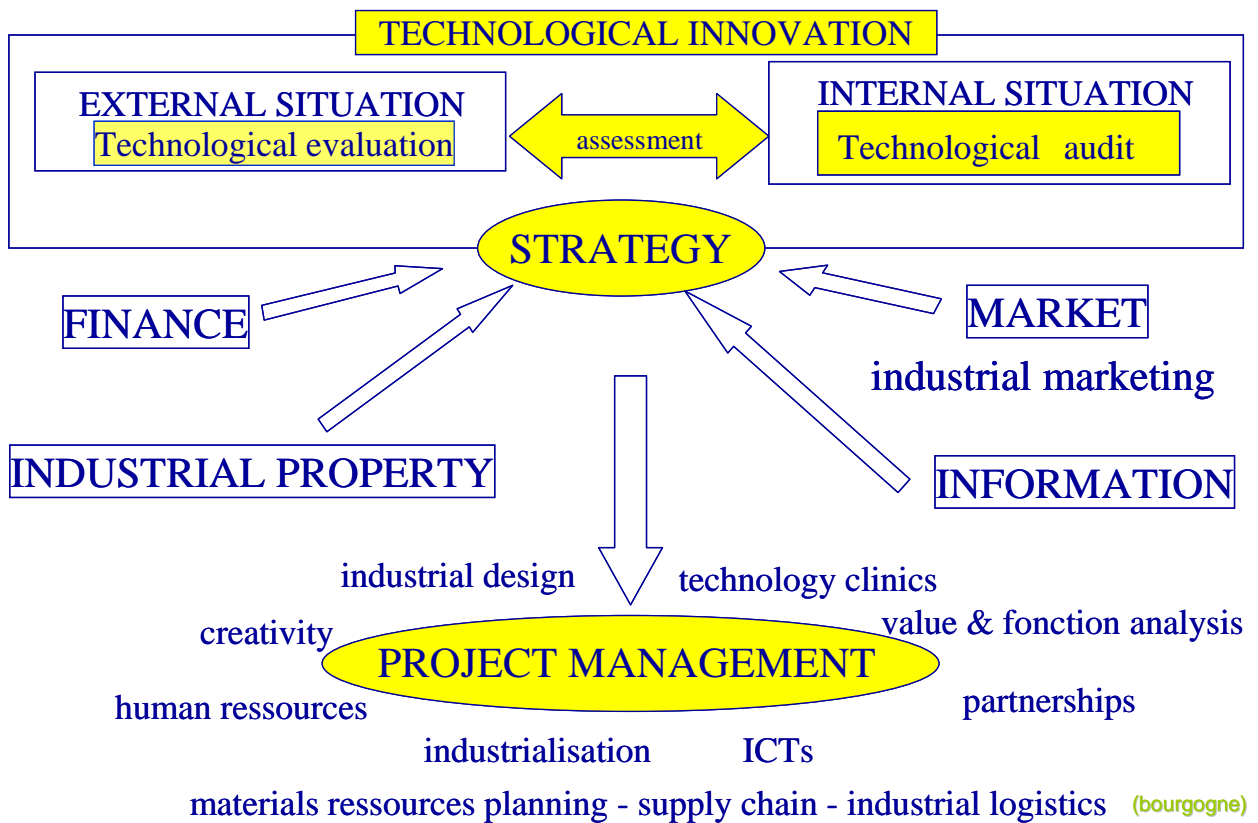
Source: The author

This kind of analysis helps policy makers, intermediaries, to shape their policies or tools. Of course, it is necessary to segment and cross analysis these data into different segments (size, market, technology, trends, export, sub-contractors/OEM...).

**APPENDIX C:
INNOVATION MANAGEMENT TECHNIQUES**

From the different meetings, it appears that the main actors tend to consider innovation only from the technological side. Of course, science and technology are of great importance to create competitive conditions, but also the conditions under which scientific and technological advances are implemented in the economic sector. The technological issues need to be supported by relevant Innovation Management Techniques (IMTs) which group different ‘soft’ techniques as summarised in the figure below³⁰.

Figure C.1: Schematic description of the global framework of technological innovation and Innovation Management Techniques (IMT)



Source: The author, for EU Thematic Network Verite

This figure shows that besides the ‘traditional’ technological approach to innovation there are other robust techniques with objective methods. The IMT’s do play their role at different steps of the innovation process. For example, the issue of intellectual property must be treated as soon as a concept is conceived. The market capability to accept the new product, process or service comes very soon after. Industrial design, functional analysis and creativity are important in the phase of design of the final product. This dimension has to be developed in the regional framework of supporting economic development and innovation policies and adapted to the different kinds of field players.

APPENDIX D: A ‘SMALL BUSINESS ACT’ (SBA) FOR EUROPE

The March 2008, the European Council expressed strong support for an initiative to further strengthen SMEs’ sustainable growth and competitiveness, named the ‘Small Business Act’ (SBA) for Europe, and requested its swift adoption. The symbolic name of an ‘Act’ given to this initiative underlines the political will to recognise the central role of SMEs in the EU economy and puts in place for the first time a comprehensive policy framework for the EU and its Member States.

A **set of 10 principles** guides the conception and implementation of policies both at Community and Member State level.

These principles are essential to bring added value at EU level, create a level playing field for SMEs and improve the legal and administrative environment throughout the EU:

1. Create an environment in which entrepreneurs and family businesses can thrive and entrepreneurship is rewarded;
2. Ensure that honest entrepreneurs who have faced bankruptcy get quickly a second chance;
3. Design rules according to the ‘Think Small First’ principle;
4. Make public administrations responsive to SME needs;
5. Adapt public policy tools to SME needs: facilitate SMEs’ participation in public procurement and better use State Aid possibilities for SMEs;
6. Facilitate SMEs’ access to finance and develop a legal and business environment supportive to timely payment in commercial transactions;
7. Help SMEs to benefit more from the opportunities offered by the Single Market;
8. Promote the upgrading of skills in SMEs and all forms of innovation;
9. Enable SMEs to turn environmental challenges into opportunities;
10. Encourage and support SMEs to benefit from the growth of markets.

A **set of new legislative proposals** which are guided by the ‘Think Small First’ principle:

- **General Block Exemption Regulation on State Aids (GBER)**
This regulation exempts from prior notification categories of State aid already covered by existing regulations in the field of aid to SME, training, employment, R&D and regional aid and covers new categories of aid. The new regulation simplifies and harmonises existing rules for SMEs and increase investment aid intensities for SMEs.
- **Regulation providing for a Statute for a European Private Company (SPE)**
This regulation provides for a Statute for an SPE that could be created and operate according to the same uniform principles in all Member States. The Commission is also

expected to come forward with the necessary amending proposals to ensure that this new company form can benefit from the existing corporate tax directives.

- Directive on reduced VAT rates

This envisaged directive will offer Member States the option to apply reduced VAT rates principally for locally supplied services which are mainly provided by SMEs.

Moreover, as part of the SBA the following proposals will be prepared:

- A legislative proposal to further modernise, simplify and harmonise the existing rules on VAT invoicing to alleviate the burden on businesses.
- Amendment to the Directive 2000/35/EC on late payments with a view to ensuring that SMEs are paid on time for any commercial transactions.

CHAPTER 4

RESEARCH INSTITUTIONS IN AGDER

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Introduction

This chapter focuses on the various research institutions in Agder and their role in the Agder local innovation system. Principal among the institutions is the University of Agder (UiA) which, as noted in Chapter 2, dominates the knowledge infrastructure of the Agder region. Its science parks (Sørlandet Kunnskapspark or knowledge park) in Kristiansand and Sørlandets Teknologisenter in Grimstad also are part of the university infrastructure in Agder. The UiA has several research and teaching centres and also has partial ownership of Agder Research and Teknova. Other research institutions include Cultiva and Sørlandet Hospital Health Enterprise (SHHF).

Three topics are of particular significance as the university seeks an expansion of its regional, national, and international profile: (1) regional engagement; (2) third stream income as an entrepreneurial university; and (3) formulating and communicating the vision and strategy of the university.

Policy issues

Regional engagement: the third mission

The traditional roles of a university are *education* and *research* – that is, to teach, and to seek new knowledge through research. Universities today are seen to have a “third mission”, called service, outreach or, more recently, *engagement* (Goddard et al., 2007). Together, the three missions of a university endow its region with skills, innovation and culture (Goddard and Chatterton, 1999). As Nilsson (2006, p. 202) says, “A successful modern university is expected to maintain these three academic missions in a creative tension with each other”. Fundamentally, then, universities are “multi-product organisations”, with expectations to produce several outputs (Lawton Smith, 2006; Luger and Goldstein, 1997).

It is no longer sufficient for universities to be preoccupied only with international academic and research communities. Universities are “pipelines” or “conduits” through which research of an international and national nature is transferred to the locality, thereby enhancing regional institutional capacity. Because of their multi-territoriality and inter-disciplinarity, universities are institutions which are positioned to interpret global issues on a local scale (Benneworth and Hospers, 2007; Chatterton and Goddard, 2003).

The third mission is not subordinate to teaching and research. As the classification of American universities involved in “community engagement” shows, many prominent research institutions in the USA maintain deep engagement with their region or community (see Box 4.1). This has been a growing trend for a decade or more (Holland, 2001; Kellogg Commission, 1999).³¹ The extent of the new expectations of universities also is seen in Finland, where five

“assessment baskets” are proposed for universities: (1) engagement in innovation activities, (2) engagement in the labour market, (3) engagement in socio-ecological development, (4) engagement in the regional environment, and (5) engagement in social debate (Ritsilä *et al.*, 2008). Thus, it is clear that society’s demands and expectations of universities have grown in recent years.

Box 4.1. Community Engagement

The concept and practice of community engagement are complicated. There are many communities, at several scales. These involve, in turn, different sets of obligations for the university (Watson, 2007).

The Carnegie Foundation for Higher Education, based in Stanford, California, USA, is well-known for its classification schemes for universities. In 2006, the Foundation invited universities in the USA to submit applications for community engagement. A total of 89 universities submitted full documentation and a year later, 76 colleges and universities recognized in the first classification. The “demographics” of the group shows that this is not a designation attractive only to second-rate institutions. Of the total, 44 are public institutions, and 32 are private universities, including prestigious several ones, such as Emory University, New York University, Tufts University, and the University of Pennsylvania. Moreover, nearly one-half (36) are doctorate-granting universities. An additional 119 institutions were awarded this classification in December 2008.

Driscoll (2008, p. 40) reports that the institutions that were classified as engaged with their communities shared a major strength: “a compelling alignment of mission, marketing, leadership, traditions, recognitions, budgetary support, infrastructure, faculty development, and strategic plans—the foundational indicators of community engagement”. She provides the example of Portland State University, whose motto, “Let knowledge serve the city,” was translated into budgetary priorities, an office of community/university partnerships, a consistent message from institutional leadership, and promotion and tenure guidelines that reward the “scholarship of application”.

The importance of “engagement” for dozens of research universities demonstrates that the “third mission” is not merely accepted but also embraced by these institutions. While many are in large cities, where the urban neighborhood is the primary community, others such as Indiana State University, Syracuse University, and Virginia Polytechnic and State University are in smaller urban settings similar to Agder.

Sources: Carnegie Foundation for the Advancement of Teaching (2007; 2008); Driscoll (2008).

Engagement is a specific interpretation of the “third mission” for institutions of higher education, and one that contrasts with the more narrow interpretation of entrepreneurship and technology transfer (Jongbloed *et al.*, 2008; Vorley and Nelles, 2008). Engagement entails partnerships with the many stakeholders that a university has, such as the list suggested by Davies (2001, p. 39): municipalities, other HEIs, chambers of commerce, regional authorities and development agencies, private enterprises of various kinds and sizes, banks, cultural bodies, trade unions, non-governmental organisations (NGOs), media, and employers’ associations. It must be emphasized that community engagement and third mission activities cannot be put in a separate box from teaching and research. The goals of engagement and third mission are less about relationships and cooperation and more about partnerships, or mutually beneficial relationships. This also implies a different balance of power, with the academic entity sharing control with others (Jongbloed *et al.*, 2008).

The concept of *partnerships* is an important one. In the absence of mutual understanding and dialogue, universities can appear to be a supermarket or a do-it-yourself store, where knowledge and its benefits can be selected and purchased (Boulton and Lucas, 2008). Both partners must invest time and effort to identify needs and to learn the benefits of interaction. As R&D increasingly is outsourced, firms need help with important and complex issues, which are potentially interesting to faculty members because they might serve as the basis for future research (Wright, 2008). Therefore, joint knowledge construction, often a goal of regional

partnerships (Karlsen, 2005), can actually occur. Furthermore, research and teaching are enhanced by close participation with regional actors, whose needs can stimulate innovative responses from university faculty members.

American universities pioneered research oriented to regional needs – for example, the University of Oklahoma in petroleum and the University of Minnesota in mining technology. These specializations also involved a search for fundamental understanding, and therefore represent basic, rather than applied, research (Rosenberg and Nelson, 1996). Gulbrandsen and Smeby (2005) find that researchers at Norwegian universities as well report that basic research accounts for a large fraction (40 percent) of their research funded by industry, and that it introduces new and interesting research topics. The needs of industry in Agder are also global in scope, as many multinational companies are present in the region. The firms located in Agder, then, also link to the global activities of these firms and the industries in which they compete.

Through its regional partnerships, a university can contribute leadership in addressing regional problems, and co-produce with the region a knowledge-based milieu – a *regional innovation system*. Enhancing knowledge infrastructure means to create an adequate supply of ideas, human capital, and academic collaborations. This involves improving innovation capacities, including selecting (and moving toward) the “right” specializations. For companies, the quality, dimension, and specialization of the local knowledge base are key factors in their location decisions. R&D managers must be able to anticipate a positive supply response from the domestic knowledge infrastructure to their demand for ideas, scientists, and academic collaborations (Foray, 2007). The ultimate goal is a self-sustaining innovating region (Arbo and Benneworth, 2007; Etzkowitz and Klofsten, 2005).

A university’s role in the territorial development process, therefore, is broad, and embraces economic, technological, environmental, social, cultural, and political agendas. The contribution of the university to the regional agenda can be learned by determining the involvement of university staff in regional public affairs, such as in politics, the media, the voluntary sector, the arts, and other educational institutions (Goddard and Chatterton, 1999; Goddard et al., 2007). The third mission highlights the increasing embeddedness of HEIs in their regions and their duty as responsible local as well as national and international agents (Chatterton and Goddard, 2003, p. 35). Universities throughout Europe are assuming responsibilities in shaping local, regional, sectoral, national, and international production and innovation systems (Havas, 2008). For example, performing artists in the UK are learning entrepreneurial skills that allow them to pursue their artistic creativity in a creative enterprise or arts business (Brown, 2005).

The impact of a university on its region can be substantial. Examining regional engagement in fourteen regions in seven European countries, Boucher et al. (2003) conclude that a large university in a peripheral region is much more important for its region’s development than several small ones in a core region. The UiA and Agder are similar in some respects to the Universities of Limerick in Shannon (Ireland), Joensuu in North Karelia (Finland), and Aachen (Germany).

Finally, all universities have a local face: as built environments their facilities are opened to the public at appropriate times. Facilities such as libraries, sports facilities, and arts and cultural venues are often significant facilities to which local public access can and must be provided (Chatterton and Goddard, 2003). Indeed, the attraction of university facilities leads to opportunities to run conferences, workshops, performances, and other events. In this way, a university is a central place in the cultural and intellectual life of a region.

An entrepreneurial university

An additional expectation has grown regarding the regional role of a university: to contribute to the regional economy through spin-offs of new firms based on innovative technologies that

flow from university research. Etzkowitz (1983, 1991, 1993) has documented the role of entrepreneurial scientists and entrepreneurial universities in American academic science since the 1980s. His picture of entrepreneurial researchers and science parks has had broad influence. Jacob et al. (2003) call it “science-based entrepreneurship”. This influence has grown further with the development of the “Triple Helix” model (Etzkowitz and Leydesdorff, 2000; Etzkowitz, 2003a). This model of university-government-industry interaction focuses on research groups and the second mission of universities – that is, research (Etzkowitz, 2003b).

The mechanisms by which university teaching and research activity stimulates economic development are more diverse and broader than spin-offs, patenting and licensing activity (Goldstein and Renault, 2004). The greatest impacts occur in small- and medium-sized regions (such as Agder), suggesting that universities may partly substitute for agglomeration economies (Goldstein and Drucker, 2006). Restricting the understanding of entrepreneurialism to official technology transfer activities also tends to dismiss or discount the “less scientific” disciplines. In a study of the University of Sussex in the UK, Martinelli et al. (2008) find dense networks of relations and multifaceted links between university faculty with non-academic actors. Entrepreneurial academics can be found both in “hard” science/engineering and in humanities/social science departments. Garnsey (2007) suggests that it would be more useful for European universities to emulate US universities’ production of multiskilled students than their output of entrepreneurs and intellectual property.

The more useful view of an entrepreneurial university is that of Clark (1998, 2004), who does not distinguish among the three missions, but focuses instead on sources of *third stream income*. Clark sees the purpose of a third stream of income as a response to the decline of the first stream, government core funding, and increased competition for the second stream, competitive research grants.³² UiA administrators complain of a lack of resources. As elsewhere, the largest source of funds is the Ministry of Education but, unlike in most countries, the second-largest source is generally regional funds. In Norway, “regional engagement of universities is not incentivised: research performance funding is based on publications” (Goddard et al., 2007, p. 94; see also Gunasekara, 2006). Therefore, the motivation to identify third stream income would seem to be present in UiA. Of course, no stream is completely secure in a financial crisis; however, three income streams are better than only two.

With detailed case studies of five European universities, Clark shows how a commitment to the third stream is also a commitment to the region of the institution. Vorley and Nelles (2008) report that universities are beginning to engage in more non-scientific, creative and cultural third stream activities. That is, the arts, humanities and social sciences are joining engineering and business in tailoring courses and research programmes to markets in their region. At the University of Twente, in the Netherlands, set up as an engineering university, the Centre for Higher Education Policy Studies has emerged and developed into a world-class research centre (Clark, 1998). Third stream income, then, is about more than money for its own sake. Money obtained from one activity can provide funding to jump-start new research-based activities which otherwise the university would lack the resources to initiate.

A major impetus and opportunity for third stream income comes from changes in the demand for education, not from neoliberal pressures alone (Normann, 2005). The long-standing demographic structure of mainly young first-degree students is shifting toward an inverted pyramid with a minority of first-time students, more students pursuing a second or third degree, and the majority of students enrolled in short-term continuing education activities (Salmi, 2001; Walshok, 1995). This means that new and different courses need to be developed to serve the new student demand, following systematic regional labor-market intelligence (Goddard and Chatterton, 1999). These courses target various new groups of students and respond to specific regional needs: different student markets, graduate retention in the region, locally-oriented courses, professional and vocational education, and non-degree programmes (Chatterton and

Goddard, 2003; Walshok, 1995). For example, executive education courses can serve the needs of businesses (large firms and SMEs), public administration, and non-governmental organisations (NGOs) for new skills and knowledge.

How does a university become entrepreneurial? Concentration on structure, formal planning and centralized control has limited impact on developing an enterprising culture. Instead, individual faculties need to recognize that academic enterprise activity can generate “non-traditional” sources of funding to address flat or declining budgets. As staff acquire good practitioner understanding, this has direct impacts on “mainstream” curriculum development, on increased research funding beyond the level that would otherwise have been obtained, and on high-quality research output (Woolard et al., 2007). Such a move toward becoming an entrepreneurial university requires a multidimensional approach as well as a degree of risk-taking (Gjerding et al., 2006).

In its relationships with businesses, a university can be used as “vendor” for a transaction, such as a license or technology transfer, or as a source of consultative knowledge and dialogue. Interaction with industry is not always easy for university faculty, who can be perceived as “selling out”. Likewise, corporate interests may have an aversion to so-called ivory tower thinking and “pure” research. Developing a dialogue allows both parties to shift from transactions to lasting partnerships that build new capabilities for the companies. Consequently, companies involve the university in their strategy, not merely in technical tasks or isolated business problems (Wright, 2008). Benneworth (2001) describes in a case study the long-term, iterative, routine and informal activities by which an academic-industrial relationship evolves over time and produces benefits that were not obvious or specified at the start.

It does appear that the large firms in the Agder region see UiA as a source of consultative knowledge, rather than as a vendor of specific technology. In addition, Teknova, a new contract R&D firm, provides outsourced R&D for several firms in the Agder region.³³ Teknova, drawing on its founder’s experience in the USA, sees contract research as a growth industry, doing research in areas where its clients have trouble hiring staff. Teknova attracts researchers at lower salaries than in industry by allowing them to spend 25% of their time on their own projects, and by encouraging publication of research results, which is not the case at many firms. Focusing on focused short-term projects, Teknova uses UiA labs and facilities and does not compete with the university.

The Norwegian firms studied by Gulbrandsen and Godoe (2008) felt that the main rationale for many collaborative projects and hosting of students was the need for a steady supply of talented, highly qualified young people. In addition to recruitment and a focus on students, the informants also emphasized the importance of public R&D for sustaining and developing a broad research and knowledge community in Norway and its regions. The UiA is part of this knowledge infrastructure in Agder.

Vision, strategy and communication

The third challenge for universities is to articulate clearly what they stand for. In the view of Boulton and Lucas (2008), universities ought not to focus on the business of innovation itself, but on developing human capital and creating an ecosystem or environment sympathetic to and supportive of innovation, contributing to the region’s intellectual, social and cultural resources. The ecosystem can be a “hubbub of creativity” that can contribute to innovation by attracting research-intensive companies and investment into a region, and helping to catalyze innovation in indigenous businesses.

A key starting point is to assess where the institution stands at present. However, such facts do not constitute a vision. Jongbloed et al. (2008, p. 307) stress that defining the mission of the

university requires asking additional questions, to distinguish between facts and ambitions. Following the question, “what is our business?” should be “What should be our business?”. The follow-up to “Who are our students?” must be “Who should be our students?”, “What is our environment?” should lead to asking “What opportunities are there?”. In addition to determining “What are our resources?” must be asked “How should we deploy our assets?”. Karlsen (2007) describes discussions and debates over such questions in Agder.

To communicate the university’s vision – internally as well as externally – is equally critical. Communication (or public relations) is important for all universities today, but is particularly essential for a regional university (Kantanen, 2005). That is, community relations is one of the many dialogues in which a university participates.

Documenting the present teaching, research and engagement activities and linkages and publicizing them with the region is an important first step in raising the profile of the university. Publicity within the institution is equally important to draw the attention of all staff to the extent and significance of regional engagement and entrepreneurial activities. This documentation is a prelude to a self-evaluation of the institution (Goddard and Chatterton, 1999). Regional needs and priorities also should be communicated throughout the university. If a common vision and understanding exists, then all university staff will be able to communicate it whenever they represent the university, whether in an official capacity or informally.

A university also must be able to respond quickly to unanticipated regional needs. These may be opportunistic short-term projects concerned with regional economic development as well as strategic, long-term forecasting projects. The university should be providing the region with research intelligence for its forward planning. This means it must be “plugged into” and participate in regional bodies. The OECD study team heard from several respondents that UiA was not a participant in regional activities and that absences at meetings in which the university is represented are common. Because of its global and local links, its interactions within the region and the credibility it holds as nonpartisan and scientifically rigorous, the university must be prepared to play a central role within the region, helping to set strategies (Goddard and Chatterton, 1999; Luger and Goldstein, 1997).

The university’s communications should be frequent and transparent, and accessible to all on the Internet. No one should wonder what the university and its people are doing. Their tasks are to develop new knowledge, to communicate that knowledge to others (students, the scientific community), and to apply it to the needs of society at home and (if appropriate) abroad.

Challenges and opportunities

Strengths

University status

The University of Agder was established as Norway’s seventh university in September 2007, when Agder University College received university accreditation. Agder University College was instituted in 1994 after six colleges in Kristiansand, Grimstad and Arendal merged. It now has university status and a growing number of doctoral programmes. Many of these are in attractive focused fields with international standing. The UiA now offers doctorate degrees in nine fields. The PhD programmes in ICT Mobile Communications and Open Systems, Information Systems, International Management, Mathematics Education, and Public Administration are taught in English, as are four Masters programmes (in Development Management, Information and Communication Technology, International Management, and Music Performance).³⁴ PhD programmes in Nordic Language, Nordic Literature, Popular Music, and Religion, Ethics and Society are taught in Norwegian.³⁵

UiA has many research-active faculty members who publish regularly in international journals. Several research centres have been established in the Faculty of Economics and Social Sciences and the Faculty of Humanities and Education.

University-industry partnerships

At least two UiA partnerships represent fruitful relationships between industry and the university. The EYDE network – begun in 2007 with UiA Faculty of Technology and Science in Mechatronics – is a model of industry-university collaboration.³⁶ A second exemplary industry-university link is the Xstrata Scholarship in Development, which funds two students in Development Studies each semester to travel to the Dominican Republic.³⁷ This programme gives students the opportunity to see first-hand the development challenges connected with mining operations in Central America, and also gives them a view onto the wider activities, in corporate social responsibility, of a large multinational company beyond its local operations within Norway. For the UiA's Faculty of Economics and Social Sciences, it is seen as “an opening for us to Central America”. Xstrata benefits from the expertise of trainees who analyse development projects in their bachelor theses.

These two programmes are very different and therefore illustrate the breadth of partnership opportunities available. Companies in Agder are enthusiastic about the possibilities for interaction with the new University of Agder. Mutually beneficial knowledge construction can result from partnerships within the region. Some of these might take the form of short-term “executive” courses targeted toward specific needs.

Campus Grimstad

All UiA Engineering and ICT programmes (in the Faculty of Engineering and Science), the Department of Working Life and Innovation (in the Faculty of Economics and Social Sciences), and parts of the Department of Health (in the Faculty of Health and Sport) are currently located in Grimstad. Campus Grimstad has been located there for many years, and linkages with private sector firms are well established. In addition, the Sørlandets Teknologisenter in Grimstad has become an established aspect of the research and innovation infrastructure in Agder. By 2010 there will be approximately 2,000 students, up from approximately 1,300 in 2008.

The focus in Grimstad on engineering and technology is a strength in that students, university staff, and companies located in the area share a common language and interests. The compact campus, adjacent to the technology park, provides proximity which enhances contacts and interaction between those in the university and those in industry.

Other research institutions

In addition to the University of Agder, other institutions are active in the local innovation system. Agder Research, 51 percent owned by the UiA, conducts research mainly on social science and social-political topics.³⁸ Agder Research is also active in several centres within the Faculty of Economics and Social Science. Because of its expertise, Agder Research generally plays a mediating role between the university and the region (Karlsen, 2007, p. 124). However, its expertise is mainly in the social and policy sciences, which limits the degree to which companies in the region see Agder Research as potentially beneficial for them.

Sørlandet Hospital Health Enterprise (SHHF), which has hospitals in Arendal, Flekkefjord, and Kristiansand, has a Unit for Research, Development, and Innovation, which is very active in medical research. Researchers at Arendal and Kristiansand are world-class and publish routinely in international refereed journals. UiA researchers in several faculties have been involved in research projects with hospital colleagues.³⁹ UiA also cooperates with SHHF through the

development of further education in an “education clinic”. This clinic is increasingly using various forms of art and cultural activities in patient-oriented activities as well as in enhancing cultural aspects within the organization of the hospital.⁴⁰ Finally, a recently-created Centre for Care Research may be able to address additional regional needs.

