

**OECD/IMHE project**

**Supporting the Contribution of Higher Education Institutions  
to Regional Development**

**Self-Evaluation Report:  
Jutland-Funen, Denmark**

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## 0. INTRODUCTION

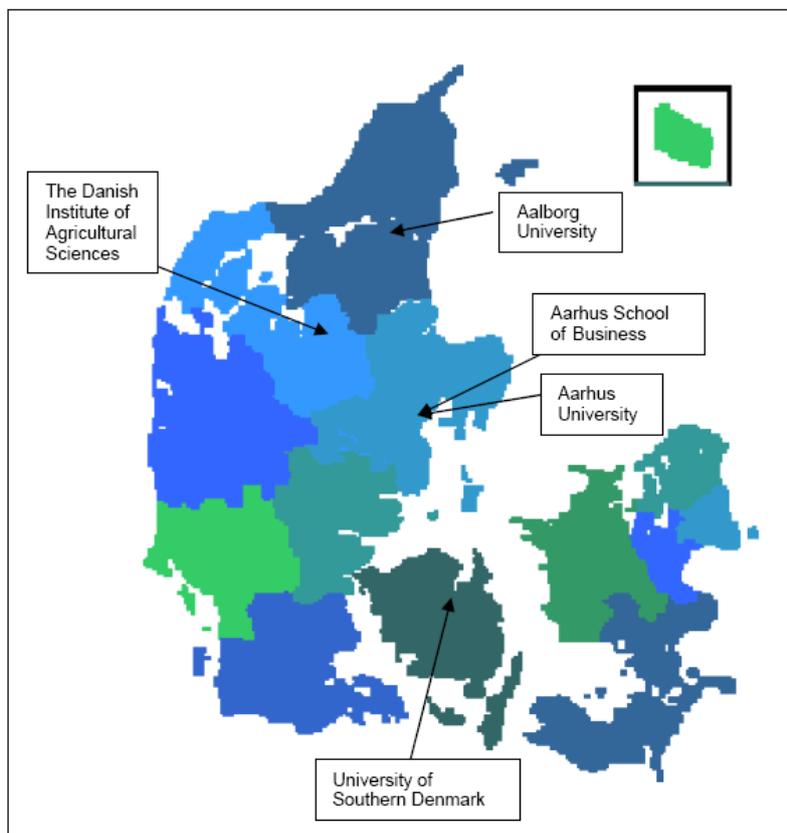
This report represents a combined analysis of the contribution of higher education institutions and research for regional development in the Jutland-Funen region of Denmark. In all, five research and educational institutions from the Jutland-Funen regions have taken part in this analysis. These are the University of Southern Denmark, Aarhus School of Business, the University of Aarhus, the Danish Institute of Agricultural Sciences at Foulum, and Aalborg University. These five institutions have compiled constituent reports (appendix 1-5) containing a review of the kind of impact the individual institutions have had on regional development. The constituent reports form a substantial part of the background material for this combined report and were developed by the individual institutions, both on the basis of internal studies, and on the basis of a dialogue with external partners, coming typically from municipalities and county authorities, local businesses and other local educational institutions. The five participating educational research institutions enjoyed ample room for manoeuvre in the creation of the constituent reports, though a common thread for all five reports was that four overall questions were addressed:

1. How do the university's research programmes contribute to regional development?
2. How do the university's teaching and degree programmes contribute to the regional labour market?
3. How does the university contribute to the social, cultural and environmental development of the region?
4. How can the capacity for regional co-operation be developed in the region?

A number of limitations were placed on the self-evaluation report, which is important to note here. The first limitation is on the range of research and educational institutions included in the self-evaluation study. This has led to a sole focus on public institutions offering research-based teaching to their students and postgraduate PhD students. In other words, there is a range of short and medium cycled higher education institutions that do not feature in this self-evaluation report. This is in spite of the fact that these institutions maintain close contact with groups and individuals in their surrounding community. At the same time, however, if all higher and further education institutions in the Jutland-Funen region were to be included in the self-evaluation report, the number of institutions would become so large that the report would become unwieldy and focus would be lost. We have, therefore, decided only to include those institutions where research is also being carried out, and which feature in the Science and Enterprise Network (ForskerKontakten).

A number of clarifications are necessary in relation to the actual regional limitations applied to the subject matter of this report. The Jutland-Funen region, which is the starting point for this self-evaluation, is a geographical region consisting of a series of counties and municipalities in which the relevant task management and decision-making competencies are to be found. The Jutland-Funen region has (by virtue of the Jutland-Funen Co-operation of Business Development) a joint trans-county committee whose objective is to reduce the imbalance between eastern and western Denmark. This body also has the aim of reducing the internal imbalance within the Jutland-Funen region itself. The individual institutions have therefore concentrated on local and regional cooperative relations they already have, which in several instances narrows the geographical focus even within the Jutland-Funen region. Furthermore, the SWOT analyses in chapters 3-5 are the result of material from the sub-regional self-evaluation reports and interviews. It is not a result of a lot of quantitative material and therefore the findings in the SWOT analyses lack the support which quantitative material could give.