Weaknesses

Is UiA isolated from the community?

UiA presents an inconsistent image and agenda to others within the region. Some respondents suggested to the OECD study team that UiA is isolated from the community, and that its university status has resulted in even less connection than previously. The complaint that UiA closed a parking lot for visitors to the Kunnskapspark might seem minor but is perceived as very negative. UiA faculty members give the impression that UiA generally is passive, waiting to be valued and sought-after by industry for research.

The composition of the UiA Board reinforces the view that industry is unimportant. Appointed by the Norwegian Ministry of Education and Research, the University Board has no representatives from local industry. Currently, the four external members of the UiA Board are two consultants, a UNEP adviser, and a lawyer.⁴¹ Industry people who met with the OECD study team believe that local firms should be represented on the board.

Regional engagement is uneven

The OECD study team heard uneven reports of UiA’s regional engagement. The partnerships with Mechatronics are widely praised by industry representatives. However, engagement by the Mechatronics group and the Centre for Development Studies are exceptions rather than the norm. In music, local history, and teacher training, UiA students are active in Agder. However, in general, it is student activities, such as thesis research, that comprise UiA’s “cooperation” with industry and represent UiA’s engagement with the region; by contrast, active links with researchers and with administrators are relatively few; see Karlsen (2007). For example, the Centre for Entrepreneurship also could broaden its small but successful LAB model to actively seek out a larger number of entrepreneurs and potential entrepreneurs who are not connected at present to UiA.

Many respondents told the OECD study team that the university is seen as passive rather than actively involved in affairs in the Agder region. Karlsen (2007) reports that UiA “cooperation” within the region takes place primarily through Bachelor’s projects and Master’s theses, rather than activities that involve UiA researchers or staff centrally. Various respondents described the university to the OECD study team as lacking ambition and too broad academically rather than focused. Finally, it was reported that UiA researchers do not always deliver reports of research projects on time. Overall, these conditions suggest that regional engagement by UiA is quite variable and could be improved.

UiA web sites are not an accurate public face of the university

The English version of UiA’s web sites gives varying information about its faculties and departments; the same may well not be true of the Norwegian version. The web site of the Mechatronics research group in the Department of Engineering, for example, is a model web site for a university programme.⁴² It includes separate pages of News, Studies, Laboratories, Links, About Grimstad, and For Visitors in both Norwegian and English. Outside the Faculty of Engineering and Science, only the Centre for Development Studies has a fully informative web site.⁴³ The departments in the Faculties of Fine Arts, and Humanities and Education, by contrast,

provide very little information and have no links on the right side of the web page, despite the nicely standardized UiA format.

In addition, over a year after attaining university status, several UiA web sites continue in April 2009 to refer to the university as the University College. Public relations with both industry and the public sector should be managed more comprehensively and professionally. The expanded civic mission of twenty-first century universities demands that they understand and present to the outside all aspects of the university as well as the formal and informal communication of faculty members (Kantanen, 2005). Students, researchers and others outside Norway will depend on the English web sites, and these should parallel those in Norwegian.

A split campus

The fact that all engineering programmes and the Department of Working Life and Innovation are located in Grimstad, soon to be joined by parts of the parts of the Department of Health (of the Faculty of Health and Sport), was noted above as a strength, but it can also be seen as a weakness. The UiA is not large and to find its faculty and students divided among locations weakens the potential for interdisciplinary interaction. While some faculty members will be willing to drive between Kristiansand and Grimstad, and many administrators will be required to do so, it remains true that less interaction is likely to occur. The geographical division poses a risk, therefore, of too little collaboration between faculties in interdisciplinary research and teaching programmes, which are a hallmark of world-class universities today (Salmi, 2001).

At present, the two university campuses fail to communicate a unified vision and strategy of the university. The two campuses appear to have distinct cultures.⁴⁴ Indeed, whether it is an accurate perception or not, the reality is that UiA is seen by some in the Agder region as two institutions rather than one.

Opportunities

Networking with regional partners

NODE (Norwegian Offshore & Drilling Engineering) network is, in effect, a collaborative research institution in Agder. The network has undertaken various projects, such as Foresight, Mechatronics, and Environmental Footprint. In these, the OECD study team was told, UiA has been largely a reactive, rather than a proactive, participant. Industry in Agder looks to the UiA not merely for participation, but for leadership in these collaborations.

Networking and foresight opportunities also are present beyond specific technological projects. Opportunities exist as well in the public sphere, where UiA social science faculty members can provide leadership and, more generally, vision for economic development and possible futures.

Third stream income from teaching

Financial resources can be enhanced by tailoring educational programmes to meet the needs of firms in Agder as well as various arms of government. A suite of “executive education” programmes geared toward those needs would be welcome by several constituencies in the region. Industry representatives in Agder suggest that additional Master’s courses could be offered that meet the needs of local firms; examples cited include hydraulics and strength calculation.

The addition of short-term, non-degree courses is another opportunity and is a growing trend in universities worldwide. The short-term nature of the courses allows for entrepreneurial

response to the needs of local firms, government bodies, and other groups. Generally, many opportunities appear to exist to develop skill upgrading for public sector and firms alike (see Box 4.2.) Examples range across all faculties, from health to arts, from public management to foreign languages, and from engineering to education, as the University of Warwick learning model below suggests. Teaching such courses has advantages beyond third stream income alone. Faculty can experiment with new ideas, and receive feedback from new and experienced groups of students.

Box 4.2. Executive Education

Executive education is the term most frequently used for degree programmes (especially at the Masters level) and short courses intended for continuing professional development and training (Goddard and Chatterton, 1999). Alternative labels include continuing education and professional development. Such courses are a significant source of third stream income for universities. While executive MBA programmes offered by business schools are perhaps best known, many other academic units also are involved in executive education. Maes (2003) suggests that the incessant interaction of education and research and of university and business simultaneously benefits and strengthens a field of research. Teaching at the frontline of an emerging discipline gives rise to innovative combinations of learning and research in which the specific expertise of executive students as “reflective practitioners” is central. There is a growing market for such courses. Büchel and Antunes (2006, p. 401) suggest that “Companies are increasingly recognizing executive education as a crucial tool for developing their managers”.

Executive education courses for public sector leaders at the global, national, and local scales, taught by social scientists, are found at many universities. In the USA, examples include: Harvard University’s John F. Kennedy School of Government, the School of Public Policy at George Mason University, Stanford Law School, the School of Policy, Planning, and Development at the University of Southern California, the Goldman School of Public Policy at the University of California, Berkeley. Outside the USA, the Stockholm School of Economics (www.ifl.se/Bazment/60.aspx) offers opportunities in the public and health sector. The Helsinki School of Economics (www.hseee.com/) is active as well.

Executive education programmes are found not only at world-class universities. Smaller universities also have them. Examples include the University of Maryland-Baltimore County and its Erickson School of Aging, Management and Policy (http://erickson.umbc.edu/programmes/executive_education__senior_care_health_services.aspx) in the USA, which focuses on the health care sector. Syracuse University’s Maxwell School of Citizenship and Public Affairs has several executive education programmes that provide a Certificate of Advanced Study in Public Administration, in Leadership of International and Non-governmental Organisations, in Conflict Resolution, and in Health Services Management and Policy (www.maxwell.syr.edu/deans/programmes/a_exed.asp).

At Tufts University in Boston, the Fletcher School of International Affairs offers an array of executive and professional education programmes related to regions, terrorism and security, and international development issues (<http://fletcher.tufts.edu/academic/execed.shtml>). With 8,500 students, Tufts is about the same size as UiA. Many universities offer “customized programmes” for a single company (http://en.wikipedia.org/wiki/Executive_Education).

Business schools at small, regional universities also offer executive education programmes. For example, The University of North Carolina at Greensboro (UNCG) (www.uncg.edu/bae/ee/), as well as The University of North Carolina Chapel Hill and NC State) and Babson College.

Other programmes are very focused; the University of North Carolina Gillings School of Public Health offers courses in public health leadership (www.sph.unc.edu/nciph/executive_education_512_1052.html).

Take advantage of local industry

The unique industrial base of the Agder region, a centre of a world-class offshore drilling platforms industry, supported by a vibrant pool of supplier firms, as well as a best-practice mining and processing sector, provides opportunities for UiA to benefit from a regional research focus. Regional engagement is a real possibility in the region. The industrial base of Agder provides

opportunities akin to those of the Finnish region of Karelia and its forests. Departments and research groups at the University of Joensuu in Finland have identified points of regional engagement as well as of international excellence – as have the University of Warwick in the UK and North Carolina State University in the USA, profiled below – at the same time as creating opportunities for third stream income (Clark, 1998, 2004).

Innovative needs drive innovative solutions. A counterpart for Agder might be the Portland, Oregon area in the USA, where a confluence of regional tastes and an outdoor culture have led to new technologies in a number of consumer products (Cortright, 2002) and in “green” technologies (Allen and Potiowsky, 2008). Portland State University, recognized by the Carnegie Foundation for its community engagement, is part of the regional institutional base of the green building cluster.

Arts and culture

Agder Research, particularly the Creative Industries group, has worked on several topics related to culture and the arts. An example is VRI Agder Culture, part of the programme Tools for Regional Research, Development and Innovation (VRI), funded by the Research Council of Norway. It does not appear as if the Faculty of Fine Arts at UiA is taking the lead in setting the agenda for creative and cultural industries in Kristiansand, Agder, Norway or, more widely, in Europe. In particular, no UiA representative appears to be working with Cultiva, the local culture foundation. Instead, UiA faculty have criticized Cultiva’s theoretical base and its elitism (Lysgård and Tveiten, 2005). Generally, there appear to be several research institutions in Agder working on arts and culture, but with relatively little interaction among them.

The arts and cultural industries, and what is known as the experience economy, present a wide set of opportunities for universities. They combine training in performance and craft as well as connection with viable livelihoods for artistic entrepreneurs. In fact, Cultiva’s asset base represents an opportunity for UiA faculty members and students to help influence or modify the agenda. Active participation with Cultiva could reap advantages for both the latter and for UiA faculty and students. People from UiA are not among those involved in Cultiva’s Foresight project for the entertainment industry in Southern Norway.⁴⁵

Threats

University inertia

A narrow, traditional international focus of some UiA faculty members could thwart efforts to promote regional engagement. Inertia and complacency suggest a lack of preparedness for inevitable changes in the future. The expectations of universities worldwide are changing, as discussed earlier in this chapter. Some UiA faculty appear to be unaware of these changing expectations and how they might be responded to by UiA and the wider local innovation system of Agder. UiA administrators should continue to work to alter the culture of the university, pointing it in the direction of regional engagement.

Universities and their faculty members cannot be concerned only with international academic and research communities. Universities also are “pipelines” or “conduits” through which research of an international and national nature is transferred to the local region, thereby enhancing the capacity of the region’s institutions for innovation and entrepreneurship. Active participation and engagement within the region are needed if faculty members stress their critical role. If regional actors in the university and in industry share knowledge, they can become innovative together, incorporating a critical role as they learn more about one another (Karlsen, 2005).

Failure to respond to new educational needs

A demographic shift is taking place in higher education in western countries, including Norway. The student population is shifting toward students enrolled in short-term continuing education activities. In addition, the demographic shift affects public sector programmes and presents challenges to forge new policies in the new context, to which university expertise can contribute.

While the “study programmes”, offered by the UiA Faculty of Health and Sport within and outside of the Arendal and Kristiansand communities, give the UiA faculty “exciting challenges in developing part-time and decentralised programmes”,⁴⁶ a broader conception of the potential demand for university services is needed. Several examples are suggested in this chapter as third stream income, and in the example of the University of Warwick

Lack of understanding and commitment to the various levels and types of regional engagement

The university and its facilities, including museums, galleries and archives, are the first order of engagement and part of simply “being there” in the region. The second order is formal contracts and enterprises. The third order relates to commitments between the university and its members (staff) (Watson, 2007). It is possible that the UiA sees only the second – that is, formal contracts – as regional engagement, along with student projects and theses. Much more is possible within Agder, including informal as well as formal relationships between university staff and others in the region.

Recommendations

Develop a coherent university vision and strategy

The UiA should develop a coherent vision and strategy. This is a difficult challenge, as universities have within them several sub-cultures that may interact very little (Sporn, 1996). In support of this, the university should strengthen management resources in strategic management and communication. In this way, the university’s broad portfolio of disciplines and programmes can be communicated in a more consistent manner both to people within the university and to the many groups outside the university.

Senior university administrators should participate in leading international strategic leadership (or strategic management) courses. Harvard University Graduate School of Education, for example, offers a number of seminars and institutes for university administrators, including university presidents.⁴⁷ The challenges of running a university today are beyond what any faculty member is normally trained to do, and beyond what he or she can gain through experience alone. In particular, UiA administrators would be able to learn how to stimulate the motivation of academic researchers at UiA, who generally participate less than students in regional activities (Karlsen, 2007).

Develop an entrepreneurial culture of education, research, and engagement

The UiA should develop an institutional culture oriented toward a “third stream” of revenue and engagement with its region. Opportunities emerge from the demographic shift toward short-term courses that meet new and emerging demands. In addition to partnerships with firms in the Agder region, opportunities exist for research and teaching niches that help the public sector, including tourism, culture, and health care. All were mentioned to the OECD study team. Some short courses and research projects can be developed into specializations of international prominence. Activities such as these will strengthen UiA’s growing engagement with its region.

Although UiA has a suite of courses in Continuing Professional Development, it is remarkable that many of the respondents who spoke with the OECD study team suggested specific courses. Firms with needs for management skills include both large multinationals and smaller start-up firms, whose needs are being met at present mainly by the local branch of the Norwegian School of Management. Niche programmes, such as change management, also were recommended by local businesspeople in Agder. Clearly, the UiA supply is not meeting the regional demand for these courses. The courses could be publicised more widely, targeted toward a larger number of firms, and new groups could be sought out.

Box 2 provides examples of executive education programmes – many outside the typical business fields – at universities (large and small) around the world. The unvoiced needs on the part of firms in Agder for such courses and programmes should be identified, as suggested in chapter 3.

The benefit of identifying new foci for research and education extends far beyond any financial gain. Researchers will tap into new ideas, which will flow into their teaching and research. Students will benefit from these ideas and their practical applications within the region. Companies and institutions in Agder will benefit from the expertise and effort of UiA researchers.

Undertake a regional foresight exercise

The UiA should look ahead and undertake – and take the lead in – broad regional foresight exercises. Experience in Finland shows that broad-based future-oriented innovation sessions are important collective learning processes that promote regional visionary capability (Harmaakorpi and Uotila, 2006; Könnölä et al., 2007). Such a broadly-focused effort would build on the regional technology alliances represented by Teknova and by NODE's industry-specific Foresight project. Such an exercise would also promote governance processes to both stimulate regional innovation and strengthen the regional economic system against global competition (Koschatsky, 2005).

Through such future-looking activities, the UiA would secure its position as the central place for ideas and knowledge within the Agder region. A prominent activity would include development of the cultural and tourism sector. As noted above, no experts from UiA appear to be working with Cultiva. Opportunities include all areas in which UiA has a major presence, whether in graduate degree programmes or large undergraduate programmes.

The university itself should undergo a broad-based foresight exercise, addressing the question: Where should the UiA be in ten years, and in twenty years? This would update strategic thinking at UiA beyond the similar efforts that led to the institution's university status in 2007. That inward-focused exercise could address such questions as opportunities, resources, and incentives for greater regional engagement. An inventory of current activities would highlight some faculty members who would have experience in engagement and advice for others on what works best and what does not work.

Increase dialogue with the region

The UiA should continue to develop a regional focus in university activities and, simultaneously, increase dialogue with the private and public sectors. Universities are central institutions in regional decision-making and university leaders must take an active role in regional governance, not merely a detached, critical role. This is particularly true of small regions such as Agder, as Benneworth and Hospers (2006) show, where the regional university has a relatively larger role.

Not only private sector firms in the region but also public sector organisations will benefit from the expertise within UiA. This will not happen overnight. A “cogenerative knowledge creation process” in which university researchers and students, on the one hand, and public and private sector organisations, on the other, learn each other’s capabilities, needs and priorities will take time to evolve (Karlsen, 2007; Wright, 2008).

Learning models

University of Warwick, UK

Description of the approach

The University of Warwick is a notable example of a university in which efforts throughout the institution have generated third stream income. At its founding in 1965, Warwick developed “an earned income policy” that prompted the creation and growth of centres and other units at the university that, more readily than traditional academic departments, reach across old university boundaries to link up with outside organisations and groups. These interdisciplinary project-oriented research centres have grown up alongside departments as a second major way to group academic work to international prominence.

Rationale and relevance for Agder

Warwick is a relatively new UK university, founded in 1965. Therefore it illustrates that a university’s culture – the Warwick way – can be created and sustained. Warwick has benefitted from a few professors who had a more global view of the possibilities for a university. As at UiA, the engineering is most strongly connected with industry. However, all units (faculties, departments, research centres) actively work at entrepreneurial and regional activities, through the work of not only students and their projects but also research faculty.

Warwick presents a coherent message of its vision. The university’s mission and its goals for 2015 are clear, concise and straightforward – and ambitious. The university’s web sites and newsletters are very informative. Warwick sees its facilities not only as internal assets but as “public services” made accessible to people within the region. The UiA could find inspiration from the Warwick case on strategic vision, interaction with the community, external communication and provision of public services.

Reasons for success

Foremost in its contribution to earned income has been the Warwick Manufacturing Group (WMG), set up in 1980 and directed ever since by Professor (now Lord) Kumar Bhattacharyya of the university’s engineering department. His research group is committed to research and development (R&D) in close collaboration with industrial firms. Over 300 firms have worked with WMG, including both multinational corporations and many SMEs. Overseas locations for the group’s work – satellite operations – have been developed in Hong Kong, Bangkok, Kuala Lumpur, Calcutta, Nanjing, and Johannesburg; at these sites, local staff and training courses are given by Warwick-based staff on three-to-four-week visits.

The point is that WMG grew from nothing to world-class stature within a dozen years. Its large-firm clients are complemented by responsibility for the SMEs in WMG’s home region. WMG recently completed building an International Digital Lab, which houses a range of digitally-based research projects alongside delivery of related courses and services to local small businesses. One can imagine similar activities growing from, for example, the Mechatronics group in UiA’s Department of Engineering.

The business school at Warwick similarly reaches out with a wide range of executive training courses. The Conference centres where the courses are held are themselves a major source of Warwick's third stream operations. All three of the university's conference centres are known as "management training centres" for WMG and the business school. Hosting conferences and visitors for all departments, and offering desirable office and training facilities for a few outside firms, the centres win national awards year after year as premier conference centres. Top-of-the-line services are offered and prices are set to cover costs plus a contribution to the general pot of earned income. Warwick's conference complex surpasses the facilities of any American university (Clark, 1998).

It is easier for engineering and business to identify clients, but all faculties can do so. The University of Warwick faces outward locally through its arts complex located at the heart of the campus, with a set of theatres, halls, and galleries for events in the performing arts (drama, music, dance, film, and visual arts) that draw over 250,000 attendance a year (Goddard and Chatterton, 1999). The arts also have research centres, including one in general humanities research as well as more targeted ones in cultural studies, social history, and the Renaissance. In theatre studies, "cultural administrators" are trained in advanced programmes in a Warwick's "research-led" departments. Clark (1998, p. 28) reports that by 1995, with self-funded courses, the theatre studies department was basically self-supporting.

Warwick's Faculty of the Arts, for example, has seven research centres: Caribbean Studies, Cultural Policy Studies, Global History and Culture Centre, History of Medicine, Study of the Renaissance, Translation and Comparative Cultural Studies, and the Humanities Research Centre. All departments and centres are entrepreneurial and have identified markets willing to pay for the educational and research services that departments can provide. Departments at Warwick, virtually without exception, have developed research centres to further their own subjects, necessitating the raising of funds from second- and third-stream sources. Other departments and schools also operate research centres, including centres on legal research, health services, philosophy and literature, macroeconomic modeling, comparative labor studies, ethnic relations, democratization, and women and gender.

Communication is taken seriously at Warwick. Its profile and mission are concise and communicated to all on the university's web site, as is its Vision 2015. The university also produces and circulates twice yearly a 4-page newsletter to residents and other stakeholders in its region. *CommUnity* provides news items on what is happening at the University, and features on how it is interacting with the local community. Among Warwick's "public services" are the Library, the Centre for Lifelong Learning, the Language Centre, Warwick Arts Centre, Music Centre, and the Sports Facilities.

Finally, with WMG and the business school leading the way, foreign students, defined as non-European students as well as non-UK citizens, together constitute a major outreach component. Short-term coursework for these students is a major source of earned income. Of course, the university has a science park; the Warwick Science Park (WSP) opened in 1984, with Innovation Centres in three other locations. For its third stream income, WSP also consults others on science park creation and development, technology transfer, and the creation and development of small technology based businesses.

Obstacles faced and response taken

The development of third streams of income seems to need a continuing motivation. However, the benefits of money motivate departments and individual faculty members, since funds are used primarily to support graduate degree programmes and Ph.D. students.

Considerations for adoption of this model in Agder

UiA should take seriously the need for transparency. At Warwick, a vast amount of information is made available on the Internet. Few units at UiA have fully informative web sites in English as well as Norwegian. The Mechatronics research group in the Department of Engineering is a notable exception and should be a model for other units in the University of Agder.

It must be recalled that the University of Warwick did not exist 50 years ago. Although its entrepreneurial ethos did not emerge overnight, it evolved steadily in a consistent direction. The university's programmes and those of individual faculty members benefit from the funds earned, as graduate programmes grow through support of Ph.D students.

References and contact information

Clark (1998, 2004); Palfreyman (1989)

About WMG: <http://www2.warwick.ac.uk/fac/sci/wmg/about/>

CommUnity Newsletter: <http://www2.warwick.ac.uk/about/community/newsletter>

EU (2008) GARNET Network of Excellence: <http://www.garnet-eu.org/index.php?id=153>

University of Warwick Science Park / About the Science Park:

http://www.warwicksciencepark.co.uk/information/about_science_park.html

University Profile and Mission: <http://www2.warwick.ac.uk/about/profile/>

Vision 2015: A Strategy for Warwick: <http://www2.warwick.ac.uk/about/vision2015/>

Warwick Arts Centre: <http://www.warwickartscentre.co.uk/home>

Warwick Conferences / Conference Park:

<http://www2.warwick.ac.uk/conferences/conferencepark/>

North Carolina State University, USA

Description of the approach

North Carolina State University (NC State) is an American land-grant university, established in 1887 as the North Carolina College of Agriculture and Mechanic Arts. NC State was among a relatively small number of US universities to apply for classification in community engagement when the Carnegie Foundation for Higher Education invited universities in the USA in 2006 to submit applications for community engagement. NC State also has a continuing effort to compare (or benchmark) itself against a set of peer institutions (Clark, 2004).

NC State has a history of both research partnerships (regional as well as international), industry education and training partnerships, and formal partnerships with economic development organisations (Tornatzky et al., 2002). Typical technology-related programmes exist, of course, such as technology transfer, industrial extension/technical assistance for large and small firms, and entrepreneurial development. The industrial research partnerships have been given new form in the Centennial Campus, which stresses close interaction with industry by granting industrial tenants the same campus privileges (for example, to the library, gym and other facilities) as faculty and students. Industrial office and labs are interspersed with university classrooms in four R&D “neighborhoods” on the campus, so that industrial researchers can continue their education, formally and informally. After the university announced the creation of a Centennial Biomedical Campus in 2003, as an extension of the original Centennial Campus, several major firms signing up for five-year commitments to collaborative research (Clark, 2004, p. 157).

Rationale and relevance of the approach to Agder

The regional mission of NC State is similar to UiA's regional orientation in Agder about which the OECD team heard during our visit. Like the University of Warwick, However, all units at NC State (faculties, departments, research centres) actively work at entrepreneurial and regional activities, through the work of not only students and their projects but also research faculty.

Little on the UiA web site addresses regional engagement, however, with two exceptions: a brief statement: "In cooperation with schools, the health sector, cultural organisations and the commercial sector, the university college will contribute to the development of Agder as an internationally orientated region" (www.uia.no/en/portaler/om_universitetet/international/internasjonal_strategi_1) and the list of regional partners under Regional cooperation (www.uia.no/en/portaler/forskning/naering_og_samfunn). Karlsen (2007) finds that UiA engagement and cooperation involves students doing projects and research (theses), but seldom are faculty members (researchers) involved. In contrast, NC State has compiled an impressive document, *The Engaged University*. The UiA could find inspiration from the NC State University to enhance its engagement and availability to collaborate with other local actors.

Results of the approach

Of the 282 higher education institutions in the USA classified as Doctoral Research Universities or Research Universities, only 89 universities submitted full documentation in response to the Carnegie Foundation's invitation for Community Engagement classification. A year later, 76 colleges and universities were recognized in the first classification (see Box 4.1). Zuiches (2008) describes the university-wide effort by the NC State Carnegie Community Engagement Task Force that went into the application. The final documentation is posted on the Internet.

Although much of what is now called community engagement at NC State is rooted in agricultural engineering extension activities, community engagement also is seen in other ways. "The resources of the University, including cultural and athletic offerings as well as library and technology services, are also widely available to various communities. Almost 200,000 citizens and event participants visited the McKimmon Center for Extension and Continuing Education in 2005-2006 alone" (Documentation for Elective Classification in Community Engagement).

Reasons for success

The Task Force identified several engagement activities outside of agriculture and engineering. One task-force member led Science House, which provides experiential learning for math and science high-school teachers across the state; another represented NC State's non-credit and distance-education programmes. A humanities extension programme had taken the humanities to rural areas throughout the state. One member connected the task force to private sector and industry partners, another to natural-resource partners. The Colleges of Humanities and Social Sciences, Education, and Physical and Mathematical Sciences each had faculty members who were leading such programmes. By including those faculty members on the panel, NC State was able to identify and draw attention to efforts at community engagement in these colleges.

In other assessments of its regional impact, NC State sees its activities in a broader light than many universities. Its task force that benchmarked activities and events designed to create an impact for economic and/or community development lists eight sets of activities that have "knowledge effects" – not only from technology transfer and commercialization, and knowledge creation and transfer, which are conventional research-based outcomes, but also from classes and

programmes, public events and programmes, experiential and service learning, technical and expert assistance, and clinical and testing services (Helmlinger Ratcliff et al., 2008). A large number of leadership and professional development courses are offered.

As at all universities that understand regional engagement, NC State interprets “public events and understanding” broadly – to include all resources designed for the public. This includes “managed learning environments” (e.g., museums, libraries, gardens, galleries, exhibits); expositions, demonstrations, fairs, and performances; and educational materials and products (e.g., pamphlets, web sites, educational broadcasting, and software). Most of the public events and experiences are short-term and learner-directed, such as the Institute for Emerging Issues and the Millennium Lecture Series (Helmlinger Ratcliff et al., 2008). Thus, activities in the arts and humanities are fully included alongside those in science and engineering.

The obstacles faced and response taken

As Zuiches (2008) points out, an effort like this is also a learning experience, as data on specific activities are frequently difficult to generate and to verify. However, by seeking out and identifying faculty members, who represented the various faculties and units of the university, it was possible to identify who was engaged with the region, both formally and informally. It is important to note that this means that many informal activities by faculty and researchers were going on, in addition to formal projects and those involving students. Colleagues are better able than administrators to learn about informal activities of their peers.

Considerations for adoption of this model in Agder

An inventory of UiA activities – formal and informal – is a first step, as recommended by Goddard and Chatterton (1999). NC State’s broad view of activities with “knowledge effects” and regional engagement illustrates the possibilities for UiA (Helmlinger Ratcliff et al., 2008). Karlsen (2007, chapter 8) has compiled a partial inventory of such activities for the UiA (actually for Agder University College, as it was when he did his research). The potential engagement opportunities in Agder extend far beyond the needs of local firms, but also extend into the community and the public sector.

Partnerships within the Agder region would have many potential benefits. The multinational firms present an international context relevant beyond international business studies. Dialogue between corporate staff and university staff will open new opportunities for collaboration. Finally, joint knowledge construction can result from sustained dialogue as understanding and trust are built (Wright, 2008).

Sources, contact details, and websites for further information

Clark (2004); Helmlinger Ratcliff et al. (2008); Tornatzky et al. (2002, pp. 43-53)

NC State Benchmark Performance Measures (Historic)

<http://www2.acs.ncsu.edu/UPA/peers/current/benchmarks/index.htm>

Comparing NC State to Peer Institutions (Current):

<http://www2.acs.ncsu.edu/UPA/peers/index.htm>

Carnegie Foundation for the Advancement of Teaching:

<http://www.ncsu.edu/extension/about/carnegie.php>

Documentation for Elective Classification In Community Engagement:

http://www.ncsu.edu/extension/publications/documents/10506Carnegie_ExecSummary_00.doc

Centennial Campus: <http://ncsu.edu/about-nc-state/centennial-campus/index.php>

The Engaged University: Extension, Engagement and Economic Development at NC State

University: <http://www.ncsu.edu/extension/documents/engageduniversity.pdf>

Leadership & Professional Development [courses and training]:
<http://www.ncsu.edu/extension/leadership-development/>

University of Twente, The Netherlands

Description

The University of Twente (UT) is a relatively young university, opened in 1964, in a peripheral region of The Netherlands. From humble beginnings, Twente has become both an entrepreneurial university within the Dutch system and one that is simultaneously a regional, a national and an international university. In 2008, UT presents a coherent identity: “The University of Twente is an enterprising research university with special focus on technological developments in the knowledge society” (University of Twente Mission Statement). Equally important is UT’s ability to build research strength in niches in which both international excellence and regional relevance can be obtained.

Rationale and relevance of the approach to Agder

Agder, like Twente, is also a small and peripheral European university – a “single player university in a peripheral region” (Boucher et al., 2003). Initially a technological university, Twente has made major efforts to be a balanced university by building up its social sciences. With five faculties, like UiA, UT has made a deliberate attempt to make sure that, as an entrepreneurial university, it does not become simply a university of entrepreneurs. It has worked to ensure the university as a collective body, a place of unifying values (Clark, 2004, p. 40). In this sense, UT is responding to far more than neoliberal pressures but has developed a sustainable and continually emerging role as an entrepreneurial, yet internationally highly respected university.

Results of the approach

A professor of mechanical engineering, Harry Van den Kroonenberg, Rector for several years between 1979 and 1988, communicated the idea, at every level inside the institution, that the University of Twente should transform itself into ‘the entrepreneurial university’. Twente’s entrepreneurial attitude shows itself in several ways.

- a significant base of third stream income, as much as one-third of the total budget;
- a budgetary system for faculties, departments and research centres that gives them complete freedom and responsibility about how to spend the sum of money;
- UT’s hundreds of spin-off companies are well documented. Less commonly acknowledged is the fact that not only engineering departments had contact with spin-off companies during their start-up phase. The faculty of philosophy and social sciences scored equal to the business school in its contacts with startups;
- a Business & Science Park, home to some 195 companies and 4000 jobs and an effective business incubator, BTC-Twente Ltd, whose main shareholder is the University of Twente itself;
- consciousness that knowledge is generated by people and that establishing personal contacts between people from universities, industry and commerce is a precarious process which must be supported by the building up and maintaining of networks of personal relations, through the creation of programmes and schemes designed for this specific purpose (Lazzeretti and Tavoletti, 2005).

- Participation in regional governance networks, which identifies additional opportunities for ways in which the university can provide teaching and research to the region's SMEs.

One of the innovative decisions was a global change in curricular structure. The university introduced a major-minor requirement – unique in Holland – for all students: after much faculty effort to work out details, the plan resulted in forty majors and thirty minors. The new scheme was intended to work against a philosophy too much oriented toward specialization. The new curriculum has operated to help bridge the university's two main internal worlds of engineering and social science – or, described at UT, applied science and applied social science (Clark, 2004).

Reasons for success/failure of the approach

UT has pursued overall coherence in its teaching and research by maintaining that it is a university with two broad groupings of fields: applied science and applied social science. The university offered “training courses in both technical and social disciplines”. It “distinguishes itself by its combination of technological and social sciences, in both its education and research programmes”. It recently added a third focus: health sciences, which had grown out of specializations developed under the major-minor scheme which opened the possibility of developing the broader area of health sciences and biomedical technology. (Clark, 2004, p. 45)

UT uses its science park (Kennispark) as a new urban “knowledge space” within regional plans (Benneworth and Hospers, 2006). Deeper webs of relationships between USOs, their spin-offs and other firms may indirectly improve the innovation environment and institutional capacity in those places. The Twente Regional Technology Circle is one such example, led by several spin-out entrepreneurs and has for 12 years provided a forum for local SMEs to build purposive relationships and collaborations (Benneworth and Charles, 2005).

UT presents a consistent message. In addition to its mission statement, cited above, the self-description for prospective graduate students is research-centred. “The University of Twente (UT) is an innovative research university that is committed to academic excellence. Focusing on technological, social and behavioural sciences, the UT invites students and researchers to venture beyond the existing boundaries of disciplines and connect with other fields of study” (<http://graduate.utwente.nl/>).

The obstacles faced and response taken

The region in which the University of Twente is located is both an old textile-based economy and one that is “institutionally thin”. The contribution of the university in such a region is to building large-scale excellence in research, which will attract new external partners, and to be an additional body/institution in governance networks, thereby increasing network connectivities (Benneworth and Hospers, 2006).

The local industrial base, specialized in textiles, had no international companies with which to build links. Therefore, UT built its own industrial base of high-tech start-up firms and now serves the needs of those firms through its Research and knowledge centres and Research schools.

Considerations for adoption of this model in Agder

The University of Twente has taken its origins in a poor region of The Netherlands to craft an international academic reputation with a large regional impact. Therefore UT represents the balance desired by UiA to have both.

UT has built a local innovation system based on small firms that has become attractive to large companies. UiA's opportunities might be at first with Agder's prominent multinational firms, and could extend from there to embrace SMEs. Yet opportunities for impact are present in noncommercial fields, such as education, as illustrated by Twente's success in developing world-class programmes in education and social sciences.

Contact details and website for further information

Clark (1998, 2004); Benneworth and Hospers (2006, 2007); Lazzeretti and Tavoletti (2005)
University of Twente Mission Statement:

http://www.utwente.nl/corporate/en/informatie/mission_statement.doc/

University of Twente Research centres: <http://www.utwente.nl/en/matrix/research/bsmpae-interfacultair.doc/>

UT Research Schools: <http://www.utwente.nl/en/research/onderzoeksscholen.doc/>

Conclusions

Learning models such as Warwick, NC State, and Twente provide guidance and examples, not a recipe or formula. Clark (2004, p. 183) insists that all universities "must carve out their own solutions, in combinations of the traditional and the new ... so they can develop capacities to adapt rapidly to change, and thereby to compete". The learning models are intended to illustrate that regional engagement and an entrepreneurial outlook do not conflict with international eminence. All three universities highlighted here have research prominence in several fields. Moreover, they continue to develop new specializations as opportunities arise. The University of Agder, like the three models described above, can build from its base of strong research programmes to become a regional, national, and international university.

With its strong regional identity and proactive local authorities, Agder is in a more favorable position than Trøndelag, where Goddard et al. (2007) describe the regional links and region building as weak. The risk remains, however, that "the great advantages which Norway enjoys as a result of oil and gas wealth have masked the need for reforms" (Goddard et al. 2007, p. 96). However, the fact that this OECD LEED review is taking place is a signal that Agder region and its university are aware of the concept of a regional innovation system and of the need for change.

The UiA is a critical link in the Agder *regional human capital system* (Goddard et al., 2007, p. 160). Universities everywhere face new challenges to deal with the combination of new demands for knowledge and a changed demographic (Salmi, 2008, pp. 109-110): "[T]he primary clientele of universities will no longer be young high school graduates. Universities must now organize themselves to accommodate the learning and training needs of a very diverse clientele: working students, mature students, stay-at-home students, traveling students, part-time students, day students, night students, weekend students, etc."

The Agder region has the opportunity to move from an "ordinary" region to an innovative region. This will require, Benneworth (2007) suggests, several changes. UiA will need to contribute actively in the region's capacity for innovation. It will need to seek out and listen to the needs of businesses – large and small. It will see its role to educate not only the typical young students, but also those in the workforce at firms and in public service and policy occupations. The university's internal continual process of learning and development should interface actively with regional needs.

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CHAPTER 5

INSTITUTIONS AND GOVERNANCE

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Introduction

The purpose of this chapter is to assess the institutions (organisations founded and united for a specific purpose) and governance (systems and practices to set and implement priorities, agendas and policies) of the regional innovation system of the Agder region in Norway. The chapter is organized into four parts as follows: i) general policy issues and good practices, ii) strengths, weaknesses, opportunities, and threats in the Agder region, iii) recommendations for policy development in the Agder region and iv) learning model programmes from regions in OECD member countries outside Norway which will assist to illustrate how to address the recommendations.

Policy issues

Institutions are structures and mechanisms of social order and cooperation governing the behaviour of a set of individuals. Institutions are at once persistent, resistant to change, but capable of changing in evolutionary time (Doloreux & Parto 2004). Governance concerns the systems and practices that governments use to set priorities and agendas, implement policies and obtain knowledge about their impacts and effectiveness. Governance concerns the ways in which the policy cycle, consisting of agenda setting and prioritization, implementation, evaluation and learning, is managed and influenced (OECD 2005). Innovation system governance can be defined as the collective decisions taken by both public and private actors that affect innovation in their localities (Simmie *et al.* 2004).

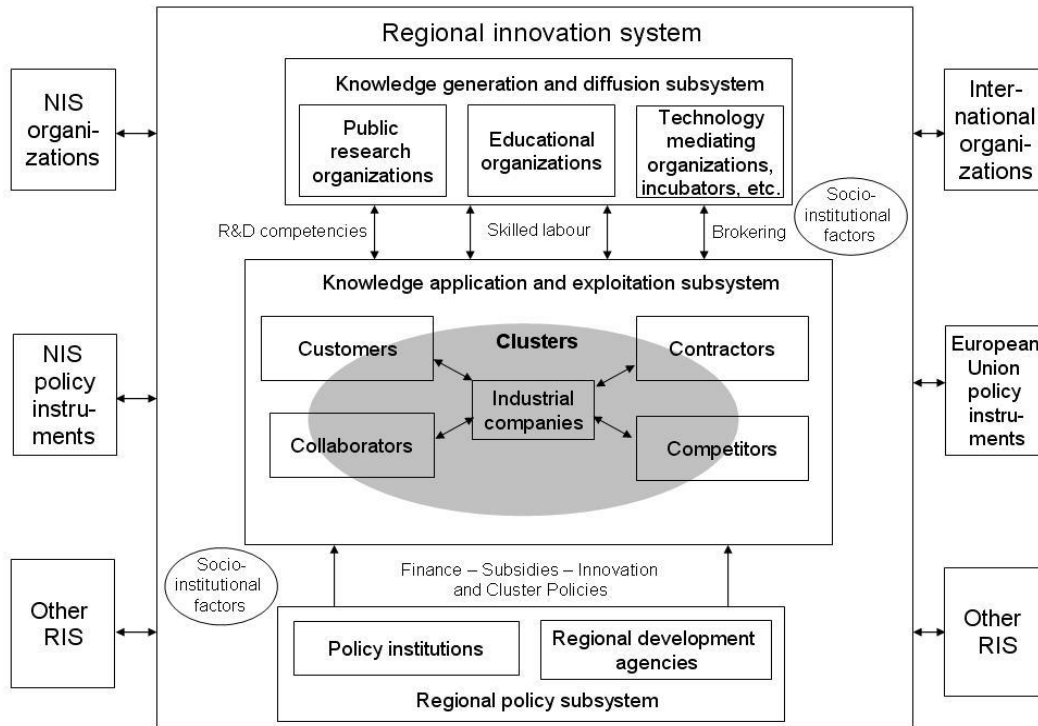
Cooke (2004) defines a regional innovation system: “A regional innovation system consists of interacting knowledge generation and exploitation of sub-systems linked to global, national, and other regional systems for commercialising new knowledge.” Which are, then, the actors in a regional innovation system? Cooke *et al.* (2007) present the main structure of a regional innovation system (see also Tödting & Trippel 2005). According to them, a regional innovation system consists of two subsystems embedded in a common regional socioeconomic and cultural setting. The knowledge application and exploitation subsystem comprises of the companies, their clients, suppliers, competitors, and industrial co-operation partners. The knowledge generation and diffusion subsystem consists of various institutions that are engaged in the production and diffusion of knowledge and skills (public research organisations, technology mediating organisations, and educational institutions).

Cooke (1998) describes three different “ideal types” of governance of regional innovation systems:

- Grassroot model, where innovation is essentially a diffuse and market driven system with little outside coordination

- Network model, where multi-level networks are established seeking agreements between actors such as e.g. firms, educational establishments and different layers of government
- Dirigiste model, where innovation is initiated at least partially from outside, e.g. actions of central government.

Figure 5.1. Diagrammatic representation of a regional innovation system



(NIS – National Innovation system)

Source : Cooke *et al.* 2007

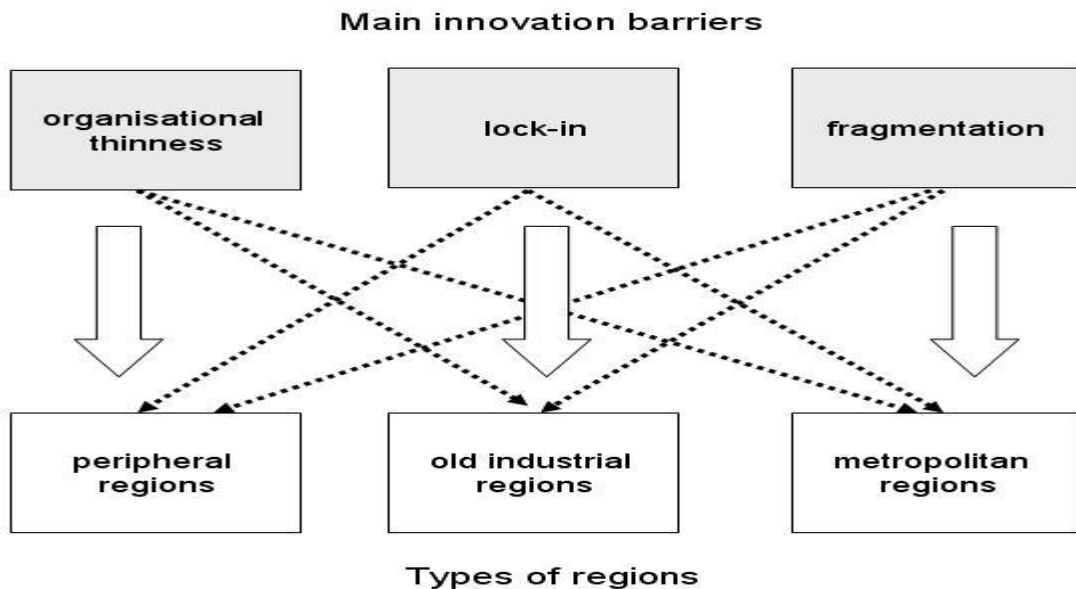
Simmie *et al.* (2004) have studied the three “ideal types” of local innovation system governance in three innovative European city regions: Oxfordshire, representing a mainly grassroots model; Stuttgart, representing a mostly networked model; and Toulouse, representing a more dirigiste example. They claim that Stuttgart with a long-standing competence in the governance of the local innovation system and Toulouse with great benefits from central decisions taken in Paris and the ability to create an image of a centre of high-tech activities appear to have been relatively successful in adapting to opportunities and threats. Oxfordshire system has been characterized by the absence of local governance and strategic thinking. The Oxfordshire region with particular strengths in high-tech and knowledge intensive services is, according to Simmie *et al.* (ibid.), relying too much on one group of specialisation rather than several as in the case of Stuttgart and Toulouse. They conclude that the key to the success of local innovation systems is their adaptive capacity: the more successful regions are able to seize external opportunities and deal with external shocks. Moreover, they state that widely networked innovation systems grow faster than market oriented grassroot systems. Asheim & Isaksen (2002) state that in reality, the ideal type regional innovation systems are rather uncommon – at least in the case of Norway.

Cooke (2004) defines two different types of regional innovation systems: IRIS (Institutional Regional Innovation System) and ERIS (Entrepreneurial Regional Innovation System). IRIS, more familiar in Europe, is research and development driven and technology-focused whereas

ERIS, more familiar in the USA, is more venture capital driven and market-focused. The logical remedy would be to increase the market-focused elements of the ERIS in Europe.

What are the typical deficiencies in the governance of regional/local innovation systems? Tödttling & Trippel (2005) state that there are three main deficiencies in regional innovation systems. Peripheral regions may often face “*organisational thinness*”: important RIS prerequisites are weakly developed, there is a lack of dynamic clusters, often the critical mass for a dynamic cluster is not reached. Old industrial regions often face a “*lock-in*”: i.e. too strong clustering as the regions are overspecialized in mature industries experiencing decline, resulting in a loss of regional competitive advantage and innovation capacity. Metropolitan regions, regarded as centres of innovation, often face the problem of “*fragmentation*”: a lack of networks and interactive learning representing an innovation barrier, resulting in the development of new technologies and the formation of new firms below expectations (Tödttling & Trippel 2005). The following figure illustrates the various deficiencies in regional innovation systems.

Figure 5.2. RIS deficiencies and types of problem regions



Source: Tödttling & Trippel, 2005

Tödttling & Trippel (ibid.) suggest that there might be predominant innovation problems in each of the types of regions described above, which require more attention than others. They emphasize, however, that regions in reality face a mix of these RIS deficiencies, and conclude that policy makers in each region should possess a detailed knowledge about the RIS specificities and the factors undermining its dynamics in their region, and they warn about the pitfalls of an innovation policy inspired in “ideal type” innovation systems.

Challenges and opportunities

The regional governance system in the Agder region includes network structures, institutions, partnerships, development organisations, funds, projects, permanent and temporary organisations which contribute to regional development processes in Agder. The local diagnostic report in chapter 2 provides a description of the Agder innovation system and its key actors. Considering both the context for entrepreneurship and innovation and the policy actions in place, the following analysis gives a more detailed view on the strengths, weaknesses, opportunities and threats related to institutions and governance in the Agder region.

Before delving deeper into the analysis of the regional innovation and governance system in the Agder region, it is important to note that Agder is not an isolated region from governance point of view but partly dominated by institutions which are in general integrated in the political and administrative context of the national innovation system in Norway - even if they are in some cases in a legal and/or operational sense autonomous from the national level. The structure is typical of the IRIS type of regional innovation systems (Heidenreich 2004).

Strengths

An interesting combination of high technology, traditional industries and emerging branches

Agder is a relatively wealthy region with entrepreneurial traditions and with an interesting combination of high technology industries such as e.g. oil and gas industry, traditional industries such as e.g. the process industry, and emerging branches such as e.g. culture-related industries. The region also includes University of Agder with a new status. The existing companies, university, and other institutions in the Agder region provide a proper base and point of departure to further develop the innovation system and to develop the Agder region with new initiatives.

From the viewpoint of regional governance, the combination of high technology and traditional industries provides the region with several alternatives to develop the industries experiencing different development phases. The industry structure increases the ability to resist to conjunctural crises.

A wide range of services and funding available for innovation and entrepreneurship

The regional innovation system in the Agder region consists of the knowledge exploration sub-system with education and research institutions as well as e.g. technology centres and incubators, the knowledge application and exploitation sub-system of firms in the main industries or clusters in the region, and by supporting institutions such as e.g. policy institutions and regional development agencies. The most notable actors and networks include e.g. intra and intermunicipal institutions such as e.g. Agderrådet, University of Agder, competence development funds, cluster and network initiatives such as e.g. Node and Eyde, regional and national funding agencies, and industry associations. The regional innovation system in the Agder region with all the institutions involved provides the people and organisations seeking for assistance and/or funding with a wide range of services and funding instruments, ranging from business idea evaluation and incubator services to assistance in penetrating the international markets and venture capital funding. The Agder institutions include the regional units of national institutions such as e.g. RCN, Innovation Norway, SIVA, but the majority of the institutions fall into local and regional category. The system, having an important influence from the national actors but also including local and regional institutions, has the capacity to find expertise and instruments to speed up the innovation promotion and entrepreneurship in the Agder region.

A tradition of co-operation, with promising private-public partnerships

The Agder region has a long tradition of public-private collaboration between leaders in industry, industry associations, and politics. Kristiansand Trade Association was established in 1848. The regional collaboration picked up momentum in the 1990s with the focus shifting from the city to the region. A long range of institutions related to the regional development of Agder were established, including e.g. the new regional funds financed by the sales of the hydro electrical energy companies owned by the municipalities. One of the testimonies of successful initiatives was the "Common Goals of Agder" project in the 1990s, headed by professor Victor D. Normann, an economics professor from the Norwegian School of Economics and Business Administration in Bergen, born in East-Agder and working at Agder University College and Agder Research in 1993-1998. The final document (14 pages) included concrete suggestions to

develop the Agder region, including e.g. the Agder University College becoming a University, improvement of road connections, research, education, culture, public service, and living conditions. The main purpose of Agderrådet (Agder Council), established in 1995, was from the start to achieve the ambitions of the “Common Goals for Agder” document. The regional policy agenda proved to be influential and gained a status as “something that everybody agrees upon”. Many of the new regional governance initiatives refer back to the “Common Goals for Agder” document (Normann 2007). The regional development in the Agder region has largely followed the guidelines of “Common Goals of Agder” and its updated version from 2003, “Common Goals on Sorlandet”. Many of the goals listed in the documents have been achieved in the recent years, including e.g. the new E-18 motorway between Grimstad and Kristiansand, the University status gained by the Agder University College in 2007, and the investments in culture projects through Cultiva fund.

The tradition of the Agder region to co-operate and act also during hard times is a valuable asset of the innovation system in the Agder region. The joint effort of the Agder region in late 1990s and again in early 2000s as a reaction to the Ericsson consolidation attempt to move the Arendal division to Oslo region is an illustrative case of the joint regional efforts. Workers, management at Arendal, and local politicians, argued that relocation was unnecessary as information technology makes it possible for the Arendal division to co-operate with the Oslo region without physical proximity (Isaksen 2001). The joint resistance resulted in the reversal of the Ericsson relocation decision. Another example of the joint public-private partnership, also related to Ericsson, is from the early 2000s when Ericsson cut off 400 people in East-Agder. After the downscaling, as a result of public-private partnerships, a series of measures to keep the qualified workforce in the Agder region, most of the qualified engineers stayed in the Agder region, many of them starting new firms.

The recent private-public partnerships include the cluster and network initiatives promoting the knowledge-intensive industries in the region: NODE, an offshore and engineering cluster, and EYDE, the network for the process industries in Agder. The co-operation between the firms in the clusters has traditionally been rather limited, but the recent experience from the NODE and EYDE indicate an increased interest in the co-operation between the cluster companies. The NODE cluster has actively participated e.g. in a joint foresight exercise anticipating the changes in the business environment in offshore and engineering industries. The establishment of Teknova research institute in 2007 as an institution focusing on university-industry cooperation, by the University of Agder, Agder Research, and the industrial partners GE Healthcare, Elkem Solar, Aker Kværner MH, DevoTeam Telecom and J.B. Ugland Holding, is a sign of interest in university-industry collaboration in the Agder region.

Weaknesses

The regional innovation system is complicated and fragmented

The Agder region has experienced a remarkable growth of the number of different institutions, networks, partnerships etc., following the establishment of the Agderrådet. At the same time, however, regional governance faces challenges such as the better utilization of the resources of a high number of institutions aimed to promote the wellbeing of the region and the challenges in finding the proper co-operation methods between the West-Agder and the East-Agder regions.

The list of the institutions in the Agder region includes about 130-150 governance institutions (the number of institutions varies slightly depending on the study), most of which have emerged during the last 6-7 years (Normann 2007). The regional innovation system in the Agder region is a complex system largely representing IRIS, the Institutional Regional Innovation System model. The Agder institutions include the regional units of national institutions such as

Innovation Norway, SIVA, but the majority of the institutions fall into local and regional category. It is a difficult task to provide an illustration of the Agder innovation system due to the large number of institutions and the relative complexity of the system.

The regional innovation system in Agder faces a mix of innovation barriers as illustrated in Figure 2 by Tödting & Trippel (2005). Firstly, the Agder region faces some “organisational thinness” more typical of peripheral regions. For example, there are indications that the critical mass of companies needed to develop a dynamic culture-related cluster is not yet reached in the Agder region. Secondly, Agder region faces challenges typical of old industrial regions, e.g. the risk of “lock-in” situations with a heavy clustering and specialization in mature industries with a risk of decline, resulting in a loss of regional competitive advantage and innovation capacity. Thirdly, the Agder region, despite non-metropolitan status, faces problems usually more typical of metropolitan regions, such as fragmentation of institutions. The fragmentation of the Agder innovation system have been explained by the national tradition of establishing institutions, the relatively easy access to funding for the institutions “in the wealthy Norway”, and by the strong interest in establishing new institutions to promote Agder regional development after 1995. There is, however, no systematic research available on the subject.

The Agder region is not fully exploiting the potential of the regional innovation system

The Agder region includes high-level industry base, a tradition of collaboration, and a talent base with a potential to further develop the economic performance of the region. The regional development in the Agder region has been influenced by concepts from international regional development discourse, including e.g. triple-helix concept by Etzkowitz & Leydendorff (2000), learning regions by Florida (1995), regional cluster theory by Porter (1998), and regional innovation systems (Cooke 2004). The Florida concept of creative class was an important part of the legitimacy of the Cultiva foundation. The ideas of new regionalism, stating that regional governance is superior to regional government have picked up momentum in the recent years in Agder, governance including the establishment of vision and goals, and the setting of a policy to achieve them through cross-sectoral governing coalitions (Normann 2007). The entire potential of the talent in Agder is currently, however, not being exploited. The following bottlenecks and/or barriers of the Agder innovation system related to institutions and regional governance are presented:

Inward-looking orientation and conservative mindset: Despite the high export per capita ratio and world-class high technology industries, the majority of the institutions in the Agder region focus on local and regional issues. There is, in fact, a dual system in the Agder region with some institutions having an international, or global, orientation, whereas the majority of the institutions fall into local or regional category. Many institutions are small, often serving only a small geographical area e.g. one municipality. The internationalization mindset of many institutions is limited, e.g. presentation and marketing materials are often in Norwegian language only. Many institutions set their ambition level and benchmark their performance only regionally (against other institutions in the Agder region) or nationally (against Stavanger). Despite some brave entrepreneurs e.g. in the shipbuilding industry with wild ideas and courage to implement the ideas, the Agder region is characterized as a conservative region, preserving the status quo rather than experimenting and taking risks. There is also a lack of visibility to be identified: the Agder innovation system is not well known outside the region, not to talk about international visibility. The know-how and expertise in the Agder region is partly a “hidden secret” – with few exceptions such as e.g. Aker Solutions. The absorptive capacity of the Agder innovation system would allow much more interaction with national and international partners.

Insufficient university/industry co-operation: The University status gained by the Agder University College in 2007 has raised expectations of increased university-industry collaboration in the region. Currently, relatively few firms cooperate with universities and R&D institutions.

New initiatives such as e.g. the research institute Teknova, established in 2007, are promising signs of improving the situation. The new Agder University, obviously without a tradition of university-industry collaboration, is compared to other universities in e.g. Oslo and Trondheim instead of the former comparison inside the University College category. From the viewpoint of regional governance, the Agder University with a new status has the potential to become even stronger actor in strengthening the Agder innovation system and university/industry co-operation – but some time is needed to fully exploit that potential. It was expressed by several interviewees in the Agder region during the OECD Expert Mission in October, 2008 that currently only few regional actors understand the entire potential of the Agder University as a key actor in the creation of the future Agder prosperity. Furthermore, the Agder region faces the challenge of providing proper dissemination of the results of the university-industry collaboration. It is obvious that the Agder University does a lot with the industry which could and should be disseminated in a more effective way. Apart from few exceptions, the industrial partners would appreciate at least to a certain extent the dissemination of the results of the university-industry collaboration.

Relatively low participation of women: Agder region is currently not exploiting the full potential of female talent especially when it comes to management positions and board memberships. The female work force in Agder has the lowest share of females with longer education in Norway. There are fewer women in management positions in Agder than in most other counties in Norway. Also in municipality councils the Agder women are underrepresented (Magnussen *et al.* 2005, Normann 2007). From the viewpoint of developing and strengthening regional governance, the regional innovation system in the Agder region is not able to use the entire managerial potential of the female talent. Although Agder region should be categorized as peripheral region, the deficiency of organisational thinness usually identified in peripheral regions is of relevance in the Agder innovation system, too. The issue of critical mass – or lack of it – is linked to the relatively low participation of women in the Agder work life and especially in managerial tasks. The region simply cannot afford losing the female talent in building up dynamic industrial clusters and a vibrant regional innovation system.

Lack of strong leadership

A top level commitment and leadership needed to implement a significant regional change process is currently not easy to identify in the Agder region. The recent debate on the future of Agder as an administrative county and the development of the regional reform has continued for some years without any fundamental changes. There is a shortage of decision-makers and experts in Agder who can, as Sotarauta (2007) puts it, “see the entire playing field and make sense of many complementing and conflicting issues, instruments, and actors simultaneously”.

Currently, it is not easy to name leading persons or a leadership team in Agder with a vision, joint ambition and commitment. The lack of leadership is related to difficulties in setting common concrete goals and empowering people behind goals, and to lack of courage to prioritize activities - to avoid the further fragmentation of the regional innovation system. There are, however, motivated, inspiring individuals in many institutions in Agder which are ready and willing to invest their time and effort to joint initiatives, e.g. in the cluster networks NODE and EYDE, forming shared leadership in their fields.

Opportunities

Reaching a critical mass – “the Agder economic region”

From the viewpoint of reaching the critical mass of innovation promotion and support of entrepreneurship, the Agder region would benefit from joint efforts between East-Agder and West-Agder actors, among the municipalities, and between the public sector and the private sector

actors. A democratic yet efficient transition towards “the Agder economic region” would be recommended to increase synergies and to reach the critical mass of the activity level.

From the viewpoint of entrepreneurship and innovation promotion, the “one Agder” economic region would have positive effects – independently of the outcome of the formal cooperation negotiations between e.g. West-Agder and East-Agder and at the municipality level. “The Agder economic region” concept would include concentrations of expertise in both East-Agder and West-Agder – supported by a common Agder brand.

Exploiting the ability to act in hard times - to revitalize the regional innovation system

The Agder region has shown the ability to consensus thinking and joint actions in economically challenging times, as shown by the Ericsson relocation case in East-Agder. At the time of writing, the global financial crisis causes difficulties and uncertainty also in the Agder region. No local economy is immune to the consequences of the crisis. The economic turbulence provides, however, also a window of opportunity to changes, by causing a sense of urgency, and not allowing the institutions just to stay at their “comfort zone”. The global financial crisis also increases the need to strengthen regional governance: to rethink the purpose and the activity level of the regional innovation system and the individual institutions.

The ability of the Agder innovation system to deal with the external shocks such as the global financial crisis and the ability to seize new opportunities for change is likely to be critical to the overall success of the Agder innovation system. The relatively small size of the Agder region and the entrepreneurial tradition would enable agile movements to increase the market-focused elements of the ERIS, or Entrepreneurial Regional Innovation System, in the Agder region – without compromising the research and technology efforts.

Better utilization of the talent in the region

There are possibilities to increase the expertise in the Agder region. The high number of institutions “hides” a substantial amount of talent which could be better exploited. There are also “latent” institutions to be identified – with obvious competitive edges but lacking the full exploitation of the institution and its talent. For example, the new status of the University of Agder provides an excellent opportunity to upgrade the image – and performance – of the technology parks, or knowledge parks, in the Agder region such as Sorlandet Kunnskapspark in the University of Agder campus site in Kristiansand to become a vital part of the Agder innovation system – to increase local networking and interactive learning.

Threats

Lock-in effects

The Agder region faces a risk of various lock-in effects endangering the development of the innovation system. According to the local diagnostic report in chapter 2, one of the major challenges of governance in the Agder region is to utilize the numerous institutions, developing both a democratic and an efficient institutional infrastructure and to avoid lock-in situations and “elite” steering. The regional governance in the Agder region has certain elements of the lock-in risk (Normann 2007), including functional lock-in (locally-tied connections and personal ties), cognitive lock-in (inward orientation and group-think) and political lock-in (overdependence of the politico-administrative system upon non-firm actors and subsidies to support the industry – often even when the industry becomes obsolete) (Grabher 1993).

One consequence of lock-in setting in the Agder region could be the inability to decrease/cut investments in the fields that either not have any particular competitive advantage or are in the

declining stage without possibilities to rejuvenate. A risk of mental lock-in and group-think lies on the mental attitude towards aiming at top international level. According to some informants in Agder, the “average” attitude in the Agder region is not to aim high but to stay on the average level of performance.

A diminished attractiveness of the Agder region

The Agder region is not an isolated region but more and more affected by the global environment. The economies of regions and their cities, including the Agder region, are in competition with those of other regions and cities. The competition is not any more limited inside the border of Norway.

The image and the attractiveness of the Agder region is an important part of the decision-making of the talented people and their families in considering Agder as the place to live, work, and start businesses. Despite the know-how and expertise cumulated in the Agder region, the international, even national image of the know-how in the Agder region could be stronger. Without specific measures by the regional governance and the institutions to attract talented people to the Agder region, there is a risk of losing talented people to other regions - both in Norway and overseas - with more attractive region marketing packages.

Inability to respond to unexpected major changes

The Agder region has undeniably, a track record of co-operation and acting together in hard times, as the Ericsson case in late 1990s and early 2000s illustrates. The ability of the institutions of the Agder innovation system to adapt to exceptional economic conditions is re-tested during the current financial crisis. The global financial crisis, not fully anticipated in the beginning of the OECD Agder review process, changes the business environment and challenges the Agder institutions and regional governance.

For example, the competence funds created to contribute to the development of the Agder innovation system have significantly reduced their financial contribution to the Agder development due to their policy of investing the yield of the funds only - not the base capital. The global financial crisis has reduced the yield of the funds. Cultiva fund invested in culture projects in Agder NOK 26M (EUR 2,7M) in 2006 and NOK 32,9 M in 2007. The expected investments in Agder for the year 2008 will be only NOK 11,3 M, the reason being the dramatically decreased yield of the fund (Fedrelandsvennen 2008). In case of prolonged global recession, the competence fund investments will stay at the low level for several years if no changes in the investment policies of the funds are made, thus decreasing the possibilities of developing new innovative companies and products in the Agder region.

Recommendations

Joint Agder Innovation Strategy to reach/strengthen the critical mass of know-how and expertise in the Agder region

The regional innovation policy and regional governance has to take into account the political situation regarding the political discussions on the closer co-operation among the municipalities in the Agder region and between East-Agder and West-Agder region. There is no time, however, to be wasted in joining the efforts in the field of innovation promotion and entrepreneurship in the region.

The Agder region should repeat the successful “Common Goals for Agder” exercise of the 1990s. The exercise needs to be adapted, however, to the current situation in Agder, and with a democratic approach. As Normann (2007) puts it: “Democracy means that no interest or policy

agenda by definition is given supremacy. Development means that the region faces up to its challenges. Democratic development means that the region uses its resources to face up its challenges.” The Joint Agder Innovation Strategy with a vision “New Common Goals for Agder” should be ambitious but possible to reach and relatively easy to communicate. The vision should also appeal to not only key institutions but also the individuals in the Agder region.

The Joint Agder Innovation Strategy exercise is suggested for various reasons. Firstly, the ever increasing national and international competition between regions makes it more and more important to mobilize all the possible actors to work in a synergic way – to strengthen the critical mass of know-how and expertise in strong branches such as oil and gas industry, and to reach the critical threshold of expertise in other branches such as culture-related industries. Secondly, the current weaknesses of the regional innovation system, ranging from leadership challenges to inward-looking orientation, need to be tackled in a joint manner to ensure the momentum of change. Thirdly, a Joint Agder Innovation Strategy is an important tool in empowering the institutions to work systematically towards a common goal. Finally, a “high profile” Innovation Strategy, in the midst of a downturn economy, would be a visible measure to show the external world, ranging from national authorities in Oslo to international companies considering location in the Agder region, that the region is making a serious attempt to ensure a successful future development – based on innovation and entrepreneurship.

The regional innovation policy and regional governance has to take into account the political situation and reality in the Agder region. The ever increasing national and international competition requires, however, that the Agder region looks for synergies and significantly increased cooperation among the institutions in the Agder region – with a new vision and goals.

What are, then, the ambitious but reachable new goals? The goal setting, in order to be credible and effective, must come from the actors inside Agder. However, it is possible to interpret the current discourse in the Agder region to identify some of the expected goals. For example, the setting up of the Agder University was a goal reached in 2007. The considerable upgrade of the Agder University, including e.g. measurable targets on not only the financial and human resources to run and develop the university but also targets related to results such as e.g. articles in top international level research journals and measurable results in university-industry cooperation, could be possible goals.

As a suggestion, the “Agder Economic Region Innovation Strategy 2010-2015” process, based on the resources and needs of the region, with the top-level commitment and broad participation of interest groups, would provide a point of departure to future regional governance extending to individual institutions. The process would include the setting of the ambition level, vision and goals for “Agder economic region” for the coming years. In order to fully demonstrate the importance and the commitment of the top level decision-makers, the steering group of the innovation strategy process should include mayors of the leading Agder cities, the university rector, and 1-2 top industrialists in the region.

Refinement of the fragmented regional innovation system in Agder: an “X-ray inspection”

The Agder region is suggested to revitalize the current innovation system. The present IRIS, or Institutional Regional Innovation System, should be completed with elements from ERIS, or Entrepreneurial Regional Innovation System, to produce an increased output in the form of growth-oriented knowledge-intensive companies and entrepreneurship.

To provide a solid base for the revitalization process of the Agder innovation system, the current regional innovation system in Agder with the 130-150 institutions needs an “X-ray inspection” including an analysis of the following issues: what is the accomplished and expected added value of each institution to the wellbeing of the Agder region? How to increase synergies

between the institutions? Which institutions are still missing or are playing too weak a role? Where in Agder are the innovations really created and developed? To which extent is the Agder innovation system able to contribute to innovation promotion in various industry sectors? How does the internal flow of information, or the local “buzz”, look like between the Agder institutions? Which kind of external linkages, or global pipelines, there exist among the Agder institutions? The evaluation should break down the expertise of the individual institutions in categories e.g. international level, national level, traditional basic knowledge, support function. The in-depth evaluation of the Agder institutions should be done in an objective manner, with the assistance of external experts from Norway and/or from other countries.

The possibilities of the Agder institutions and the regional innovation system to promote companies in the key industries are currently largely related to the strategically targeted industries: process industry, oil and gas industry, ICT industry, culture and tourism sector. The evaluation of the innovation system includes the analysis of these key sectors, too. The current status of the regional clusters or cluster initiatives should be categorized, followed by policy guidance for each cluster. The categorization of regional clusters by Enright (2001) could serve as a point of departure for the cluster evaluation, including the following key categories: working clusters, latent clusters, potential clusters, policy driven clusters, and “wishful thinking” clusters. The categorization of the clusters should be followed by concrete actions to refocus the cluster activity in Agder. For example, the decision-makers are recommended to stop additional funding of “wishful thinking” clusters which are lacking not only critical mass but also any particular competitive advantage in the foreseeable future.

As a side benefit, the resource mapping or “X-ray scanning” is likely to increase the information between the actors of the Agder innovation system on the skills and potential of the regional talent. Job rotation between the institutions is encouraged, including job rotation between public and private sector. Talented female experts should be considered more often as candidates when filling the management and senior level positions in Agder. The municipalities in the Agder region could plan and implement a special campaign, directed to female talent in the local, regional and even national media to invite female candidates to apply for management positions in Agder.

Funding organisations play a critical role in the change process of the Agder innovation system. The individual institutions of a regional innovation system are often determined to continue their activities as long as their funding is guaranteed. Financial steering is crucial in order to refine and prioritize the activities of institutions in the Agder region. The packaging of funding decisions into larger unities would be advantageous for the funding organisations themselves; instead of tens of small funding decisions the preparation work could focus on a few, larger funding packages. The key funding organisations providing the major part of the funding of the Agder institutions are encouraged to actively contribute to the refinement process of the Agder innovation system. The regional competence funds should be more agile for changes and refocusing based on the current needs of the Agder region than funds with more national character.

Shared leadership

Regional governance in the Agder region would be more effective if the regional innovation policy would be supported by the powerful individuals of the region. The new initiatives should be well anchored in the region’s industry and the region’s key opinion leaders. To maximise the results of the joint activities among the actors in the Agder innovation system, a shared leadership would be more likely to succeed than “one-man show”.

It is likely that a successful implementation of the “upgrading process” of the Agder innovation system requires a team consisting of a change agent - a skilled person with an ability

to manage the change process – supported by a powerful guiding coalition of influential private and public sector representatives. The personal commitment of top-level individuals such as city mayors, university rector, CEOs of leading industries, with a mutual trust, is very important in the further development of the Agder innovation system. The results of the current status analysis, or the “X-ray scanning”, of the Agder innovation system provide a common point of departure for shared leadership in the coming years – based on analyzed information.

Enhance national and international links

The Agder innovation system needs to be increasingly integrated into the external linkages of the innovation system. As Cooke (2007) states, regional innovation systems are not isolated “islands” but more like “icebergs”, swiftly affected by their global environment, immediate external conditions and internal dynamics.

The Agder region should join forces to promote the Agder industry also outside the Agder region and outside Norway, and to attract talented people and companies to locate and invest in the Agder region. The innovation activity in Agder should not limit its expertise inside the Agder region but should include national and international decision-makers and experts in order to meet the challenges in the coming years. The Agder region and its institutions should attract and invite not only blue collar workers but also experts from knowledge-intensive branches from other countries to act as visiting professors, researchers, board members of the companies and other institutions, members of regional think tank activities etc. Attracting talent outside the region is relevant also from the viewpoint of meeting the challenge of critical mass e.g. in various research fields of Agder University.

Nationally, the links to Oslo region are important, one of the reasons being the concentration of the national innovation policy actors in the capital region. The new status of Agder as “a region with a university” is one natural door-opener towards a bigger role in the Norwegian Innovation System - a window of opportunity that should be utilized. The University of Agder plays a key role in raising the awareness of Agder know-how and expertise nationally. The know-how and expertise of the Agder region deserves to be widely known among the key actors of the national innovation system in Norway. Internationally, the Agder region should look for strategic, long term partners fitting into the knowledge base of the Agder region. There is a need of gate actors instead of gate keepers in Agder; gate actors being well-connected individuals and institutions opening and exploiting the new international contact networks.

The regions, including Agder, need to explore and introduce new, innovative ways of attracting world-class talent. Kao (2009), describing “the global war for talent”, presents a thought-provoking example of attracting world-class talent to a small country that wants to invest in cutting-edge technology in synthetic biology. “If the country pays 10 leading scientists 1 M USD each annually and spends another 100 M USD to build a world-class research institute, it becomes a player in strategic industry, yielding incalculable financial and social returns over time”. It could be assumed that an exercise suggested by Kao would be difficult to implement in the majority of regions, including Agder. The Agder region should, however, seriously consider experimental, innovative campaigns and actions in attracting world-class talent.

Internal and external communication strategy

The Agder region has the challenge of communicating the results of the innovation promotion activities to the interest groups inside and outside the region. The findings of the OECD expert group visit in Agder indicate that people and organisations are not always well aware of the activities of even close-by colleagues and partners inside the region.

The governance of the Agder innovation system needs to be supported and complemented by a communication strategy and professional expertise to communicate the strengths of the Agder innovation system to the rest of the world, to assist in promoting internal networking and partnerships within the Agder region, and to provide the citizens in Agder with the proper picture of the activities and plans of the institutions of the Agder region. As a concrete first step, an illustrative, easy-to-understand description of the Agder innovation system and the key actors should be prepared and disseminated in Norwegian and English languages. Moreover, the strategy documents should be published in Norwegian and in English. Communication is also related to the empowerment of the “average” citizens of the Agder region. The reliable, credible communication strategy and communication plan with a high level of transparency is one step away from perceived “elite steering” and towards empowerment.

One of the concrete outcomes of the communication strategy work could be the continuous and systematic development of an ambitious Agder brand. Places can – and should – be brands. A single city might need to be part of a larger location in place branding strategies, in order to acquire critical mass to appeal investors and companies (Moilanen & Rainisto 2009). The development of the Agder brand would contribute to the promotion of individual municipalities and their activities. A successful Agder region branding program requires a joint commitment and strategy with a sense of direction and sufficient resources.

Learning models

ProcessIT Innovations, Sweden

Description of the approach

ProcessIT, or Process IT Innovations, is a concept initiated in 2003 in Northern Sweden to support research projects in the process industry. The aim of the ProcessIT concept is to contribute to the creation and growth of the process industry companies by developing new ICT-based products and services based on the process industry’s needs. ProcessIT as a concept is based on automated treatment of process-, production- and product information and includes modeling, measurement technology, automated processes, signal processing and information transfer technology (ProcessIT 2008).

Northern Sweden has reached a position in ICT especially within wireless technology and its applications but also in general usage of ICT-based services. There are several large process industries located in North Sweden and North Finland. Over the years, ICT has strengthened the positions of the traditional industries in their markets. A needs inventory in 2001-2002 at more than 20 of the process industries in North Sweden identified more than 100 applications, and classified as short-term or long-term needs for the companies (Johansson *et al.* 2007, Johansson 2008). SISU-Project, the predecessor of the ProcessIT programme, started as a Vinnova pilot project in 2001 as a learning project with a focus on collaboration between university, industry and society. ProcessIT Innovations started in 2003 and applied for and received support from the VINNVÄXT programme in 2004. As a winner in the VINNVÄXT competition it was guaranteed 60 million SEK (5.45 million Euros) in financial support over a period of ten years. Together with an equivalent amount of co-financing from the county administrative boards, municipalities, universities in North Sweden, and the process industries in the region, ProcessIT Innovations has a funding of 120 million SEK (10.9 million Euros).

The governance of ProcessIT Innovations is conducted by the board of directors representing region’s industry, universities and local communities. The executive management team of ProcessIT Innovations includes the process leader and representatives from the universities of Luleå and Umeå, and from the region’s major process industries. The research management team assesses and takes responsibility for long-term plans and the scientific quality of the research in

R&D projects and in research programmes. An industry advisory board with representatives from the process industry as well as the ICT industry is connected to the work of the research management team.

The leadership of the ProcessIT initiative as an innovation system has shifted during the journey. Initially, the network facilitator organisation Internet Bay was in the leadership position and launched the idea of an innovation system as an outcome of the conducted need inventory. Thereafter, the universities took over the leadership, and together with the country administrative boards attempted to launch a multifaceted innovation system (Northern Lights), which failed. With that lesson learned, the universities in tight collaboration with the process industry in the region and with support from regional government joined forces when establishing ProcessIT Innovations, and a neutral and independent process leader was recruited, with a background in the ICT industry and with a good reputation in region's process industry (Johansson 2008).

Relevance to the Agder region

Process IT initiative is relevant to the Agder case in many aspects. Firstly, both the Agder region and the Norrbotten region in North Sweden have a strong presence of process industry. Secondly, the regions share the ambition to increase the collaboration between the traditional industries and the new, knowledge-intensive industries, such as the ICT industry. North Sweden has gained an experience of the combination of process industry and ICT solutions which would be valuable for the actors in the Agder region such as e.g. EYDE network. Finally, the Process IT initiative is an adaptation of Triple Helix concept, familiar also in the Agder regional development. The change of leadership over time, experienced in North Sweden, is a relevant issue to be studied and considered in the Agder region, too.

Results of the approach

ProcessIT Innovations concept has been well accepted in North Sweden. The ProcessIT programme has been able to keep up the enthusiasm and broad participation in the ProcessIT initiatives. The ProcessIT case shows that it is doubtful if a common steering-organisation has the ability to, in a classic sense, govern the innovation system. Their role is important but more restricted to parrying for unexpected events, to decide on projects, to facilitate meetings and to act as a lubricant in the system when creating awareness of the potential benefits that a successful innovation system can generate to the actors. Moreover, the ProcessIT case demonstrates that the innovation system has ability to self-organize (Johansson 2008).

Reasons for success/failure

ProcessIT concept has been able to combine top-down and bottom-up approaches successfully. The national Vinnväxt programme by Vinnova brings visibility, credibility, and systematic approach. The bottom-up approach, starting from the needs inventory of the process industry, guarantees that the ProcessIT initiatives are based on the real needs of the industry. The ProcessIT concept has experienced various development phases over time which have refined the concept.

Obstacles

ProcessIT concept has not succeeded in broadening up the concept into North Finland in a larger scale. The structure of the process industry in North Finland has similarities to the process industry in North Sweden, but the practical co-operation across the country border faces challenges such as e.g. lack of proper financial instruments to co-funding of joint projects.

Considerations for adoption in Agder

The Process-IT initiative is an example of a long-term initiative and commitment combining top-down and bottom-up approaches. The time span of ten years provided by the Vinnväxt programme is of special interest from the viewpoint of establishing long-term public-private partnerships. The EYDE network of process industries, together with the University of Agder is suggested as a first candidate to study the possibility of adopting at least some elements of the ProcessIT concept into the Agder region. The key industries in the Agder region are constantly facing the fluctuation of conjunctures which requires long-term planning of e.g. work force arrangements and research programmes, issues familiar to ProcessIT interest groups.

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Helsinki Region Innovation Strategy, Finland

Description of the approach

The Helsinki Metropolitan Area comprises four cities with a total of approximately one million people: Helsinki 573 000, Espoo 241 000, Vantaa 195 000, and Kauniainen with 8 000 inhabitants. There is a total of nine universities, eight polytechnics, numerous research institutes and a large number of diverse regional and national intermediate and agency organisations involved in innovative activities. Despite the high ratings of the region in many assessments of competitiveness and substantial investments in its innovation system, the Helsinki Region has remained a medium-sized generator of wealth by the standards of European regions. The collaboration between public sector participants, as well as between the local authorities in the region and its universities and polytechnics, has not been satisfactory. The lack of collaboration has often been explained as a consequence of the large number of participants in the region (Culminatum 2005).

The idea of the common innovation strategy for the Helsinki Metropolitan Area emerged in 2003 by a leading club of decision-makers convened by the Mayor of Helsinki, Eva-Riitta Siitonen, to reinforce the collaboration between various social participants in the Region. The process of formulating the innovation strategy was financed by the National Technology Agency of Finland Tekes and by the local authorities of Helsinki, Espoo, and Vantaa. The work was implemented by the regional development company Culminatum Ltd. The steering group consisted of the Board of Directors of Culminatum and five outside experts representing some of the key players of the Finnish Innovation system: the Finnish Funding Agency for Technology and Innovation TEKES, the Finnish Innovation Fund SITRA, Nokia Plc, University of Helsinki, and Uusimaa Employment and Economic Development centre.

More than 100 influential people in the Helsinki Region were interviewed to investigate the principal bottlenecks and future prospects of innovation activity. The strategy work resulted in action proposals in four main categories: improving the international appeal of research and expertise, reinforcing expertise clusters and creating common development platforms, reform and innovation in public services, and support for innovative activity. The final strategy contains 26 action proposals. The final report includes a list of names of 110 active participants in the process of formulating the strategy (Culminatum 2005).

Relevance to Agder

The Helsinki Region Innovation Strategy is relevant to the Agder case in many aspects. Firstly, the Helsinki Metropolitan Area comprises cities with different sizes, the city of Helsinki being clearly the biggest city. In the Agder region, Kristiansand has the status of the biggest city. In both the Helsinki region and the Agder region, there is some tension to be identified between the biggest city and the other cities or municipalities due to the dominant role of the biggest city. Secondly, the intensity of the collaboration between the various institutions of the regional innovation system has not been satisfactory in the Helsinki region. Thirdly, both regions have identified the large number of institutions as a factor having an effect in the relatively fragmented innovation system. Finally, the Helsinki Region Innovation Strategy is relevant to Agder from the leadership viewpoint. The attempt similar to the Helsinki Region to join forces behind a common strategy (Agder plan) is under way in the Agder region, too. The Agder region is implementing a strategy process with working groups to identify and develop elements of the joint development strategy.

Results of the approach

The development of the regional innovation strategy is a continuous process. The strategy preparation is only the first step. It might be too early to evaluate the long-term results of the Helsinki Region Innovation Strategy. The strategy work resulted in the strategy document with concrete action proposals, some of which have already been realised e.g. the establishment of Helsinki Region Marketing office. The Helsinki Region Innovation Strategy paved the way for another public-private initiative, The Competitiveness Strategy for the Metropolitan Region in Finland, which is currently under way. The Competitiveness Strategy defines the competitiveness of the Metropolitan region as the ability of the individual cities to *jointly* build up sustainable working environments which attract companies, investments and workforce. The Competitiveness Strategy is closely linked to the National Innovation Strategy of Finland.

Perhaps the most important outcome of the Helsinki Region Innovation Strategy was, however, the process itself. The Helsinki Region Innovation Strategy was able to gather the key decision makers from the four municipalities to an open debate on the future elements of success in the Helsinki region. The preparation group of the Helsinki region innovation strategy document succeeded in empowering a group of 300 experts from national, regional, and local institutions to contribute to the strategy process via interviews, conferences, and workshops. The process increased trust between the institutions in four cities simply by providing a forum for experts from various fields to know each other and express their views on the regional development.

Considerations for adoption in Agder

The Agder region is implementing a strategy process with working groups to identify and develop elements of the joint development strategy. The innovation strategy exercise implemented in the Helsinki region, followed by a joint competitiveness strategy, is an example of using the full potential of the network of committed, even enthusiastic experts from both public and private sector, providing a proper basis of empowerment of the strategy actions. The Helsinki case demonstrates the importance of top-level individual commitment to initiate the process. In Helsinki Region, the mayor of the largest city started the process which would not have been possible without shared leadership.

The Agder region is suggested to consider revitalizing the regional innovation system with a joint innovation strategy exercise, having the sufficient breadth and top-level commitment as described in the Helsinki region case. The experience gained by the Helsinki Region Innovation Strategy should be studied carefully in the Agder region, followed by a visit to Helsinki region to interview some of the key persons in charge of the strategy process. The country-specific and

region-specific issues in the Helsinki region strategy process should not be a hindrance to adopt some of the best practices of the Helsinki strategy process and the shared leadership practices to Agder region.

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Uppsala Bio Cluster Initiative – the change process, Sweden

Description of the model

The Swedish city of Uppsala is located 65 kilometres north of Stockholm. Almost 10 % of the work force in the Uppsala region is active in biotechnology related fields in public and private sector. Uppsala BIO is a ten-year cluster organisation focused on promoting the competitiveness of the Uppsala region in life sciences. The vision of the Uppsala BIO, stated in 2003, is to develop Uppsala- Stockholm region to become one of the world’s five leading biotechnology regions within five years. Uppsala BIO is a member of the Vinnväxt programme by Vinnova. Uppsala Bio is organized as a project under STUNS –the Foundation for Collaboration between Uppsala’s Universities, the Business Community, and Society. The current organisation does not have a board, but a steering committee. The board of STUNS sets the long-term strategic goals and visions to Uppsala BIO whereas the daily work is run by the Uppsala BIO management team (Teigland 2007).

The governance of the Uppsala BIO cluster has been studied by Teigland & Lundequist (2008). They adapted Kotter’s model of eight steps, common in successful change efforts, to the Uppsala BIO Cluster initiative.

Table 5.1. Elements of successful change efforts (Kotter 1996)

| |
|--|
| Establishing a sense of urgency |
| Building a powerful coalition |
| Creating a compelling vision |
| Developing an effective activity plan |
| Choosing a change specialist as process leader |
| Creating broad commitment |
| Planning for and creating short-term wins |
| Continuously communicating |

The introduction of the elements of successful change elements is important from the viewpoint of regional governance. The main issue of interest in Teigland & Lundequist (2008) evaluation of Uppsala BIO cluster is the relevance and potential applicability of the Kotter (1996) model to regional development change processes in Agder.

Relevance to Agder

The Uppsala Bio Cluster case has certain relevance to Agder case, too. The biotechnology cluster in the Uppsala region faced the situation where a sense of urgency for changes increased considerably when Pharmacia downsized its activities in the region. Agder has faced a similar situation e.g. in the early 2000s with the Ericsson downsizing case. The pressure to refine the innovation system and the sense of urgency to changes is likely to increase in Agder, too, one

reason being the effect of the global financial crisis on the key industrial branches in the Agder region.

The issues of the Kotter (1996) model are relevant regarding the current regional development discourse in the Agder region. Issues such as vision, top-level commitment, strong leadership, and change specialist as process leader are important elements of the Agder governance, too. The creation of broad commitment and empowerment are essential but often overlooked issues in regional change processes, as well as continuous communication.

Results of the approach

The Teigland & Lundequist (2008) evaluation of the Uppsala BIO cluster initiative, adapting the Kotter (1996) model, proved to be useful and revealed lots of issues relevant to the analysis and development of cluster initiatives. The most relevant findings from the viewpoint of the regional governance in Agder include:

- Pharmacia downsizing case triggered the sense of urgency in the Uppsala region
- the researchers list the local “closed boys network” syndrome as a threat to sustainable regional change process
- key opinion leaders in the region are important in communicating the compelling vision - but one should also listen to people, not only communicate the vision
- the activity plan should find the “passion” of the regional talent
- Uppsala BIO should be a cluster facilitator, not an operator
- one should not only focus on long-term results but also produce and communicate short-term wins.

Considerations for adoption in Agder

The adoption of the Lundequist & Teigland (2008) cluster analysis in Agder should include answering to e.g. the following questions: does the Agder region have more forces of change than forces of retaining the status quo? Which event, or series of events, is going to trigger the change in Agder? To which extent and within which timeframe would it be possible to join the ideas and plans of top experts and decision-makers in West-Agder and East-Agder behind a joint innovation strategy and implementation?

The Agder Research could be a potential candidate to study the relevance and possibility of evaluating the potential and possibilities for change in the Agder clusters. The eight-step Kotter (1996) model introduced in this learning model presentation would be a natural point of departure for the exercise to be implemented in co-operation with the cluster management teams in Agder.

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Technology Parks and Regional governance discourse in Pisa, Italy

Description of the model

Pisa is a city in Tuscany region, Italy, with 92,000 inhabitants, characterized by a strong public research system, with three universities, including two schools of advanced studies. The

area is characterized by the presence of more than 200 high-tech companies for an employment of approximately 7,000 people (Di Minin *et al.* 2003)). The Pisa region is a concentration of three local universities, the biggest being the University of Pisa with about 50,000 students. The region includes even several public research centres. The traditional manufacturing of the Pisa region has been the leather and shoe industry, the light motorcycle industry and the wood and furniture sector. The local economy has been able to generate new high technology based industry in the fields of ICT and pharmaceuticals (Di Minin *et al.* 2003, Teräs 2008).

There are two major technology centres in the Pisa region: Polo Tecnologico di Navacchio and Pont-Tech technology centre in Pontedera. Navacchio Technology Park (Polo Tecnologico di Navacchio) is located 10 km from the Pisa airport, towards Florence. The first tenant started at the Navacchio Technology Park in the year 1999, and the technology park hosted 60 companies and 430 employees in 2006. Polo Tecnologico di Navacchio was established with the aim of creating favourable conditions for increased competitiveness in the small and medium enterprise market by integrating the innovative requirements of the SMEs and the provision of technological knowledge originating from specialist centres and the research system. The biggest sector of activity among the tenants is information and telematics.

Pont Tech (Pontedera Tecnologia) is a consortium for industrial research and technological transfer. Pont Tech is located in Pontedera (PI), 26 km from Pisa towards Florence, in the heart of an industrial district where the Piaggio motorcycle production facilities are located. Pont Tech was born as a result of a common initiative of local institutions, universities and industries. The mission of Pont-Tech is to promote technology transfer from research towards industrial application. Scuola Superiore Sant'Anna, one of the three universities in Pisa, is the leading scientific partner of the Pont-Tech Consortium. Pont-Tech and Scuola Superiore Sant'Anna collaborate in the fields of robotics, mechatronics, and microsystem technologies and have jointly established CRIM (Centre of Applied Research in Microengineering) an applied research centre for Microengineering. Pont Tech also runs the technology centre/business incubator. A total of 18 spinoff companies has been established in 1991-2005 in the fields of ICT, communication, bioinformatics, mechanics, training, and consultancy.

Teräs (2008) studied the regional innovation system in the Pisa region, including the analysis of the role and importance of technology parks in the Pisa innovation system. According to the study, the Polo Navacchio Industrial Park is recognized as the best-performing technology park in the Pisa region. Besides the Polo Navacchio Industrial Park, only the SSSUP Pontedera Technology Park was considered to have relevance in the development of the Pisa innovation system. The following citations from the study interviews of actors in the Pisa innovation system have been selected to communicate more of the atmosphere of the interviews.

“In the late 1980s, there was an important conference in Pisa with all relevant organisations. In the first half of the 1990s, there was this project for a Science Park and a lot of tension and a lot of discussion took place... a bit less based on walls, bricks. The result was that the 1990s were a decade of heavy talking, heavy discussion, some money, a lot of problems, misunderstandings, a lot of jealousy and the whole science park, let's say, fashion declined, and the result was that, in my opinion, starting from the late 1990s and early 2000s those who were able to start initiatives, started initiatives without worrying too much of networking both at regional and at local level, for example Sant'Anna built its own science pole in Pontedera. Navacchio got the money, built his incubator”

“At present, I can mention as relevant only the Sant'Anna thing in Pontedera and the Navacchio, they can sell themselves rather well, after all...all other initiatives...at present...are waste of time and resources.”

“The new generation of (science) parks all over the world want to put together research, company, centre of services. Why? That condition is that is very important for the sector, the cluster, and particularly the little company, but this concept is not very clear in this territory”

The replies reveal that the role of technology parks as institutions of the regional innovation system is still rather unclear in the Pisa region. The good work, even the results of the two leading technology parks in Navacchio and Pontedera, is recognized but the strategic importance of technology parks in the Pisa region innovation system is difficult to see. The opportunity to use technology parks as strategic tools in the regional governance of Pisa has not yet been fully utilized.

Relevance to Agder

The Pisa technology park case illustrates the difficulties of regional governance encountered in every-day work in the regions. The sometimes “chaotic” regional development discourse situations and lack of leadership, described in the first citation above (Pisa in the 1980s and 1990s) are likely to be familiar in many regions in various countries, including Agder.

Currently, technology parks are not fully utilized as instruments in the Agder regional innovation system. The role of technology parks is important in Agder, too, in gathering companies and experts together to constitute a regional cluster and in catalyzing local networking and interactive learning. Agder does have technology or knowledge parks but the regional innovation system needs an upgrading of the performance of the technology park network.

Results of the approach

The key persons of the Navacchio and Pontedera technology park initiatives did not want to wait amid a somewhat “chaotic” regional development situation. Instead, they realized the technology park development plans and seized the opportunity - without waiting too long for a regional planning consensus or “a joint plan of Pisa innovation promotion”. The outcome seems to be relatively satisfactory: according to Teräs (2008) study, the Navacchio and Pontedera technology parks are the two leading technology park initiatives in the Pisa region.

Considerations for adoption in Agder

The Pisa case lifts up the role of technology centres in the regional innovation system. The new status of the University of Agder provides a window of opportunity to upgrade the performance and the image of technology park, or knowledge park, initiatives in the Agder region. An important lesson to be learned from the Pisa case is the ability of the representatives of the Technology Park initiatives to seize the opportunity and build up the Technology Parks amid a somewhat “fuzzy” regional innovation system. According to Sotarauta (2007), the relationships between influential individuals and institutions are reciprocal. Individual actors shape their institutional environment but at the same time they are shaped by the institutions. The positive examples of the individual actions may have a positive effect on the entire innovation system. The implication for the Agder region would be a closer integration of the technology or knowledge parks as essential institutions of the Agder innovation system.

Contact information

www.polotecnologico.it/ (Navacchio)

http://www.sssup.it/context.jsp?ID_LINK=41&area=47 (Pontedera)

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CHAPTER 6

REGIONAL ENDOWMENT

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Introduction

This chapter will discuss what is called the regional endowment, e.g. the territorial based resources and capabilities, of Agder, especially focusing on the working of the regional innovation system. A regional innovation system can be defined as a systemic and long term cooperation between actors and agencies that promote learning and innovation. Key actors is the knowledge exploring subsystem, where the university and R&D-institutes are central, and the knowledge exploiting subsystem, constituted by firms often in regional clusters. Extending this traditional view on a RIS with a Triple-Helix perspective the regional government and governance system also becomes a central player in the RIS. The key resource for such a system to function properly and effectively is of course people and their human capital, which the educational system produces and where a well functioning labour market is the most important mediating mechanism to match demand and supply of various types of competences and jobs in the knowledge exploring subsector, the knowledge exploiting subsector as well as in the regional government. All of these four directly and indirectly constituting elements of a RIS are dealt with separately in the previous individual chapters, and the main aim of this chapter is to integrate the perspectives presented in these chapters, and develop them further using a regional innovation system approach.

Policy issues

Regional innovation systems

The Agder region could be described as a dual society, economically, socially, culturally and geographically. Economically with respect to the existence of large, global competitive firms as well as local SMEs; socially one finds both a concentration of highly qualified engineers on the one hand and a lower than national average educational level on the other; culturally there exists a relatively large, and growing group of immigrants which also in itself disclose a dual character with a mixture of well-qualified people with university degrees (especially engineers working in the equipment supplier and ICT firms) as well as low qualified refugees from third world countries, and a similar division among the local population between the well-educated and the religious low church people. Geographically we can identify a clear centre-periphery structure with the coastline as the industrially and urban centre and the inland as the rural periphery dominated by primary occupations and tourism. The challenge for a regional innovation policy and the RIS in implementing the policy is to be able to address and be relevant to both sides of the duality. This could be achieved, we will argue, by applying a broad based innovation policy not only caring for the globally successful, large global firms but which also could bring about the necessary upgrading of the more 'ordinary' parts of the economy and region.

Such a broad based innovation policy must include and combine the STI (Science, Technology and Innovation) as well as the DUI (Doing, Using and Interaction) modes of

innovation, which according to Lorenz and Lundvall (2006) represent two different ways of carrying out innovation, and needs both a narrow and a broad defined RIS to be implemented and carried out. The DUI mode is a user (market or demand) driven model based more on competence building and organizational innovations and producing mostly incremental innovations. Such a mode of innovation is typically found in non-R&D based economies. On the other hand one finds a more narrow definition of the mode of innovation as STI based on the use of codified scientific knowledge, which is a science push/supply driven high tech strategy able to produce radical innovations. These two modes of innovation will also be differently manifested with regard to regional specialisation and clustering, as some regional clusters will be primarily based on the DUI mode of innovation (e.g. engineering based industries), while other clusters will base their activity on the STI mode of innovation.

Regional innovation systems can be defined in a narrow and broad way (Asheim and Gertler, 2005; Lundvall, 1992; 2008). A regional innovation system broadly defined, includes the wider setting of organisations and institutions affecting and supporting learning and innovation in a region with an explicit focus on competence building and organisational innovations. This type of system is less systemic than the narrowly defined types of innovation systems. Firms mainly base their innovation activity on interactive, localised learning processes stimulated by geographical, social and cultural/institutional proximity, without much direct contact with knowledge creating organisations (i.e. R&D institutes and universities) (Asheim and Gertler, 2005). It can, however, play a very important role in establishing a ‘culture of innovation’ in a region, since it due to its broadness reach out to more ‘normal’ people than the other type of innovation systems. Key aspects of this perspective are that it emphasizes the importance of partly embedding the innovation process at the work place (micro) level, where ‘normal’ people carry out their daily tasks. Partly it builds on the dynamic interplay between the micro, meso and macro levels, where “macro-structures condition micro-dynamics and vice versa new macro-structures are shaped by micro-processes” (Lundvall, 2008, 101). A narrow definition of innovation systems on the other hand primarily incorporates the R&D functions of universities, public and private research institutes and corporations, reflecting a top-down model of science and technology policies. The narrowly defined innovation system corresponds to the STI mode of innovation, while the more broadly defined system is more easily accommodated by the DUI mode of innovation.

Knowledge and innovation should, thus, not simply be equated with R&D. Innovative activities have much broader knowledge bases than just science based R&D, and there are many examples of nations and regions demonstrating a rapid economic growth and a high level of living standard with an industry competing on the bases of non-R&D based, incremental innovations (e.g. Denmark and regions in The Third Italy (Asheim, 2000)). Thus, a region’s knowledge base is larger than its science base, implying that arguing for an increasingly more knowledge intensive globalising economy does not necessarily mean that innovation and competitiveness becomes more dependent on R&D. This is especially relevant for the Agder region, where e.g. the large and international competitive oil equipment sector, draws heavily on the DUI mode of innovation.

Solutions to the long term problems of the DUI mode of innovation I: Distributed knowledge networks and developmental learning

As a result of the growing complexity and diversity of contemporary knowledge creation and innovation processes, firms increasingly become parts of network organised innovation projects (either as part of MNCs or in value chains of suppliers and subcontractors). This implies a growing need to acquire new knowledge to supplement their internal, core knowledge base(s) – either by attracting human capital possessing competences based on a different knowledge base or by acquiring new external knowledge base(s) by collaborating with external firms through R&D cooperation, outsourcing or off-shoring of R&D, and/or with research institutes or universities, which underline the importance of firms’ absorptive capacity, i.e. its capacity and capability of making use of new knowledge. The strategy of acquiring and integrating external knowledge

base(s), therefore, implies that more and more a shift is taking place from firms' internal knowledge base to increasingly globally 'distributed knowledge network'⁴⁸ and 'open innovation' (CHESBROUGH, 2003). This is manifested by the increased importance of and attention to clusters, innovation systems (regional, national and sectoral), global production networks and value chains for firms' knowledge creation and innovation processes, demonstrating that 'the relevant knowledge base for many industries is not internal to the industry, but is distributed across a range of technologies, actors and industries' (SMITH, 2000, 19).

However, even staying within a DUI mode of innovation gives more innovative possibilities than previously recognised. This position is linked to research challenging the traditional view of learning as only incremental (or reproductive/adaptive) (Cooke, 2007). Ellström (1997) emphasizes that learning is not only reproductive or adaptive (resulting in imitation) but that it also can be developmental and creative. Ellström uses these categories to make a distinction between developmental learning which he sees as the 'logic' of knowledge exploration on the one hand, and reproductive or adaptive learning which represents the 'logic' of knowledge exploitation in his view.

New research on the relationship between forms of work organisation in EU and the impact on job stress, worker satisfaction, labour market flexibility, learning, innovation and patenting confirms that learning also can be developmental and creative due to the high degree of work autonomy and learning dynamics found in *learning* forms of work organisation. This study, distinguishing between four main forms of work organisation: 'learning', 'lean', 'Taylorist' and 'simple structure', shows that not only does the learning work organisation result in less job stress and greater worker satisfaction, it also implies more labour market flexibility, superior conditions for learning and innovation, and even a larger propensity for patenting (Lorenz and Valeyre, 2006). The study shows a clear north-south divide with regard to the dominating forms of work organisation with Northern Europe dominated by learning forms of work organisation, while Southern Europe has work organisations characterized by either Taylorist or simple forms. The positive impact of the learning form of work organisation on innovation is confirmed by another study reporting that 'low road' practices using short-term and temporary contracts, having a lack of employer commitment to job security, low levels of training, and so on are negatively correlated with innovation. In contrast, it is found that 'high road' work practices characterized by 'high commitment' organisations or 'transformed' workplaces are positively correlated with innovation (Michie and Sheehan, 2003). This implies that a DUI mode of innovation which has learning work organisations as its micro foundation in addition to the interactive form of innovation at the meso level not only should be expected to produce incremental innovations but also has the potential of creating radical innovations due to the presence of developmental learning. Thus, such an 'upgraded' DUI mode of innovation could well establish itself as a 'high road' strategy in the globalizing knowledge economy. However, this possibility would potentially be strengthened through combining the DUI mode of innovation with the STI mode.

This perspective should be looked upon as a strategy for formulation of long term, bottom-up and partnership-based development strategies initiating learning-based processes of innovation and change. Of strategic importance in this context is the capacity of people, organisations, networks and regions to learn (Lundvall, 2008), and, thus, regional development coalitions resemble a regional innovation system broadly defined. The concept can, thus, be used to describe a region characterised by innovative activity based on localised, interactive learning and co-operation exploiting learning based competitiveness (Amin and Thrift, 1995) building on a DUI-mode of innovation. It is the aim of the VRI project, which with the exception of the Regional Innovation Strategy pilot actions of the EU commission (Bellini and Landabaso, 2007) is a rather unique innovation policy programme in an international context by promoting broadly defined regional innovation systems, to achieve this.

Solutions to the long term problems of the DUI mode of innovation II: The differentiated knowledge bases

When one considers the actual knowledge bases and competences of various industries and sectors of the economy, it is clear that knowledge creation and innovation processes have become increasingly complex, diverse and interdependent in recent years. There is a larger variety of knowledge sources and inputs to be used by organisations and firms, and there is more collaboration and division of labour among actors (individuals, companies, and other organisations). However, the binary argument of whether knowledge is codified or tacit can be criticized for a restrictively narrow understanding of knowledge, learning and innovation (Johnson et al., 2002). Thus, a need to go beyond this simple dichotomy can be identified. One way of doing this is to study the basic types of knowledge used as input in knowledge creation and innovation processes. By way of suggesting an alternative conceptualization, a distinction can be made between ‘synthetic’, ‘analytical’, and ‘symbolic’ types of knowledge bases⁴⁹

Following received wisdom from the philosophy of science, an epistemological distinction can be identified between two more or less independent and parallel forms of knowledge creation, ‘natural science’ and ‘engineering science’ (Laestadius, 2000). Johnson et al. (2002, p. 250) refer to the Aristotelian distinction between on the one hand ‘epistēmè: knowledge that is universal and theoretical’, and ‘technè: knowledge that is instrumental, context specific and practice related’. The former corresponds with the rationale for ‘analysis’ referring to understanding and explaining features of the (natural) world (natural science/know-why), and the latter with ‘synthesis’ (or integrative knowledge creation) referring to designing or constructing something to attain functional goals (engineering science/know-how) (SIMON, 1969). A main rationale of activities drawing on symbolic knowledge is creation of alternative realities and expression of cultural meaning by provoking reactions in the minds of consumers through transmission in an affecting, sensuous medium (table 6.1):

Table 6.1. Differentiated knowledge bases. A typology

| Analytical (science based) | Synthetic(engineering based) | Symbolic (artistic based) |
|---|---|---|
| Developing new knowledge about natural systems by applying scientific laws; <i>know why</i> | Applying or combining existing knowledge in new ways; <i>know how</i> | Creating meaning, desire, aesthetic qualities, affect, intangibles, symbols, images; <i>know who</i> |
| Scientific knowledge, models, deductive | Problem-solving, custom production, inductive | Creative process |
| Collaboration within and between research units | Interactive learning with customers and suppliers | Learning-by-doing, in studio, project teams |
| Strong codified knowledge content, highly abstract, universal | Partially codified knowledge, strong tacit component, more context-specific | Importance of interpretation, creativity, cultural knowledge, sign values; implies strong context specificity |
| Meaning relatively constant between places | Meaning varies substantially between places | Meaning highly variable between place, class and gender |
| Drug development | Mechanical engineering | Cultural production, design, brands |

Source: Asheim and Gertler, 2005; Asheim et al, 2007; Gertler, 2008.

The knowledge bases contain different mixes of tacit and codified knowledge, codification possibilities and limits, qualifications and skills required by organisations and institutions involved as well as specific innovation challenges and pressures, which in turn help explaining their different sensitivity to geographical distance and, accordingly, the importance of spatial proximity for knowledge creation. Thus, the dominance of one mode arguably has different spatial implications for the knowledge interplay between actors than another mode of knowledge creation. Analytical knowledge creation tends to be less sensitive to distance-decay facilitating global knowledge networks as well as dense local collaboration. Synthetic knowledge creation, on

the other hand, has a tendency to be relatively more sensitive to proximity effects between the actors involved, thus favouring local collaboration (Moodysson *et al.*, 2008).

As this threefold distinction refers to ideal-types⁵⁰, most activities are in practice comprised of more than one knowledge base. The degree to which certain knowledge bases dominates, however, varies and is contingent on the characteristics of the firms and industries as well as between different type of activities (e.g. research and manufacturing).

The underlying idea behind the differentiated knowledge base approach is not to explain the level of competence (e.g. human capital)⁵¹ or the R&D intensity (e.g. high tech or low tech) of firms but to characterise the nature of the basic (or critical) knowledge input on which the innovation activity is based (hence the term 'knowledge base') (Moodysson, 2007). According to Laestadius (2007) this approach also makes it unnecessary to classify some types of knowledge as more advanced, complex, and sophisticated than other knowledge, or to consider science based (analytical) knowledge as more important for innovation and competitiveness of firms, industries and regions than engineering based (synthetic) knowledge or artistic based (symbolic) knowledge. This is once more a question of contingency with respect to the firm, industries, and regions in focus.

Solutions to the long term problems of the DUI mode of innovation III: Combining the DUI and STI modes of innovation

A third solution would be the option of combining the dominating DUI mode of innovation of the majority of firms with the STI mode. New research confirms that combining the two modes of innovation seems to be most efficient, i.e. firms that have used the STI-mode intensively may benefit from paying more attention to the DUI-mode and vice versa (Lorenz and Lundvall, 2006). In this way, on the firm levels these two modes of innovation can (and should) co-exist, but they will be applied in different combinations depending on the dominating knowledge base(s) of the regional industry.

Referring to Berg Jensen *et al.* (2007) and Lorenz and Lundvall (2006) the 'Science, Technology and Innovation' (STI) mode of innovation, based on the use of codified scientific knowledge, could broadly be associated with the analytical knowledge base, while the 'Doing, Using and Interacting' (DUI) mode, relying on informal processes of learning and competence building and experience-based know-how, would mostly resemble the synthetic (and symbolic) knowledge bases. However, once again we shall argue that such a dichotomy becomes too crude especially when discussing the possible combination of the two modes of innovation.

Here the perspective of cognitive distance becomes crucial (Nooteboom, 2000). If the cognitive distance between the two modes of innovation is perceived by key actors to be too wide, then it will not be possible to combine the two modes and to view them as complementary modes of innovation instead of incompatible alternatives. There will be a lack of absorptive capacity within firms and regional clusters to acknowledge and appreciate the potential gains of the other mode of innovation as well as to access and acquire the necessary competence to combining the two modes of innovation. There are, however, two key 'bridging devices' which could assist in achieving an optimal cognitive distance as a necessary condition for combining the two modes. The first of these deals with understanding that the STI mode is not only limited to an analytical knowledge base, but can also include synthetic and symbolic knowledge bases. In the case of the synthetic knowledge base this can be illustrated by reference to applied research undertaken at (technical) universities, which clearly must be part of the STI mode, but operates on the basis of synthetic (engineering) knowledge (of course drawing on basic research at science departments of universities creating new analytical knowledge), while the case of symbolic knowledge can partly be substantiated by the new tendency of changing design education from being artisan based to be placed at universities with research based teaching, and partly by the steadily increasing research

in game soft ware and new media, which in some countries, e.g. in Denmark, is located at new, specialized universities (e.g. the IT university in Copenhagen). This broadening of what constitute the STI mode of innovation shows that also activities based on synthetic and symbolic knowledge bases needs to undertake new knowledge creation and innovation in accordance with a STI mode, and, thus, needs systemic relations with universities or other types of R&D institutes (e.g. in a regional innovation system context).

The other ‘bridging device’ is the recognition that partly learning is not only reproductive but can also be developmental, and partly the innovative potential that a learning work organisation can display in being the operative context for such learning. Even the most analytical, science based company will obviously benefit from organizing its work in such a way that learning dynamics is created by giving their employees autonomy in their work. This has to build on the principles of broad participation of functional, flexible workers in accordance with the Nordic model of a learning work organisation (Ennals and Gustavsen, 1999).

The Nordic economies’ performance in a comparative perspective: An empirical illustration

In order to illustrate the point of the potential strength of combining the two modes of innovation, we shall take a short, comparative look at the economic performance of three Nordic countries with respect to innovativeness and competitiveness. Even if this has a national focus, it can very well illustrate a similar situation at the regional level. According to the World Economic Forum Growth Competitiveness Report Finland, Sweden and Denmark have consistently the last 5 years been among the 5-6 highest ranking nations with Finland and Sweden most years among the 3 highest ranking nations.⁵² However, this impressive performance of the Nordic states is achieved with very different innovation policies and strategies. On the one hand Finland has pursued a science-driven, high tech oriented strategy focusing on radical product innovations, with especially good results in the ICT sector, and Sweden a technology-based strategy of process innovations and complex product improvements, with both countries ranking as the top two nations with respect to R&D investments (Sweden 4% and Finland 3.8%). Denmark has on the other hand implemented a user-driven, market based strategy characterized by mostly non-R&D, incremental innovations using mainly a synthetic knowledge base especially within consumer goods sectors (e.g. furniture), sometimes with a design orientation, but not as a general rule such as in ‘made in Italy’ products, where the symbolic knowledge base is of paramount importance (the exception to this story is the strong pharmaceutical sector, whose product development of course is R&D based applying an analytical knowledge base). This picture corresponds nicely with the ideas of Lorenz and Lundvall (2006) about different but complementary ‘modes of innovation’ (STI and DUI). These empirical facts and theoretical perspectives have a very important policy implication in that there is no ‘one size fits all’, i.e. no optimal or best way with respect to innovation policy promoting competitiveness and innovation in various industries in different regions and nations in a globalizing knowledge economy, but that innovation policies instead must be fine tuned to take into account the respective industrial structures and social and institutional environments and sets-up, i.e. that innovation policies must be adaptive and context sensitive.

The distinction between the two modes of innovation is important to better grasp the importance of innovation as interactive learning, which characterizes the DUI mode of innovation. It can help explaining why the Agder firms are innovative even if the figures for R&D expenditure are clearly below national average, and also to clarify what the OECD review of Norwegian innovation policy calls the ‘Norwegian puzzle’ (i.e. that despite weak innovation inputs and even weaker outputs, Norwegian per capita incomes are very high in international comparison (OECD, 2008))⁵³. The high per capita income in Norway is partly due to firms applying the DUI mode of innovation, which means that they are innovative (even if it is mostly a question of incremental innovation), and partly due to being among the world highest productivity levels in the process industry (which is also the case for the process firms in the Agder region),

which is achieved by a high level of STI engineering based process innovations as well as a highly qualified labour force with autonomy in their work, which promotes individual learning in daily work. Thus, it is not a ‘puzzle’ at all, but relatively easily explainable with the adequate theoretical perspectives at disposal.

Interesting in this connection is Finland’s new innovation strategy, which was presented in June 2008. As Finland has been one of the countries that most vigorously and with quite a lot of success has pursued a science based/push innovation policy, it is noticeable to see arguments for a more broad based innovation policy. It is argued that securing growth and competitiveness in a globalizing knowledge economy cannot any longer only be based on a sector and technology oriented strategy, and that a demand-based, user-driven innovation policy (e.g. a DUI mode of innovation) must be implemented alongside a supply-driven policy (e.g. a STI mode of innovation). For this to become publically and politically manifest it is also proposed to expand the Cabinet Committee on Economic Policy into a Cabinet Committee on Economic and Innovation Policy, and in a parallel move to rename, in terms of its tasks and composition, the Science and Technology Policy Council into a wider Research and Innovation Council (Ministry of Employment and the Economy, 2008).

Finally, what is important with the innovation system perspective for explaining the ‘paradox’ of the economic performance of the Nordic states is that this perspective partly has contributed to extending the definition of innovation from the traditional linear view of starting with science and ending up with new products to a view of innovation as interactive learning. This implies that all industries and sectors can be innovative, i.e. not only R&D intensive, high tech firms and sectors but also medium and low tech firms and sectors implying that innovation is not equal to but instead more than R&D intensity. This could, according to Lundvall and Borrás (2005), be referred to as a development from ‘science’ and ‘technology’ policies to ‘innovation policy’, which is confirmed by the new Finnish innovation strategy. Partly that an innovation system is build around the strengths of public-private partnerships, where a (pro)active public sector helps promoting innovation through various forms of innovation policies, implemented within the framework of innovation systems.

Challenges and opportunities

Strengths

Global competitive large industry

Very competitive large industry. World leading in process and engineering sectors (oil equipment suppliers). West-Agder is the biggest export county (per capita) in Norway. The new university, especially the Grimstad engineering campus with its well-developed relations with local industry (see chapter on university/R&D institutions).

Good links between the Grimstad campus of the university and local industry

According to one of the largest oil equipment suppliers in cooperation with universities on applied research projects *geographical proximity* matters most, and instead of always accessing the best competence globally found at places such as MIT, the company chooses to focus on the geographically closest available competence. Thus, they prioritize building up research cooperation with the regional university (i.e. University of Agder, Grimstad campus) by among other things employing some professors in 20% positions in the company as a way of strengthening the competence at the university to be applied in collaborative research projects. In addition they take a central part in funding and using a regional, applied research organisation (Teknova). The company called this form of carrying out applied research ‘cooperation at the operational level’, which, according to the company, is the right level of research collaboration

for technological development. To achieve this, geographical proximity is of great importance. In addition the company cooperates with national (Norwegian Technical University in Trondheim) and international top universities (e.g. Carnegie Mellon University, Pittsburgh and Denmark's Technical University, Copenhagen) in research projects on technological development, which always involve company funded PhD's to secure a more long-term 'payback' for the company. In order to strengthen the relationship to the company they also make sure that one of the supervisors is coming from the company, which provides *organizational* as well as *institutional* proximity (Boschma, 2005).⁵⁴ Concerning cooperation with university this can take place in normal open conditions when it is a question of general technological platform development, but not with respect to how to apply this general technology in application development. Then results from research on technological development are applied in concrete, individual projects, which underpin the competitive advantage of the company. Thus, this example illustrates how 'second best' regional universities can be used and upgraded by large companies to become active partners in collaborative R&D projects in addition to the companies also using non-local, more internationally leading universities.

Strong and promising network/cluster cooperation

Clusters/networks such as NODE and EYDE, of which the NODE cluster of equipment suppliers has been given the Arena status by Innovation Norway (see chapter 2 on business/industry) seems to be well functioning. The DUI-based type of innovations will remain the key to the competitive advantage in this type of industries, as strong tacit, context specific knowledge components, which is found in e.g. engineering, synthetic knowledge dominating the DUI mode, is difficult to copy by other firms in different contexts (i.e. it will not become general available or ubiquitous), and, thus will be the basis for sustaining the firms' and regions' competitive advantage also in the long run (Porter, 1998). In the Agder case this perspective, thus, is clearly very relevant, as even the large, global competitive firms in the process industry and the equipment suppliers mostly rely on a synthetic knowledge base and the DUI mode of innovation, and what is locally considered to be an important new, emerging industry, cultural industry, primarily draws on a symbolic knowledge base. Firms that base their innovative activity on analytical knowledge do hardly exist in the region. On the positive side this implies that the majority of the industry at Agder is based on knowledge bases that are locally embedded and, thus, that this industry tends to be rather 'sticky' with respect to delocalisation, which is important in Agder since many of the largest firms, especially among the process firms, are owned by foreign companies.

Weaknesses

General weak university-region links

University-region relationship is (as indicated in the local innovation survey) in general weak, especially with respect to the main campus in Kristiansand. Thus, the connectivity in the RIS between the university and industry/public sector (with the exception of Grimstad campus' relationships to industry) needs to be strengthened.

Dual economic and social structures

Low general educational level. Lower than national average of per capita income and R&D expenditures. Lower employment level, especially for females. In the local report from Agder it is emphasized that the firms generally are innovative (based on a survey of four sectors) with regard to the level of introduction of new or significantly improved products or services on the market for the last three years (i.e. the sectors given priority in the VRI Agder research programme; ICT, equipment suppliers, process firms and culture firms). However, the Agder region is well below the national average when it comes to R&D expenditure pr. capita in 2005.

This discrepancy could partly be explained by the sectoral composition of the survey (i.e. manufacturing of communication equipment normally have a high share of turnover from innovation as defined above). Partly it is a question of the mode of innovation applied in the majority of the Agder firms.

Divided regional government/governance system

This leads to lack of coordination between the two counties of Agder, and, consequently, to suboptimal solutions with respect to doubling of agencies and organisations, which individually become too small and insufficient. One example of this is wide spread of STI type of resources between too many competence centres, and knowledge parks (Kristiansand, Grimstad, Arendal and Mandal). Important to secure critical mass, and co-locate such centres and parks with the two university campus?

Opportunities

Large industry as basis for restructuring

Exploit the potentials of large industry in process and equipment supplier sectors to develop new, related variety based industry (e.g. environmental) combining the DUI and STI mode of innovations. Use the existing cluster/networks (NODE and EYDE) as well as the applied R&D institute Teknova and the University in this work. The large firms are international competitive, have a high competence level, have very well developed international networks and market contacts. Through the cluster/networks cooperation they are also well connected regionally. These firms also have the best developed links to the University with respect to research and education.

Develop better university-region links

Develop closer contact between university and region, and not only with respect to industry, which the Grimstad campus has done quite successful within e.g. IT and mechatronics but also the public sector. Large potential demand for upgrading in the primary and secondary parts of the educational system, hospitals (e.g. further training of nurses etc.), and public administration (e.g. language courses). There are also clear potentials in developing research cooperation between the hospital and the university, especially with respect to medical technology (see learning model 2 for further elaborations). In addition also large demand for managerial courses for industry, which today mainly are offered by the local branch of the Norwegian School of Management. This could represent important new income sources and act as a cross-subsidization of research activities at the university.

Develop integrated (common) government/governance structures

The common regional development plan if successful can represent an important step towards a single Agder region, which would provide the basis for a more pro-active regional government as a key actor in the RIS (see learning model 1 for further elaborations).

Threats

High degree of industrial specialization

This means Agder is vulnerable with respect to global market recession (and permanently lower oil price) and cost based competition from low cost countries in Eastern Europe and the third world. The originally positive lock-in tendencies of industrial specialization have the risk of turning into negative lock-in if the companies are not also supplied with new, external STI based knowledge (analytical and synthetic). At the same time there are few new emerging industries

appearing and it is difficult to see the potentials of cultural industry in this respect. In the long run, it will be problematic for most firms to rely exclusively on informal localised learning, but must also gain access to wider pools of both scientific (analytical) and engineering (synthetic) knowledge on a national and global scale (Asheim et al., 2003).

Dominance of foreign ownership

Foreign ownership is especially dominating in the process industry. One example of the problems with foreign ownership is the tendencies of lack of recognition of the potentials of the DUI mode of innovation exploiting the learning potentials of the learning work organisation. The firms in the process industry have embarked on a research project on the introduction of Lean Manufacturing in their activities. As shown in the study by Lorenz and Valeyre (2006), even if the lean form of work organisation also contains learning, the learning dynamics is not as strong as in the learning form of work organisation due to a lower degree of work autonomy. This initiative is thus rather surprising given the results of the innovation survey which shows that also for the process firms individual learning in daily work is the most important factor for firms for developing and maintaining core competence. The share of 88% ranks only marginally below what is found among equipment suppliers with 91% of the firms ranking this factor as the most important. An argument based on the specificity of process industries not being especially suited for applying the principle of learning work organisations does, therefore, not hold. Another explanation might be related to the fact that all of the process firms in Agder are owned by foreign MNCs. The relevance of this argument is furthermore substantiated by the practice of process firms belonging to the Norwegian owned Norsk Hydro, which have applied learning work organisations consciously in their firms in Norway and abroad to promote productivity, learning and innovation. The relevance of the national business systems perspective on the importance of the MNCs home country institutions and practices when acquiring foreign subsidiaries here comes to our mind (Herstad, 2005). The fact that the process firms are the most STI mode of innovation oriented firms with all firms having their own R&D department or unit and with the highest share of systemic R&D in the firms as well as the highest level of cooperation with universities and research institutes among the four group of firms (even if it is not more than 14 and 29% respectively) should neither work against also applying learning work organisations within the individual firms, rather to the contrary.

Increasing problems of attracting and retaining qualified labour

Business climate (e.g. qualified and interesting jobs) might be good, but people climate (not very urban) might represent a challenge in the future. However, research has shown that especially people working within synthetic knowledge based industries give priority to an interesting job rather than to the people climate of cities (openness, tolerance, cultural offers etc.). Thus, as the demand is directed towards engineers that lack of urbanity in Kristiansand and consequently a low score on people climate will not necessarily have any negative impact on the attraction of foreign talents. But efforts should be sustained to develop further a more attractive people climate in Agder. Interviewed firms could confirm that they had never experienced an engineer turning down a job offer because of lack of urban life in the region.

Lack of strategic leadership at the university

There seems to be no explicit policy concerning the role of the universities with respect to national and regional tasks. It is important to make a clear priority between the various tasks and commitment a university has to take on (research, teaching, third mission), and on which geographical levels it chooses to carry the tasks out (regionally, nationally or internationally).

Recommendations

Establish better contacts between Agder University and the region

In the SWOT analysis the role of the university was emphasised in several contexts. Partly the good links between the engineering campus of the university and the local industry was mentioned as one of the strengths of the region; the general weak links between the University and the region was referred to as a weakness; developing better links between the University and the region was mentioned as an opportunity, and, finally, the lack of strategic leadership at the university was categorised as a weakness. This demonstrates that the potential role of the University in the development of the region is looked upon as being of strategic importance.

As this is treated in a separate chapter, the recommendations concerning improving the contacts between the University and the region in this chapter will be short. It is important to remember that improving the quality of education and research primarily goes through a deepened cooperation with regional actors both in the public and private sector. Only in this way the necessary additional funding in addition to national and international sources will be available. The Grimstad campus has been quite successful in establishing cooperation with local industry in education as well as in research both within IT and mechatronics. The large, international competitive industry is interested in and prepared to enlarge and deepened this cooperation, which will strengthen the STI-based, narrowly defined RIS. However, also with the public sector there can be scope for extended cooperation. As mentioned with respect to ‘opportunities’ there exists a large potential demand for educational upgrading in the primary and secondary parts of the educational system, the hospital, which not only concerns further training of nurses, but also research cooperation, and the public administration (e.g. language courses). There is also an unfilled demand for managerial courses for the private industry. The role of strategic leadership of the university in this context is to make the necessary decisions about what to prioritize, e.g. in which areas of education and research the cooperation with regional actors should be extended and deepened. It is thus of key importance that the university leadership develops a clear strategy and plan for how to improve the links with the region.

Strengthen the DUI-based, broadly defined RIS

Use VRI to strengthen the DUI-based, broadly defined RIS and improve the connectivity in the system (especially between university and industry) specifically and to establish better contacts between university and the region generally. VRI is based on establishing a regional development coalition consisting of all partners involved in promoting regional development, i.e. the Triple Helix partnership of industry, university and regional government. In addition it also involves labour market partners (the trade union and the confederation of industry). Thus, it incorporates all organisations and institutions that promote learning and innovation on a wider scale. These constellations of Triple-Helix actors are in the VRI context referred to as ‘regional development coalitions’ understood as the inter-linking of learning organisations ranging from work organisations inside firms via inter-firm networks to different actors in the region.

A strengthened DUI mode of innovation must be based on learning work organisations within firms and trustful interactive learning between firms in networks or regional clusters. According to the innovation survey in the local report this seems to be the general case for the four groups of firms in the survey. In the local diagnostic report, the distinction between DUI and STI modes of innovation is used to explain the level and type of innovativeness of the firms. Most firms in the survey apply a DUI mode of innovation (87% for all firms in the survey), where the most important sources of knowledge for firms’ innovation activity is found inside the firm among the highly qualified work force and in interaction with customers (user-producer relationships). Universities and research institutes rank low on the list of important knowledge sources. The same picture is found when analyzing which factors are seen as important for

developing and maintaining core competence in the firm, where individual learning in daily work and cooperation with customers/suppliers are mentioned as the most important. In ICT firms (especially) and process firms also knowledge flows between employers are referred to as important, while systematic R&D efforts in the firms only are important in process firms (2nd most important factor compared to only the 6th most important factor in ICT firms and equipment suppliers). This could mostly be explained by all participating process firms in the survey state that they have their own R&D department or unit within the firms against 40% in ICT firms and 60% in equipment suppliers. Thus, the potentials for the DUI system to be applied as a means for a ‘high road strategy’ seem to be in place in the Agder case.

Strengthen the STI-based, narrowly defined RIS

Use the University, industrial networks (e.g. EYDE), regional clusters (e.g. NODE), R&D institutes (e.g. Teknova and Agder Research) and large firms in general to strengthen the STI-based, narrowly defined RIS. The creation of a narrowly defined, regional innovation system through increased cooperation with local universities and R&D institutes, and through the establishment of technology transfer agencies, may provide access to knowledge and competence that supplements firms’ locally derived competence. This not only increases their collective innovative and absorptive capacity, but may also serve to counteract technological ‘lock-in’ (the inability to deviate from an established but outdated technological trajectory) within regional clusters of firms, which is not the least relevant in the Agder case due to the dominant role of relative mature industries such as the process industry and the equipment supplier industry. An indication of the relevance of this argument also for the Agder firms is that almost 55% of the firms in the innovation survey state that formal knowledge is very important and around 40% that it is of some importance, while only some 5% of the firms say it is less important.

Promote an optimal combination of the DUI and STI parts of the RIS

Use key actors (VRI as a regional development coalition), large and small industry, industrial networks and regional clusters, R&D institutes and university to find optimal combination of the two modes of innovation. The distinction between the two modes of innovation helps on the one hand to avoid a too one-sided focus on promoting science-based innovation of high-technology firms at the expense of the role of learning and experience-based, user-driven innovation. However, on the other hand it also indicates limits of such innovation strategies in a longer term perspective and, thus, emphasizes the need for firms in traditional manufacturing sectors and services more generally to link up with sources of codified knowledge in distributed knowledge networks (analytical, synthetic as well as symbolic knowledge).⁵⁵

What is in the OECD-report (OECD, 2008) called ‘more intense innovation activity’ is most probably R&D based innovation activity taking place in a STI mode of innovation. An example of this could be SMEs which may have to supplement their informal knowledge, characterized by a high tacit component (i.e. the DUI mode of innovation), with competence arising from more systematic research and development (i.e. the STI mode of innovation) in order to avoid being locked-in a price squeezing, low road competition from low cost countries. This will typically be the case for e.g. the subcontractors of the two large international companies in the oil equipment sector.

Thus, in the Agder case with a dominating DUI mode of innovation the challenge is how to be able to combine this mode with the STI mode in such a way as to secure development *in* (sustaining innovativeness and competitiveness producing economic growth) as well as *of* the region (securing high and regionally and socially, evenly distributed level of living conditions). Basically, the VRI program has the instruments and vehicles to achieve this. The predecessors of the program were ‘pure’ DUI-based programs. However, with the establishment of the VRI program an explicit attention also to building narrowly defined RIS was included. Along with the

Finnish argument of the necessity of a broad based innovation policy we would argue, that such an innovation policy can also deal with the duality problems of Agder bringing development to the weaker part of the economy, the socially and culturally marginalized as well as to the more 'ordinary' inland parts of the region in addition to further promote and develop the more successful side of the duality. A broad based innovation policy not only support industries using a STI-based mode of innovation, but extends such support to non-R&D based industries and all type of services (i.e. not only to knowledge based services). Thus, innovation support could be allocated to services that are important for the tourist sector, which is a key economic activity and job creator in many of the inland counties of the Agder region.

Use large industry and industrial clusters/networks to increase non-local relationships and knowledge flows

These actors can together with other Triple-Helix actors, notably the University, assist in establishing the necessary non-local, national and international links needed to access and acquire knowledge not found or generated locally. Integration into more globally distributed knowledge networks and value chains could represent one solution to the problems of 'lock-in' due to lack of innovative capacity, which eventually could place the Agder region in a low road, cost squeezing form of competition. This perspective is highly relevant for many of the largest Agder firms especially for the process industry where all large firms are owned by foreign MNCs, but also for the equipment suppliers, where e.g. National Well is American owned and Aker Solution part of a Norwegian MNC. Firms in the process industry also indicate (as the only of the four groups of firms in the innovation survey) that cooperation with other firms in the company was the third most important factor of knowledge source for innovation activity. Triple-Helix constellations can also effectively be used for lobbying and networking towards national and EU authorities to achieve research funding. The strong presence of foreign ownership could here be beneficial.

Use large industry supported by the Triple-Helix collaboration to promote industrial diversity

Use the large and international competitive industry in cooperation with other Triple-Helix actors and agencies of the RIS to promote industrial diversity. The large firms represent through their competence basis and international networks an important platform for taking on the necessary restructuring process to create a stronger industrial diversification, which should be based on the idea of related variety. This means taking the competence basis of the large firms as a point of departure and exploit these competences in newer areas through new combinations of existing knowledge or combining existing knowledge with newly created knowledge developed in cooperation with the University and/or R&D institutes such as Teknova. However, the strong presence of foreign ownership especially in the process industry could represent a restriction in these efforts, if such restructuring activities are not in accordance with the broader corporate plans.

In allowing for a stronger economic support from regional and national agencies and authorities an alternative cost approach could be applied. The idea of such an approach is to evaluate the cost of exploiting the potentials of large firms to generate related variety based industrial diversity with respect to employment growth and economic development compared to the support of entrepreneurial activity and small firms especially with respect to cultural industry. Today a large part of the regional and national support from e.g. Innovation Norway is allocated to starts-up and general entrepreneurial activity not the least within the cultural industries. This might not be the most efficient use of support in order to secure economic growth and job creation in the Agder region in the years to come.

Use cultural industry to improve people climate

An interesting question with respect to the cultural industries is if a strengthening of the this industry in the region could represent an upgrading of people climate and, thus, make it easier to attract and retain highly qualified immigrants in the region in accordance with Florida's argument (Florida, 2002), or if such policies only have relevance in larger city-regions, which in the Norwegian case means the Oslo-region.

Improve regional government/governance cooperation

In order to create a more pro-active and stronger regional government as part of the Triple-Helix constellation in the Agder region, it is very important to transcend the regional government/governance divide in the region. The Scania case, reported in the learning model 1, clearly illustrates this point. The merger of the two counties in Scania has been one important factor in enabling the regional authorities to take a much more active part in the Triple-Helix cooperation than normally is the case. Thus, securing a successful outcome of the work with the common regional development plan is an important test case for the formation of a single Agder county.

Learning models

The learning models presented below show how Triple Helix actors can work together to foster and strengthen regional innovation and competitiveness. Thus, the examples of learning models presented do not represent individual, specific policy measures but rather a good mix of various policy initiatives taken by Triple Helix actors in the respective regions in cooperation with national agencies and foreign partners. The models are all examples of mobilization and use of Triple Helix forms of resources, capabilities, organisations and institutions in various regional endowments to promote regional development.

The regions from where the examples are taken from, i.e. Scania, Sweden, North Jutland, Denmark and Norte, Portugal, all have in common not to be central region, but rather what could be called semi-peripheral regions. Furthermore, they do all have universities, which have taken a clear responsibility for the third task of promoting regional development. However, while Scania and North Jutland both are regions in highly developed economies, Norte in Portugal represents a follower region. University of Porto is however the second largest Portuguese university, and has a respected academic standard in a European context.

Triple-Helix cooperation in Scania, Sweden

Description of the approach

The Triple-Helix cooperation in Scania is one of the best examples internationally demonstrating that the Triple-Helix approach can be more than just a metaphor and be highly operative in promoting regional development through a close relationship between university, industry and regional government. While also other Swedish regions have strong research universities and international competitive industry, what is rather unique with Scania is the proactive regional government. The structural background for this the region's status as a county with relative autonomous regional governance power. The reason for achieving such a position, which implies taking over responsibility of tasks such as planning and investment in infrastructure, the hospital sector and regional policy from the national agencies in the regions, was a merger of the two original counties in Scania, Malmöhus and Kristianstad län, in the early 1990s. This relative self government position has given the county more windows of opportunity than is normally the case of regions in the Nordic countries.

Rationale and relevance of the approach to Agder

Agder is – as Scania was before the merger – split up in two counties, West and East Agder. A process of merger of Norwegian counties was supposed to start last year, but was not taken through Parliament by the Government. The two counties in Agder were among the most eager to carry such a merger through. In spite of the process being halted at the national level, the two counties still continues their efforts of achieving a merger, and have now a process of developing a common regional development plan. The example from Scania could help promoting this process when recognizing the positive impact it has had on the Triple-Helix cooperation in general, and the ability to achieve national and international funding specifically.

Results of the approach

As already indicated there have been very positive results of the merger. Here only three examples will be mentioned: the Interreg project initiated by Lund and Copenhagen universities to establish the Medicon Valley Academy/Alliance, which was strongly supported by Region Scania. This has resulted in Medicon Valley today being among the 3-4 largest biotech regions in Europe when it comes to products in the pipeline, and, thus, it ranks high in the hierarchy of global bioregions. The second example is being part of one of the three first VINNVÄXT winners. VINNVÄXT is a VINNOVA policy initiative of building regional innovation system with a ten year support to promote global competitive industries. The VINNVÄXT initiative in Scania is focused on food (functional food, convenient food, international marketing of food), which all are areas where Lund University has a strong research base. The initiative is called 'Food Innovation at Interfaces. The VINNVÄXT programme requires that such initiatives have to be constructed around a triple helix involving active participation from industry/the business community, research organisations and public administration. The third example is an effort of promoting wireless communications and internet based services in Scania and the neighboring county of Blekinge called 'Mobile Heights'. Two of VINNOVA's Industry Excellence Centres constitute the base for this effort, which is based at Lund's university technological institute, but is also strongly supported by key industrial partners, such as Sony Ericsson, and Region Scania. The national Swedish Governmental Agency for Innovation System, VINNOVA, is involved by funding the two Industry Excellence Centres over a ten years period.

Reasons for success

A successful Triple Helix cooperation requires the presence of strong and able partners, i.e. a good university, competitive industry and a proactive regional government. Scania has all these actors present in its regional innovation system. Lund university is the largest university in the Nordic countries and among the stronger in Europe, and the region has a number of international competitive industrial sectors, e.g. IT (Sony Ericsson), biotech (Medicon Valley) and the emerging food sector, which traditionally has been very large and strong in Scania, but which was in urgent need of restructuring and upgrading when the VINNVÄXT initiative was taken. However, as already said above, the proactive attitude of Region Scania has been a very important element of the success. In addition the social, spatial and institutional proximity that the regional level offers is very important in the formation of such collaboration.

Obstacles faced and response taken

The main obstacles have to do with concrete governance challenges, especially in the VINNVÄXT programme when it became operational. However, in the process of collaboration for applying for national and international funding the cooperation seems to function very well. There is many statements about how important and well-functioning the cooperation between the Triple Helix partners in Scania is.

Considerations for adoption of this model in Agder

The Agder region has two of the three elements in place for initiating the same efficient Triple Helix collaboration as in Scania. It has a new university, not as large and strong as Lund, but still a university, where especially the engineering school at the Grimstad campus has developed a close relationship with industry. The region has a number of large and international firms grouped together in clusters, the Node network for the engineering based equipment suppliers, and the Eyde network for process industry. In both these networks also regional authorities and the university take part. The Node network has also achieved status as an Arena project supported by Innovation Norway. The only lacking element is a strong and united regional government which could be achieved through a merger of the two counties. As this is something that the region is working towards, the learning model from Scania could represent important information and inspiration for achieving the same in the Agder region.

Contact details and website for further information

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b) Presentation of Medicon Valley:

Asheim, B. and J. Moodysson (2008): Medicon Valley, in cluster book from OECD (you have the exact reference, Gabriela?)

Presentation of VINNVÄXT in general (in addition to the specific presentation of the VINNVÄXT project in Scania found in the above references):

www.vinnova.se

Asheim, B. (2008): Regional Environment for Innovation and Entrepreneurship, in Potter, J, and Miranda, G. (eds.), *Entrepreneurship and Local Innovation Systems in Cantabria, Spain*. OECD, Paris, pp. 177-180.

Presentation of 'Mobile Heights': <http://www.vinnova.se/Verksamhet/Informations--och-kommunikationsteknik/Starka-forsknings--och-innovationsmiljoer/Mobile-Heights/>

Cluster emergence in North Jutland, Denmark

Description of the approach

This case presents two different cluster development stories, one mature cluster, NorCOM (wireless communication technology) with roots back to the 1960s. This was an industry-driven, bottom-up organized process, but where the university, which has very relevant, world class research within this field, has gained increasing importance for the cluster development. This example illustrates the phenomenon of a high-tech cluster being able to emerge in a peripheral region as well as pointing to the key role of university research for its further development. The other cluster is the Biomedico initiative, a broad Life Science cluster, which was started around 2000 by policy actors, encouraged by and based on world leading results of the Department of Health Science and Technology at Aalborg University and in close cooperation with Aarhus and Aalborg university hospitals. This is a top-down policy initiative in search for new industries to obtain a more diversified industrial structure.

Rationale and relevance of the approach to Agder

While the NorCOM cluster resembles the two network or cluster initiatives in Agder, the Node network and Eyde network, which both are industry driven but with (varying degrees) of cooperation with the University of Agder, the Biomedico cluster initiative could serve as an inspiration for taking advantage of the research carried out at Kristiansand hospital by the regional authorities. The NorCOM cluster could demonstrate how such clusters develop over time, and especially the increasing importance of intensifying cooperation with the regional university's engineering and basic research (with an application oriented touch) to secure innovativeness and competitiveness. The development of the cluster was further promoted by the establishment of the NOVI Science Pars by the university, regional government and the local ban, which provided location close to the university for the further expansion of the cluster. This resembles similar initiatives at Agder. As with University of Agder Aalborg university does not have a medical faculty, and Aalborg hospital cooperation with the engineering school of the university, and specifically with the above mentioned department. Thus, the same elements are in place in Agder with a hospital undertaking research and an engineering school at the Grimstad campus, even if a similar department as the one at Aalborg does not exist at Grimstad. However, possibilities might exist for establishing a similar type of competition with e.g. the IT department at Grimstad.

Results of the approach

The NorCOM cluster must generally be said to have experienced a positive development, even if this industry has had it ups and downs over the years, and is also struggling right now due to the economic downturn in the global economy. The development of the cluster illustrates the increasing importance of university-industry cooperation and also of infrastructure investment such as the establishment of the science park. The Biomedico cluster suffers under the lack of potential industrial partners in the region, even if some of the NorCOM companies are interested in medical technology research activity at Aalborg University (i.e. a related variety based relationship is starting to emerge). This means that the Biomedico cluster still primarily is a research cluster, and has not yet fully developed into being also a cluster where production is taking place.

Reasons for success/failure of the approach

The reason for success for the NorCOM cluster is an industry with a solid competence base, which has been strengthened over the years by cooperation with Aalborg University as well as with incoming FDI to the regions. The research at the university deserves to be mentioned separately, as it would have been problematic to develop the cluster without the proximity to world class research within this field. Finally, the close cooperation between the Triple Helix partners has also played a positive role in securing the success of the cluster.

The Biomedico cluster has its strength in the research activity taking place at the university as well as in the strong determination of the regional policymakers and authorities to promote the development of a life science cluster. The weakness of this cluster development is the lack of production capacity in the region, which, thus, reduces the economic impact of the cluster with respect to stimulating economic development and job creation in the region.

The obstacles faced and response taken

The obstacles for the NorCOM cluster has mostly been exogenous and caused by fluctuations in the global economy and the consequence of this for the demand of the final products of the cluster. Periods with downsizing has been dealt with in the normal Danish way of exploiting the strength of the labour market's flexibility. Concerning the Biomedico cluster there is a need for a triggering event to start entrepreneurial activity and/or the attraction of companies

from other regions or from abroad to provide the lacking production capacity. The quality of the candidates (human capital) from – as well as of the research – the regional university play a strategic role for the attraction of FDI to be successful.

Considerations for adoption of this model in Agder

The example of the Biomedico cluster shows the possible windows of opportunity for regional policy actors and agencies to take initiative. This could be relevant in order to further develop and make use of the research carried out at Kristiansand hospital. However, considerations should be undertaken with respect to also provide industrial partners for such a policy driven initiative.

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www.biomedicoforum.dk

Norte region and University of Porto, Portugal

Description of the approach

During the last 20 years a large number of private, non-profit associations or network within various fields of R&D based activities have been established in the Norte region of Portugal drawing on the research activity carried out at the University of Porto. These initiatives have been strongly policy driven with the ambition to build a regional innovation system with the university as the key node in the knowledge exploration subsystem of a regional innovation system. Of such important networks the following could be mentioned:

- IPATIMUP, Institute of Molecular Pathology and Immunology at the University of Porto with one of the four first Associated Laboratories created by the Ministry of Science and Higher Education in 2000.
- IBMC, Instituto de Biologia Molecular e Celular, is a multidisciplinary research institution.
- INEB, Instituto de Engenharia Biomedica, aims at providing interface between academia and the entrepreneurial and health sectors in the areas of Biomedical Engineering. The institute was founded in June 1989 by six institutions, including the University of Porto.
- The Health Cluster Portugal (HCP) has as its main objective the promotion and implementation of initiatives and activities leading to the creation of an international competitive and innovative national cluster in the economic areas related to health and to the improvement of health care. The cluster was established in 2008 and has more than 80 members today.
- INEGI is an interface institution between university and industry, oriented to the activities of R&D, Innovation and Technology Transfer. It was founded in 1986 as an

organisation to strengthen the liaison between the Department of Mechanical Engineering and Industrial Management of the University of Porto and industry.

- INESC Porto, Institute for Systems and Computer Engineering of Porto. Its main activities are scientific research and technological development as well as consulting and advanced training in the areas of telecommunication and multimedia, power systems, manufacturing systems engineering, information and communication systems and optoelectronics. INESC is a research institution working as an interface between the academic world and industry, service and public administration in the areas of information technology, telecommunications and electronics. It has recently been appointed as associated laboratory.

Rationale and relevance of the approach to Agder

This Portuguese case demonstrates the proactive role that policy makers and regional government can have in creating a regional innovation system building on the strength of research at the university. For Agder this might be important as an inspiration and guide for taking similar initiatives or for further develop initiatives already in place. Such initiatives could be used as a strategy for a diversification of the industrial structure based on two of the three Triple Helix actors, but with complementary assistance from potential FDIs, which are attracted to the region due to the strength of the research and the proactiveness of the regional authorities.

Results of the approach

So far the results of the many Portuguese initiatives have been positive, as Porto has been able to attract partly foreign research organisations such a Fraunhofer institute and R&D departments of foreign MNC such as Siemens within the area of information technology.

Reasons for success/failure of the approach

The main reason for success is partly the strength of the university research and partly the determination of the policy actors and agencies with respect to building a regional innovation system. The main problem of the development is the lack of production capacity as well as a lack of R&D in the business sector, which means that the absorptive capacity of the local industry is rather weak. This might results in problems of focusing the applied parts of the research activity of application oriented research.

Obstacles faced and response taken

The local policy actors and the university have followed a strategy building on three perspectives:

- to identify technology and innovations trajectories based on links between university – industry
- to identify drivers of change supporting the policy
- to initiate institutional and organizational change in order to create a well-connected RIS

It is believed that implementing a strategy building these principles will transcend the identified obstacles in the process so far.

Considerations for adoption of this model in Agder

The Agder region needs to develop towards a more diversified region economically with less dependence on the two large industrial sectors. Creating new, knowledge based economic activity often starts with a collaboration between the regional public government and authorities and the university. These examples from Porto might give insight in how such processes could be initiated and further promoted. As a learning model these examples could thus serve the Agder region well.

Contact details and website for further information

General presentation of the case: A. Almeida, A. Figueiredo and M. R. Silva: From Concept to Policy: Building Regional Innovation Systems in Follower Regions. Paper presented at seminar on 'Regional Innovation Policy', Santander, Spain, October 2008.

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CHAPTER 7

PILLARS OF A SUCCESSFUL INNOVATION STRATEGY: THE CASE OF SCIENCE VALE UK (OXFORDSHIRE)

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Description of the approach

Science Vale UK is a partnership of local and regional public authorities and private sector property developers. The partnership 'brings together the key players who are committed to achieving even greater economic success and sustainability in South Central Oxfordshire'. The objective is 'that the area establishes itself as a world leader in science, high technology and the application of knowledge'.

Science Vale UK is located to the south of Oxford in the county of Oxfordshire spanning two local districts: the Vale of White Horse and South Oxfordshire. The county is predominately rural: some 78% of the land is under agricultural use. The county has a rapidly growing population (2001: 607,000, 2007: 635,500). The Science Vale UK area has a population of about 57,000. Employment and housing growth are directed away from the city of Oxford to designated growth areas in four country towns (including Didcot) in the Science Vale UK region.

As in the Agder region, the driving force for Science Vale UK is two local authority districts (Vale of White Horse and South Oxfordshire). These have joined with Oxfordshire County Council, the UKAEA/Harwell Science Campus (which hosts the major research establishments in the county and is now being extensively developed as a science park), Milton Park (an office/science/industrial park) and the South East England Development Agency, SEEDA, (the regional development agency). The Government Office for the South East (part of central government) and the Oxfordshire Economic Partnership are observers on the initiative. Governance is the key element in the strategy. The partners comprise the Board which is chaired by SEEDA. It is project managed by the Vale of White Horse District Council. The critical elements are that the system of governance includes all the major players in the region at planning and delivery stages. For example, Milton Park as a partner is involved in the local development framework, and was therefore directly consulted before the draft was published.

Unlike Agder, Oxfordshire is notable for its dense concentration of scientific and engineering research in the public and private sector. The county has three universities (including the University of Oxford) and 7 government laboratories which are mainly in Science Vale UK. These include nuclear energy and space research laboratories, several of which are located on the Harwell Science and Innovation Campus (for example the Rutherford Appleton Laboratory and UKAEA Harwell). The Harwell Science and Innovation Campus is increasingly being transformed from a pure science to a site of innovation. In 2008, a £1bn expansion at science site was announced. This is a joint venture by a new public-private partnership UK Atomic Energy Authority, the Science and Technology Facilities Council (STFC) (responsible for the Rutherford

Appleton Laboratory, scientific research especially space exploration) and the international property group Goodman. About 10,000 square metres of laboratory, high technology industrial and office space will be developed on sites within the existing 300 hectare campus.

The number of high tech firms is increasing rapidly. In 2004 there were 3,500 firms employing 45,000, accounting 12% of county's firms and 14% of workforce. These include 114 spin-offs from the universities and national laboratories (Lawton Smith et al 2007). As a consequence, the county's (and particularly Science Vale UK's) workforce is highly skilled and mobile. Oxfordshire has the second most qualified workforce in England and Wales, and the sixth least settled county by number of people who have lived overseas a year earlier. Associated with the rise in high-tech entrepreneurship is the rapid expansion of business networks for example for supporting particular sectors and raising finance.

Milton Park, a mixed science park, office and industrial park, is the major host to Oxfordshire's high-tech firms, out-performing in this respect both the Oxford Science Park (co-owned by one of the University of Oxford's colleges) and the Begbroke Science Park (owned by Oxford University). A new innovation centre opened in 2009, providing accommodation for 60 companies. Its contributions to innovation in Science Vale UK include organising mentoring and seminars, promoting competitions e.g. Greenshoots award for small innovation businesses, hosting networks e.g. Oxfordshire Bioscience Network, encouraging spin-outs from universities and government laboratories and occasionally taking equity stakes in local companies. It also hosts training for staff, involvement with local schools and work experience for students. Its prestigious image is very important to the Science Vale UK initiative. It is already involved with the two local secondary schools. It hosts an initiative for disadvantaged children, providing office accommodation.

The Science Vale UK initiative began in 2007 when the South Oxfordshire Quadrant group was established. The first action was to commission a feasibility study. Its remit was 'to investigate 'the economic and employment growth potential of scientific research, innovation and business enterprise within the Quadrant area in southern central Oxfordshire'. The partners in this study were SQW and the Oxfordshire Economic Observatory. The consultancy report cost £49,900. The study adopted a similar approach to that commissioned by the Agder region from the OECD, but had a particular emphasis on the characteristics of comparator/competitor regions (South Cambridgeshire, Grenoble, San Diego and the Elat region: the Eindhoven, Leuven, Aachen growth triangle).

Limiting factors are that this initiative does have not short-term outcomes. Science Vale UK is looking to agree a business plan for the Learning Park in two years, and transport improvements by 2016. Funding is a major impediment to the realisation of its success.

Following the consultancy report, the next actions were to agree the components of the innovation strategy. The agreed strategy comprises three main strands: **Branding**, the **Learning Park** and **Lobbying on transport infrastructure** (each are discussed below). These are directly orchestrated by the Science Vale UK partnership as a whole. Associated aims of attracting R&D intensive foreign-owned companies (especially to Milton Park and the Harwell Science Campus) and stimulating local high-tech entrepreneurship (especially spin-offs from local universities and government laboratories) are best described as indirect as they are largely in the hands of the organisations concerned and the two property developments. The Science Vale UK innovation policy is directed at creating a supportive environment where entrepreneurship and innovation flourish and barriers to their success are reduced. It is also intended to redress Oxford-centric focus in policy-making.

Branding

Branding is central to the whole innovation strategy. The development an international profile building on the key scientific strengths in the science base, the high-tech firms and the two science property developments as internationally important locations for high-tech developments is crucial. The branding and promotion of the project is spearheaded by a website but the intention is now to establish an even bolder web presence. The SQW study stimulated considerable debate on the name within the Science Vale UK Board. In October 2008 the Board decided on the name Science Vale UK as major UK research organisations are involved. This is intended that it is seen not just an Oxfordshire Science Initiative but is an international initiative. A website was established and a branding and promotion strategy was agreed. The Harwell Science and Innovation campus and Milton Park will be major 'winners' in the strategy as it will increase the take-up of premises on those sites as well as reinforce their international profile.

The Learning Park

The Learning Park is intended to be a 'cradle to the grave learning' system of education provision. It is currently at the planning stage. The intention is to raise the level of performance of education in the Science Vale UK area, and to build in vocational training for science and industry into the teaching curriculum. The multi-million pound hub for vocational training is proposed for Didcot to fill a growing skills gap in science and technology workers. A report by the Oxfordshire Economic Partnership finds that South Oxfordshire and the Vale of White Horse employers recently experienced the greatest recruitment difficulties, 58% and 51% respectively. The occupational groups most difficult to recruit are professional/technical specialists and associate professional/technical staff. Needing the right skills is cited by 50% of employers having difficulties, though this may be underestimated as many will make do with existing untrained or qualified staff in the present climate. This affects performance, often leading to lack of innovation and loss of business. It also means employers are looking outside the County to recruit though they would rather have local people which has an impact on housing and transport. However, a quarter of those interviewed expected to take on more staff in 2009 despite the economic climate.

To address these problems, the Learning Park plan is to have secondary schools, further education and a designated science and technology centre all on one site. The two secondary schools which first suggested the idea in 2006, Didcot Girls' School, and St Birinus Boys School, would be participants. The new science and technology centre will involve Oxford Brookes University and the Rutherford Appleton Laboratory. Local industry, including the CEO from the European Laboratory of the Japanese electronics firm Sharp is involved in the initiative.

Two issues yet to be resolved are location and funding. It is not yet clear how many hectares would it need and therefore where a suitable site might be. Funding is a problem. Oxfordshire is not one of the counties covered by the national 'Building Schools for the Future' initiative as with very low unemployment, as it is not a 'problem' area. It is, however, potentially a funding stream as the argument will be that there needs to be planning to addresses future skill needs.

Lobbying on transport infrastructure

Science Vale UK is bisected by a key north-south trunk road, a road which is part of the national rather than the regional road network. It is one of the most heavily used roads in the UK and is subject to severe traffic congestion at peak periods during the day. This has an adverse effect on the costs and efficiency of firms and organisations in the area, and is a disincentive for firms which might consider locating in Science Vale UK.

To improve the situation, in 2008 Oxfordshire County Council put in a £34m bid for government funding for road and other transport improvements in SVUK (by 2016). The objective is to take local traffic off the A34. The application now has the support of the Regional Assembly, which means that it is recognised as at least a regional rather than just a local problem. County council requests for improvements to the A34 are not new. Rather they have been made for many years. In 2005 a headline in the local newspaper reported that “A34 relief 'years away”.

Rationale and relevance of the approach to Agder

The Science Vale UK approach needs to be understood in relation to the local (Oxfordshire) political, economic and social context. This in turn is directly influenced by national and regional policies targeted at economic development as well the social welfare agenda relating to housing. The aims and actions of Science Vale UK in the first instance are primarily targeted raising the international profile of the region. Longer term objectives relate to the sustainability of the project. Similar considerations apply to the Agder region.

The Science Vale UK initiative was stimulated by regional policy (South East Plan) which spells out housing growth targets. It was agreed that it is essential to promote the local economy by coordinating generation of jobs for people living in the new houses. At the same time, a regional initiative ‘Diamonds for Growth’, directed at ‘expanding the knowledge economy in the South East’, helped focus the need for local growth (based on 9 areas in the SE region). There was a concern that the focus for the Central Oxfordshire Diamond would be Oxford with southern Oxfordshire’s potential being overlooked.

The local and regional agenda were also influenced by those at national level. The Sainsbury Review (2007) “The race to the top: A Review of Government’s science and innovation policies” was influential in local thinking about economic growth being stimulated by technology transfer in Science Vale UK.

A further political factor which is important in understanding this initiative is the ‘statutory vacuum’ that has long existed in Oxfordshire: economic development is still low on Oxfordshire political agenda. It has been non-government agencies that have driven the focus on providing a supportive environment for high-tech industry to grow. There has been a lack of public-private partnerships, a lack of co-ordination on labour market development, limited foreign investment in corporate headquarters or major R&D facilities and limited integration in policy frameworks, hence the need for more ‘boundary spanning agencies’. At the regional level, the regional development agencies have limited funds for driving through major developments (see Lawton Smith 2003).

Results of the approach

Following from the feasibility study, the main results of the approach so far have been the following. In 2008 (October), the name of the area was agreed as Science Vale UK. The intention was to highlight that this is more than a local initiative. In 2009 decisions were agreed on the next two key targets: the Learning Park and the Transport strategy. Other relevant supporting initiatives are:

Oxfordshire science festival which is an annual event run by a local charitable trust, The Oxford Trust, to engage the public in the activities of firms and research organisations in the county. Didcot is hosting a series of events in 2009.

Other local environmental initiatives which signal innovative thinking include green travel planning. Buses running on biofuels operate between Didcot railway station and Milton Park, and are sponsored by Milton Park.

Reasons for success/failure of the approach

Success factors in Science Vale UK innovation strategy relate to the system of governance. Key is the founding partnership combined with political will for improving the physical infrastructure and driving forward innovation-based economic development. The system of governance involves all partners at planning stages in local development framework. Private sector involvement is critical, particularly the two property developments: Milton Park and the Harwell Science Campus. The former is embedded in the local system of governance, is an exemplar organisation held up by Science Vale UK as a model of how other organisations should operate. The Harwell Science and Innovation Campus is increasingly major site of entrepreneurship and innovation. The organisation is also major driver of the Science Vale UK initiative. Information of these two key local actors illustrates the importance of their involvement.

Obstacles faced and response taken

The major obstacles are the lack of funding and uncertainties over central government policies on housing, road improvements and the local science infrastructure. Funds available from the partners for the Science Vale UK are limited. The total budget for 2009/10 is only £75,000. The response taken to funding shortages is to lever funds through representation to regional and national policy organizations for example for the Learning Park initiative. The national/regional importance of the area in the international economy is stressed.

Considerations for adoption of this model in Agder

Considerations for this model for the Agder region relate to building on local strengths and branding them nationally and internationally. The OECD report highlights a number of notable assets. These include human capital resources, the creation of the University of Agder, and as in Science Vale UK, both the business and policy community becoming aware of the potential for improving the innovation capacity of the region.

The practical application of the Science Vale UK is that a coherent partnership arrangement should be set up which decides the system of governance. This partnership can then determine priorities in the innovation strategy. It should involve the local business parks as they of all private sector organisations are most likely to benefit through increasing business. An early key decision should be on branding the region. A name such as the 'Knowledge and Innovation Belt' suggested at the February workshop in Agder will have international cache. As in Oxfordshire, skills are likely to be a second key focus of policy.

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CHAPTER 8

THE PROCESS TO CREATE AN INNOVATION STRATEGY: THE CASE OF WESER-EMS, GERMANY

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Description of the approach

The region of Weser-Ems in north-western Germany was the first region to develop a regional innovation strategy supported by the European Union in 1998. With 15,000 Km² it has a comparable land size to Agder (16,000). With a population of 2.5 million inhabitants it is for German standards a relatively thinly populated region (162.7 inhab/km²). The region corresponds to the NUTS II- level.

Weser-Ems is located in the most western part of the state of Lower Saxony (Niedersachsen). The region consists of 12 counties (Ammerland, Aurich, Cloppenburg, Emsland, Friesland, Grafschaft Bentheim, Leer, Oldenburg, Osnabrück, Vechta, Wesermarsch and Wittmund) and five cities (Delmenhorst, Emden, Oldenburg, Osnabrück and Wilhelmshaven). Weser-Ems used to be a so-called administrative district (*Regierungsbezirk*), an administrative level between the state (*Land*) and counties (*Kreise*). The administrative district of Weser-Ems was until its abolishment, in 2005, the main initiator of the regional innovation strategy. Funding for innovative projects often comes from Hanover, the capital of the state of Lower Saxony.

The region has three relatively young universities in Oldenburg, Osnabrück and Vechta and two polytechnics (Osnabrück and Oldenburg/Ostfriesland/ Wilhelmshaven). Of the 120 research institutions in the Lower Saxony state, 90% are concentrated in the eastern triangle Hanover-Göttingen-Braunschweig. Hence, there are only very few non-academic research institutions in Weser-Ems. This is seen as a main bottleneck for innovative activities in the region. Traditionally, this is a relatively structurally weak region with a relatively low GDP per capita. Also the educational level of the age-cohort 25-64 years is below the national average, as are the R&D-investments as share of the GDP.

The main impetus to start to develop a regional innovation strategy can be seen in external financial support from the European Commission and the state of Lower Saxony. Particularly the launch of the RITTS/RIS programmes of the European Commission was the main reason why the regional stakeholders met regularly between 1995 and 1997 to discuss a submission of a proposal to Brussels. Weser-Ems was selected by the European Commission as one of 19 model regions in Europe to develop a regional innovation strategy.

The actual formulation of the regional innovation strategy went through a bottom-up procedure in which about 1,000 regional stakeholders worked in 15 working groups. The

thematic working groups focused on themes such as ICT, environment-friendly transport logistics, energy industry, endogenous innovation potential and renewable resources. The regional innovation strategy was formulated on the basis of a strengths-weaknesses analysis that was carried out by experts from the relevant regional groups and institutions. The aim of the regional innovation strategy is to increase growth and employment in the region Weser-Ems through the support of innovativeness and competitiveness of companies. The regional innovation strategy covers the whole area of the administrative district Weser-Ems.

In order to implement the actions of the regional innovation strategy the RIS project office was set-up with the financial support from Brussels and the state of Lower Saxony. The RIS project office runs the day to day business and tries to acquire funds from the European Commission, the state government of Lower Saxony, as well as from the federal government. From 1999 to 2001 there has been financial support from the European Commission (EFRE-programme RIS+) to carry out the strategy. After 2001 the RIS project office has managed to acquire funds on a more ad-hoc basis from various sources and spatial levels (supranational, national, regional). The annual budget of the RIS project office only based on membership fees is about 300,000 €; the total budget including project money strongly varies.

In addition to the RIS project office, a steering group of 24 members regularly meets to monitor the work done by the RIS project office. The steering group members consist of local authorities, chambers of commerce, industry association, large companies, as well as universities and polytechnics. The steering group also plays an important role concerning evaluation. They assess the effects of the proposed projects on the regional economy in general and on local small and medium-sized enterprises in particular.

The operative basis of analysis and project formulation was formed by three sub-regional conferences, Land Oldenburg, Osnabrück-Bentheim-Emsland and Ost-Friesland. The role of these sub-regional conferences as bottom-up processes is to develop the content of a regional innovation strategy and policy. This type of conferences can also be found in other German states, such as North Rhine-Westphalia (Gualini 2004). At this sub-regional level the main actors involved in innovation, such as companies, chambers of commerce, local authorities, universities, polytechnics and public research institutes regularly meet to select and prioritise projects. Selection criteria for the funding of projects are among others: a high relevance for the regional economy, existing potential for innovation in the region, significant potential for growth and a contribution to employment creation.

The bottom-up component is reinforced by the participation of regional councils, which consist of the main regional stakeholders, including both private and public partners, who together seek to foster local and regional development in their regions. Public grants are given to the regional councils as technical and organisational support to carry out public relations and provide the public with broad information. They also provide regional firms with information about the regional policy programmes and the ways on how to obtain subsidies. This includes advisory workshops and organising events, but also the acquisition of projects. Furthermore these regional councils help with the monitoring and assistance of regional projects, including projects supported in the framework of the regional innovation strategy. Project initiators are assisted in the process of developing applications and are accompanied until approval. The regional councils interact closely with the local business development offices and hence try to build up networks of all relevant actors.

Rationale and relevance of the approach to Agder

In general, the rationale to devise and implement a regional innovation strategy lies in more effectively organising and co-ordinating existing innovation policies and institutions. In many regions, policies and institutions can be found that are initiated and financed by ministries and administrations at several spatial levels (local, regional, national, supranational). Lacking co-ordination at the regional level leads to overlap and missed chances of synergy. Extensive and well co-ordinated interaction between regional institutes and policies makes them to be more than just the sum of parts. Moreover, by carefully analysing the strengths and weaknesses of the policies and institutions in the region, one can devise new institutions and policies that can reduce existing gaps and deficits in the region.

The Weser-Ems region has some similarities with the Agder region; it is a semi-rural area, with a rather peripheral location in Germany; it has a few medium-sized cities and three relatively small and young universities, which are actively involved in the regional innovation strategy. Due to its coastal location it has some maritime and tourism activities, but also a strong agricultural sector and food processing industry. The process of developing a regional innovation strategy seems to be of high relevance to Agder, which seems to suffer from a too fragmented, thick institutional tissue and a lack of bundling and prioritising. Moreover, the way the bottom-up approach of developing and selecting supported projects seems to fit to the consensus-oriented egalitarian society of Norway.

Results of the approach

The main outcome of the strengths-weaknesses analysis was that the region lacked research and development capacities in some important locally-embedded technology fields. The main initiative to tackle this problem was to set up the so-called competence centres. These centres were established on the initiative of university professors, researchers at public research establishments and researchers in local companies. The centres act as observers, analysts, triggers and suppliers of innovations, the latter on the basis of joint research projects. Often the staff involved in the competence centres and projects are financed by their main employer, such as the chamber of commerce, university or public research institute. If they work successfully and can foster technology transfer, spin-offs and entrepreneurship a fully fledged cluster can be the result in the future.

Since 1998, the following competence centres have been created: food industry (NieKE), traffic and logistic (LOGIS.NET), renewable resources (3N), future power supply (RIS Energy) and health care management industry (GewiNet). As a successful example, 3N is the main competence centre and contact partner for information about renewable resources and bio-energy in Lower Saxony. It gives advice along the value added chains about plant breeding, crop production, harvest and logistic, processing and process engineering, as well as the commercialisation of products. It is a platform and expert intermediary between industry, science and public administration. Other activities carried out by this competence centre include the acquisition, control and coordination of research projects, the evaluation and development of technical facilities/ facilities of bio-energy, statements, reports, evaluations, feasibility studies, the supervision of cross-linked internet platforms (3N/NaRo.Net/BEN-Online/RIKO-databank), public relations, trade fairs and expositions. It also regularly organises congresses, expert conferences, workshops and training courses.

In addition to competence centres as the core element of the regional innovation strategy, other individual projects are supported, as well, on the basis of public-private partnerships. Examples are the “youth for innovation” (y4i) project, which promotes innovation in schools, and the “impact assessment systems and methodologies for innovation excellence” (IASMINE) project, which investigates new methods to evaluate innovation strategies in an international

comparative way. The regional innovation strategy in Weser-Ems has realised an increase in linking knowledge resources and thus an increase in knowledge transfer also with regional companies.

Overall, due to the regional innovation strategy a broad and sound consensus among the actors in the Weser-Ems region has been achieved. According to Kipp (2007) this EU RIS pilot project marked the beginning of an innovation-oriented process of regionalisation.

Reasons for success/failure of the approach

All in all, the RIS/RITTS programme of the European Commission led to the initiative to develop a regional innovation strategy in this relatively peripheral and structurally weak region. The core element of this strategy, namely the competence centres, has set in motion a development towards clusters, although it has become clear that the road towards clusters is long. Due to the regional innovation strategy the relatively few endogenous innovation potentials that are available in this region are better and more efficiently used and fostered. However, recently due to changes in governance structures, namely the abolishment of the administrative district, the regional innovation strategy seems to be institutionally somewhat weakened in the Weser-Ems region (see below). Moreover, due to a lack of transparency concerning evaluations of the regional innovation strategy, it is hard to assess the real impact of the strategy on regional competitiveness, innovativeness and economic growth.

The conception of the competence centres is positively assessed by the main innovation actors in the region, although it has been criticised that the establishment often has taken several years. The success of individual centres strongly depends on the motivation of the involved actors. The lack of incentive structures has been criticised.

The obstacles faced and response taken

The main obstacles faced are related to changes in governance structures. In 2005 the RIS project office converted into a new organisational structure. It became the foundation of “Weser-Ems – Regionale Innovationsstrategie e. V.” (RIS Weser-Ems) in the form of a professional association. This change is related to the abolishment of administrative districts (*Regierungsbezirke*) in Lower Saxony. After the abolishment of the administrative district Weser-Ems in 2005, RIS Weser-Ems got a new organisation structure. The counties, cities, large companies, chambers of commerce and higher education institutes have set up professional association with the name Regionale Innovationsstrategie Weser-Ems. With the change of organisation structure, the RIS project office also moved to premises of the energy company EWE AG in Oldenburg, which seems to have got a larger say in the organisation. Accompanying this organisational change means also a stronger focus of support on the needs of the regional economy.

In addition, the guiding themes have been newly formulated and include now five industries: ‘food industry’, ‘logistics and transport’, ‘renewable primary products’, ‘future energy supply’ and ‘health, wellness and tourism’. Three main themes that cut across these five guiding themes are ‘modern information and communication technologies’, ‘technology transfer’ and ‘training and qualification’.

In the framework of planning for the EU structure funds support period 2007-2013 there were plans to give RIS Weser-Ems an autonomous regionalised budget of about 20 million EUR. However, the state of Lower Saxony decided to give each individual county a sum of 5 million EUR which should include co-financing. This meant a blow for the continuation of financing of a regional innovation strategy. Although the state of Lower Saxony expects the counties to finance cross-border innovation projects with these funds, in reality they use the funds to support their

own small and medium-sized enterprises. The upshot of this has been an increasing fragmentation of funds and a weakening of the regional innovation strategy.

According to Kipp (2007), who interviewed the main innovation actors, RIS Weser-Ems certainly has strengthened the networks of innovation partners in the region. The bottom-up process behind the strategy that is mainly based on existing endogenous competences and organisations is certainly the main explanatory factor behind the strength and enthusiasm of the innovation networks. RIS therefore has a broad backing from innovation partners in the region. Despite this broad backing, institutional and governance reorganisations such as the abolishment of the administrative district and the reorganisation of the distribution of EU funds, have recently reduced the capacity to act for RIS Weser-Ems. Many important actors in the region fear a further decrease in importance of RIS Weser-Ems in the future. Others, on the other hand, see in RIS Weser-Ems the last trump card local authorities have in north-western Lower Saxony after the abolishment of the administrative district. The challenge for RIS Weser-Ems in the near future will be to develop concrete and successful innovation projects from which all counties in the region will benefit.

Considerations for adoption of this model in Agder

Given the fragmented institutional tissue of the Agder region and the lack of critical mass in some industrial and technological areas, the regional innovation strategy of Weser-Ems seems to have elements that could be considered to adopt in Agder. Particularly the bottom-up process that led towards the strategy and its main outcome, the competence centres, seems to be a promising approach for Agder. As written above, the way the bottom-up approach of developing and selecting supported projects seems to fit to the consensus-oriented egalitarian society of Norway. It will help to raise enthusiasm among innovation actors in Agder to develop a regional innovation strategy and it will help to prioritise projects in a consensus-oriented manner. The main incentive to develop the strategy in the Weser-Ems region, however, was the support programme of the European Commission, an opportunity that is lacking in Norway. In Norway, the central government might play an important role in developing incentives for regions such as Agder to develop a regional innovation strategy.

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CONCLUSIONS

In the knowledge-based economy, entrepreneurship and innovation are of fundamental importance to regional economic growth, particularly in developed cities and regions across the OECD. In the current context of financial crisis and economic recession, it is essential for local and regional governments to define and pursue an innovation and entrepreneurship strategy to meet the short-term imperative of weathering the crisis while ensuring long-term support for a broader economic development plan that will underpin growth during the recovery. In addition to this challenge, globalisation has enlarged the market and global competitors are putting pressure on mature and emerging economic sectors in terms of prices and the introduction of innovative products and services. Innovative and entrepreneurial activities that increase efficiency and product differentiation are therefore essential to face these challenges. It is important that appropriate policy support is designed and implemented to address the problems affecting firms and the local environments in which they operate in order to maintain jobs and economic growth locally and to compete in the global markets.

Agder has launched an important and ambitious multi-stakeholder exercise to define and implement an innovation and entrepreneurship strategy across the region that will provide a framework for future policies. Public authorities from both the East and West counties, together with representatives of the private sector, the University of Agder, and various local stakeholders are working together on a regional plan that will set the guidelines for the economic development of the region in the long run, based on knowledge-intensive activities. The Agder VRI Programme has been the basis for a first round of discussions to better understand the region's innovation assets and challenges, but some regional capabilities appear to be underexploited or need to be strengthened in order to achieve the expected results.

Agder is in a position of considerable strength in terms of its human capital and labour market performance, thanks notably to a highly-qualified workforce. Also, the presence of mature and well reputed leading companies in world niche markets is an important asset for the region. In terms of regional co-operation and political will, there is a remarkable tradition of collaboration among people and organisations in the Agder region, including during hard times, which is reinforced by the establishment of several notable formal regional partnerships across the two counties.

In addition, the region benefits from an important share of immigrants which offers the opportunity for a broadening of the region's skills base and for the diversification into new economic activities and sectors. Regarding its institutions, Agder hosts one of the largest hospitals in terms of regional research activity in Norway. Also, the recent upgrading of the University College to University status provides the opportunity to enhance the formation of higher level skills and to attract international students to the region, contributing to the pool of highly qualified skills. The University has therefore various opportunities to further develop its networks nationally and abroad, as well as its third stream income to meet new demands.

As in many developed regions across the OECD, the presence in Agder of well established institutions working collectively to achieve regional economic growth strategy is not easy to coordinate. Internationally, one of the most important problems of local innovation systems is weaknesses in linkages between universities and industry. This is also the case in Agder, where

an element of the origin of the problem is the relatively recent status of the University. But also, the business sector is not making full use of its capacity to influence the region's economic development strategy and to contribute to reshaping the region's vision. The presence of many actors and institutions in such a small region, without clear leadership, leads to some duplication of agencies and organisations, which individually become too small and insufficient. The region's strategy seems then to be unclear, and the vision limited, without the benefit of emerging efforts to assemble and co-ordinate the region's development actors.

The principal conclusion of this review is therefore that the East and West counties efforts to collaborate in a common innovation and entrepreneurship strategy for the region should be maintained. The challenges of entrepreneurship and innovation should be tackled in a joint manner between the East and West Agder counties and with the participation of other key stakeholders. A shared leadership is more likely to succeed, but the personal commitment of top-level individuals such as city mayors, university rector, Chief Executive Officers of leading industries, with a mutual trust, will be essential in the further development of the Agder entrepreneurship and innovation system.

The leaders in the region need to recognise the weaknesses and opportunities ahead, and seize the moment to respond to the economic challenge of shifting to the knowledge economy. The leaders will therefore need to undertake broad regional economic foresight and scenario research to understand future economic policy needs and design appropriate responses. Based on this analysis, the leaders should seek to create a regional innovation and entrepreneurship strategy to underpin the broader regional plan, and should show leadership by supporting and implementing the strategy. This strategy will serve to emphasise the critical role of innovation and entrepreneurship to quality of life, focus efforts in drawing down national funding for research, innovation and entrepreneurship, increase co-ordination and synergies among local public actors and mobilise the company sector.

Regional leaders will also need to understand the likely future development of the economy as a whole and its sectors in order to define customised actions. In many ways Agder is starting from a good base because it has many positive experiences that can be developed and integrated into future policies and does not need to 'reinvent the wheel'. For instance, the initiative to create a joint regional plan between East and West Agder is an extremely positive commitment to move forward in a collaborative manner that builds on other cross-county collaborations in the past. Other examples such as the public response to the downsizing of Ericsson and the public-private co-operation in the NODE network could be generalised to support this kind of collaborative and proactive approach.

Building on these, the leaders should aim at improving the design and delivery of economic policy support by creating mechanisms for shared strategic decision making, prioritising the most important actions and actors, and improving the links between different policy actions. A clear vision of the regional needs, of the current resources available and the existing gaps in the system will be needed in order to maximise the impact of the strategy. Finally, it will be important to set out and communicate a vision for the future economic development of the region in consultation with industry, the University and other players. A lack of internal and external communication could put the regional efforts at stake.

This OECD report should contribute to the debate. The recommendations have been designed to assist policy makers and local stakeholders in responding effectively to the challenges and to be integrated into forthcoming policy plans for the region. The following box sets out the recommendations made in this report in summary form. These recommendations highlight key actions that should be undertaken in each of the five thematic areas of the report, namely human capital, the business sector, research organisations, institutions and governance and regional endowment. The recommendations represent a set of activities that the East and West Agder

counties and other key stakeholders may pursue to reinforce the entrepreneurship and innovation activities in the region. The full details are available in the chapters in the body of the report.

Box 9.1. Summary of recommendations

Human capital

- Create a stronger culture of lifelong learning.
- Increase the responsiveness of the education and training system.
- Increase rigour in the vocational education and training system.
- Encourage mobility between the public and the private sector.
- Integrate women more strongly in entrepreneurship and innovation activities.
- Actively attract and retain international students to the University.
- Make more and better use of the immigrant population in the region.

The business sector

- Support entrepreneurial activity in the University.
- Create a unified entrepreneurship support system.
- Facilitate spin-off development.
- Ensure financial provision for entrepreneurs.
- Understand the needs of the different segments of businesses.
- Support innovation with 'soft' techniques and networks.
- Integrate into more globally- distributed knowledge networks.

Research organisations

- Develop the "third stream" of the University.
- Build stronger synergies between the two University campuses.
- Define a clear image and role for the University in the region.
- Strengthen University-industry links.

Institutions and governance

- Assess and organise the actors in the innovation system.
- Define jointly the "New Common Goals for Agder".
- Develop a communication strategy.
- Leadership should be identified and supported.

Regional endowment

- Combine support of science and technology innovation with a broader-based local innovation policy.
- Promote industrial diversity through related variety strategies.
- Integrate Cultiva into a broader tourism strategy.
- Define and place the "Agder Brand" in the people's mindset.
- Bring Agder to the international scene and build international links.

ENDNOTES

¹ Chief editor. This paper was written in collaboration with Gudmund Berg, Roger Normann, James Karlsen and Arne Isaksen from the University of Agder. This working paper is a part of a research process and should not be interpreted as the final result. The working paper has been cleared through the project leader but the author(s) is solely responsible for its contents. It is not permitted to cite the working paper without the expressed approval of the author(s).

² www.statbank.ssb.no

³ The same numbers are also found in table 1.1 for the yearly National Accounts statistics on county level). The basis for the figures of the gross product on national level is the table 05112 in the section for National Accounts statistics. (The two tables are equivalent, but the table 05112 gives the national numbers directly.

⁴ <http://tinyurl.com/5d4nh2>

⁵ Agder Research: Research at Agder, FoU report, 2009.

⁶ www.siva.no

⁷ Innovasjonssystemet på Agder. Institusjoner med innflytelse i innovasjonsprosesser i bedriftslivet på Agder. By Elisabet S. Hauge, Halvor Hulaas og Roger Normann, Agder Research. Prosjektrapport nr. 24/2002

⁸ “FORNY is a joint programme between the Research Council of Norway and Innovation Norway. It was established as a programme in 2000, but has existed as a project since 1995. The programme is financed by the following ministries: Trade and Industry; Local Government and Regional Development; Education and Research; Fisheries and Coastal Affairs; Agriculture and Food. The actual target group of the programme is the researchers themselves. However, instead of targeting the researchers directly, FORNY works through the institutions that employ them, the technology transfer offices of these institutions, and a selection of their cooperating innovation companies and science parks. Thus, the target group of the FORNY programme consists of universities, colleges, research institutes, university hospitals and, on certain conditions, individual researchers or small research groups.

The programme offers four kinds of funding:

- Funding of infrastructure activities, i.e. activities aiming to make researchers and research institutions focus on the commercial potential of research results
- Funding of commercialisation projects, i.e. the process of establishing a new company or a licence agreement based on a research based business idea
- Funding of verification of technology, i.e. proof of concept
- Scholarships to researchers which will enable them to focus on the commercialisation project instead of their regular work

In addition, FORNY offers bonuses for successful completion of commercialisation projects.

The FORNY funding can cover a maximum of 50% of the costs related to the various activities. Information about institutions commercialising R&D with funding from FORNY can be found to the left, under "Institutions." (Source: Norwegian Research Council, web page: <http://www.forskningsradet.no>)

⁹ The chemical manufacturing industry and metal production (NACE 24 and 27) have about 2500 jobs in Agder, while the process industry firms in the sample have more than 1900 jobs. Manufacturing of machinery and equipment (NACE 27) includes about 2800 jobs in Agder, and the equipment suppliers in the sample have nearly 2500 jobs. As regards the ICT industry, the sectors Office machinery and equipment, Electrical machinery and apparatus, Radio, television and communication equipment and apparatus, and Computer and related activities (NACE 30, 31, 32 and 72) includes 1900 jobs at Agder, and the sample of ICT firms in the survey includes 750 jobs.

¹⁰ Source: Innovasjonsundersøkelsen 2006 (The Innovation Study 2006), Table 11.3a. Statistics Norway

¹¹ Works and publications of the Centre for Advanced Studies (Director, Prof Philip Cooke) <http://www.cardiff.ac.uk/cass/>

¹² The publication of EURADA (European Regional Agencies Association): Good practices in Economic Development (Myths, usefulness, identification and best use prepared under the EU project INNOCOACH (RIS-NAC accompanying measure) is an interesting practical synthesis of economic development management approach

¹³ Mechatronics or Mechatronics is the synergetic and systemic combination of mechanics, electronics and real time informatics which is commonly represented by the figure here after. It concerns the complete chain captors-actuators and is impacted by computing methods and sciences, modelling and simulation, as well as by system dynamics, micro and nano-technologies.

¹⁴ Helge Reøde: conversation with the author Dec. 9th, 2008.

¹⁵ Lean Manufacturing: Lean Manufacturing comes from the Toyota Production System and its key aim is to increase the value-added work by eliminating waste and reducing incidental work. The technique often decreases the time between a customer order and shipment, and it is designed to radically improve profitability.

¹⁶ Abstract from: Isaksen A. (2001), The Ericsson consolidation attempt: An illustration of local power and opportunity in a global economy. Canadian Journal of Regional Science/Revue canadienne des sciences régionales, XXIV:1, 101-120.

¹⁷ Entropy in physics (thermodynamics) measures the unavailability of a system to do work.

¹⁸ Entrepreneurship policy In the Nordic countries – perspectives of the development since 2003, Anders Lundström (editor), September 2008.

¹⁹ Personal work of the author in the framework of a European project VERITE (<http://www.e-innovation.org/>)

²⁰ OECD publication: Science, technology and industry 2008 – ISBN 978-92-64-04995-6 (French issue)

²¹ <http://ec.europa.eu/entreprise/leadmarket/leadmarket.htm>

²² OECD review of innovation policy, see note 12

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- 23 Co-ompetition is the main characteristic of the clusters. Co-ompetition means co-operation, as long as the market is not close (up-flow collaborative research) and competition as soon as the market is visible (process, product, services design...).
- 24 France updates every five years such a key technologies exercise and regional implementations are quasi systematic. See: http://www.industrie.gouv.fr/techno_cles_2010/html/sommaire.html (only in French).
- 25 Special data processing for the Agder region made for the author by BAK, Basel Economics, www.bakbasel.com. BAK Basel has made two full studies for the Hordaland and for Oslo (these studies are available on demand).
- 26 Commission staff working document – Accompanying document to the Communication from the Commission on the European Competitiveness Report 2008 [COM(2008) 774 final]
- 27 Personal work of the author together with Aeriades (Cluster for Aeronautics and Space of Lorraine)
- 28 Basque Country Cluster Approach, Juan Manuel Esteban Gorostiola, Co-ordinator of the cluster policy, Basque authority, http://www.ecluster.it/ecluster/export/sites/ecluster/download/conference/juan_esteban_basque_cluster_policy.pdf
- 29 Abstract of a recent study made by Technopolis for the Evaluation of the Regional Programme of Innovative Actions of the Region of Midi-Pyrénées, December 10, 2008
- 30 Personal work of the author in the framework of a European project VERITE (<http://www.e-innovation.org/>)
- 31 Lazzeroni and Piccaluga (2003) identify four missions for the university: as a knowledge factory in its research role, as a human capital factory in its teaching role, as a technology transfer factory in its interaction with industry, and as a regional development factory in its territorial role.
- 32 Clark (1998) provides data on third-stream income (other than core support and funding from research councils) at five European universities. By 1995, third-stream Warwick had gone from 0.6% in 1970 to 47%, Twente from 7% in 1970 to 21%, Strathclyde from 14% in 1970 to 51%, Chalmers from 14% in 1980 to 20%, and Joensuu from 3% in 1980 to 27%
- 33 Teknova is funded equally by GE Healthcare, Elkem Solar, Aker Kvaerner MH, Devoteam Telecom and JB Uglund Holding, together with UiA. See <http://www.nrk.no/nyheter/distrikt/sorlandet/1.4211653>.
- 34 University of Agder (2007) Degree programmes in English http://www.uia.no/en/portaler/student_og_studier/study_programmes/degrees_in_english.
- 35 University of Agder (2008) Research/PhD Programmes lists 7 PhD programmes, as well as a planned programme in Popular Music; see http://www.uia.no/en/portaler/forskning/ph_d_utdanning.
- 36 See News: Mechatronics 2007 http://www.uia.no/en/portaler/om_universitetet/teknologi_og_realfag/ingenioervitenskap/mekatronikk/nyheter2007.
- 37 <http://www.uia.no/no/portaler/aktuelt/nyhetsarkiv/xstrata>.
- 38 http://english.nifustep.no/norsk/institutter/agderforskning_as.

39 See www.sshf.no/artikkel.aspx?m=263

40 *Sørlandet Hospital HF - care when you need it the most!*
http://www.sshf.no/5mai08_engelsk_uHZJt.pdf.file

41 The other (internal) University Board members include: the Rector, three elected academic faculty members, one elected administrative staff member, and two student members. See the Google translation of the web page: *eksterne - Universitetet i Agder*: www.uia.no/no/portaler/aktuelt/nyhetsarkivet/eksterne.

42 http://www.uia.no/en/portaler/om_universitetet/teknologi_og_realfag/ingenioervitenskap/mekatronikk

43 http://www.uia.no/en/portaler/om_universitetet/oekonomi_og_samfunnsvitenskap/institutt/utviklingsstudier

44 The campus in Grimstad retains its Agder University College identity in April 2009. See Agder University College, Campus Grimstad, <http://grimstad.hia.no/english.htm>. Even if this site is not part of the new uia.no web site, it is reachable by Google, the most common means of finding information on the web, and should be removed from the Internet servers. The same problem exists for web sites of the Centre for Entrepreneurship.

45 http://www.cultiva.no/Foresight_innen_opplevelse

46 http://www.uia.no/en/portaler/om_universitetet/helse_og_idrettsfag_1

47 See <http://www.gse.harvard.edu/~ppe/highered/>

48 A globally distributed knowledge network is ‘a systemically coherent set of knowledges, maintained across an economically and/or socially integrated set of agents and institutions’ (Smith, 2000, p. 19).

49 The distinction between analytical and synthetic knowledge bases was originally introduced by Laestadius (1998, 2007) as an alternative to the OECD classification of industries according to R&D intensity (e.g. high, medium and low tech) arguing that knowledge intensity is more than R&D intensity (e.g. that engineering based industries such as paper and pulp also is knowledge intensive even if it does not show up as high-tech industry). It has been further developed in ASHEIM and GERTLER (2005) and ASHEIM and COENEN (2005) to explain the geographies of innovation for different firms and industries using knowledge bases to show the broader organisational and geographical implications of different types of knowledge (e.g. how innovation processes are organised, patterns of cooperation, locational aspects and importance of proximity). The idea to distinguish between analytical and synthetic knowledge bases in this way was developed at a workshop in Lund in November 2001, organised by Björn Asheim and also involving Gernot Grabher, Aage Mariussen and Franz Tödting, in preparation for a TSER project entitled ‘TEMPO’ to the 5th Framework Programme of the EU. At this workshop the original analytical-synthetic distinction was expanded with a third category, symbolic knowledge base, to cater for the growing importance of cultural production (ASHEIM, COENEN, MOODYSSON and VANG, 2007). We acknowledge our debt to the above mentioned colleagues in the process of developing the concepts and analytical approaches.

50 Ideal types are a mode of conceptual abstraction where the empirical input constituting the ideal types exists in reality, while the ideal types as such do not.

51 GUILIANI (2005) and GUILIANI and BELL (2005) confusingly refer to ‘level of competence’ as ‘knowledge base’ instead of using the term ‘competence base’ to avoid misunderstandings.

52 This was before the global financial crisis, but even now during the crisis the Nordic countries are among the best performers.

53 In addition to the distinction between the two modes of innovation the normal indicators of innovation inputs (R&D expenditure and PhD candidates) and outputs (number of patents) are clearly most relevant for the STI mode of innovation, and even not for all branches dominated by this mode either. Patents are more relevant for biotech firms than for ICT firms, and moreover, it is problematic to refer to ‘patents’ as an innovation output. Patents record that an invention has taken place, but this is not the same as innovation understood as the commercialization of inventions (i.e. bringing the patented product of process to the market).

54 In contrast to R&D work geographical proximity is not important for the manufacturing of the many parts used in the final assembly of the equipment as there, at least in principle, should be no iteration in carrying out such operations.

55 In order to illustrate the importance of these ‘bridging’ mechanisms even further we shall give a concrete example taken from a large, international company that is world leading within its area (Aker solution producing drilling equipment for offshore oil and gas production. Together with National Well, located next to Aker just outside Kristiansand, they supply around 90% of the global market for offshore drilling solutions). This is an engineering company whose products are based on a synthetic knowledge base with all the typical characteristics of this knowledge base: problem-solving and custom production based on interactive learning with customers and suppliers. Knowledge is partly codified with a strong tacit component, and is clearly context-specific. Core competence of the company is to comprehend the complex construction process of the equipment in a holistic way. The point is not to understand the individual ‘machines’ being needed, but to understand the individual machines as part of a system. This is a very complicated process with more than 1.000 different steps, which clearly underlines the problem-solving and custom oriented production of a typical synthetic, engineering based company. This is a good example of the importance of tacit, context (i.e. product)-specific knowledge as one of the most important sources for sustaining the firm’s competitive advantage.

When asked about how they organized their innovation activity the R&D director of the company made an important distinction between *application development* (‘machine’ development) and *technological development*. *Application* development means solving concrete problems in connection with building the specific equipment for customers. This is carried out drawing on internal engineering competence as well as in interaction with suppliers and customers, and is, thus, an example of the DUI mode of (incremental) innovation. In addition professional R&D firms (consultancy firms) domestically and abroad are used. *Technology* development means development of more general platform technologies, which represents the technological basic competence for carrying out application development. While the application development is only made in-house or in user-producer relationships, technological development takes place in cooperation with (technical) universities as applied research projects, and represents, thus, the STI mode of innovation but still based on synthetic knowledge.