Figure 0.1: The five institutions and their geographical context



Finally, there is a predominant stress in the self-evaluation report on the importance of the contributions from technical and natural science disciplines to social improvements. However, a wide range of interaction with the surrounding society is taking place, both within the humanities and sociology, which is not sufficiently covered in this report.

## **1. OVERVIEW OF THE REGION**

This self-evaluation takes the Jutland-Funen region and its universities' contribution to, and interaction with, that same region as its starting point. The Jutland-Funen region does not constitute an area with political decision-making competency, but rather a geographically restricted area, namely, that part of Denmark lying west of the Great Belt. The Jutland-Funen region consists of eight counties and 173 municipalities, each having an independent decision-making competency within certain areas.

There has traditionally been a great disparity between the rural and the urban areas, and between east and west in Denmark. This imbalance has lessened in recent years but can still be seen today; in particular in the difference between eastern and western regions of Denmark and between rural areas and urban areas. This disparity has revealed itself in a number of areas: one of these areas being employment levels and another educational activity. There has, for example, been a greater tradition of training and education in urban than in rural areas and this discrepancy can still be seen to this day, where a greater percentage of school leavers in urban areas move on to higher education than those from rural areas.

The Jutland-Funen region has traditionally been a byword for agriculture and fishing and their related industries. More than 75% of total agricultural capacity in Denmark is located in the Jutland-Funen region. Since 1990, the number of farms has nearly halved and today agriculture is far more automated and concentrated. In parallel with this development, the number of people employed within the agricultural sector has fallen by approximately 50% over the last 20 years (Source: Statistic Denmark). Along the west coast and out towards the North Sea there has been a rich fishing tradition which is equally in decline. A whole culture based on local fishing has disappeared and the trend is for fewer and much larger fishing vessels. Today, a growing proportion of the labour force is therefore employed within the service industries, whilst the percentage of those employed within primary industries has fallen drastically.

### **1.1. The Jutland-Funen Co-operation of Business Development**

In order to ensure and reinforce growth and development in the Jutland-Funen region, a co-operation initiative was established in 1998 between counties and municipalities in Jutland and Funen, which also included the participation of the Danish Ministry of Economic and Business Affairs. This new partnership development was given the name "The Jutland-Funen Co-operation of Business Development" (Det jysk-fynske erhvervssamarbejde). The key concepts behind the initiative were "knowledge, competency and renewal". Since then the Jutland-Funen Co-operation of Business Development has initiated a large number of trans-county projects and activities in co-operation with the business community and education and research institutions. In this regard, the Jutland-Funen IT scheme, the Jutland-Funen ICT centres and the Jutland-Funen Science and Enterprise Network grouping in particular catch the eye. A central objective for this initiative is the achievement of a more equal balance between on the one hand, the Copenhagen (the capital) region, and on the other, the Jutland-Funen region. Attention has also been given to the internal balance, or lack of same, within the Jutland-Funen region itself.

### **1.2. Geographical situation**

Copenhagen is Denmark's largest city and the country's capital. It is also here that the greatest volume of cultural, economic and financial activities can be found. Copenhagen is therefore the powerhouse that drives the whole of the eastern region of Denmark. The other larger cities and cities in Denmark are, on the other hand, located in the Jutland-Funen region where Aarhus, as Denmark's second largest city, is by far the biggest urban

area in the Jutland-Funen region. Aarhus is the only urban area outside Copenhagen with more than one university. Aarhus is also regarded as being a separate cultural dynamo outside of Copenhagen, having a range of museums and other cultural facilities. Over and above Aarhus, Denmark's 3<sup>rd</sup>-5<sup>th</sup> largest cities are also to be found in the region: Odense, Aalborg and Esbjerg respectively.

The greater part of state institutions and their attendant work places are located in Copenhagen. Part of the work of the Jutland-Funen Co-operation of Business Development has been channelled into a purposeful and coordinated effort to achieve the transfer of state institutions from Copenhagen to the Jutland-Funen region.

### 1.3. Demographic situation

#### 1.3.1. Population growth

The total population in the Jutland-Funen region is 2.97 million inhabitants, and this reflects a gradual increase of just under 5% in the last ten years, a figure that is less than the corresponding figure for the capital region. That said, the greatest population growth on a national scale is in Aarhus County, which has seen a rise of as much as 10.14%. There are, however, large internal differences within the region and the growth in the number of inhabitants in the larger urban areas on the eastern side of the region is far greater than that of its western counterpart. It is, therefore, the larger cities in the eastern part of the region that account for the growth in population, whilst a process of depopulation is occurring in the peripheral areas. This development will come to have a noticeable effect on a string of towns and cities beginning with Aarhus in the north, then across to Vejle/Kolding and then on to Odense, and will serve to reinforce the regional imbalance. A corresponding development will, moreover, be experienced in the other larger cities in the Jutland-Funen region.

**Table 1.1** Population and demographic development 1990-2004 for the counties in the Jutland-Funen region compared to the entire country:

	1990	1995	2000	2005	Change 1990-2005 in %
<b>The whole country</b>	5 135 409	5 215 718	5 330 020	5 411 405	5.37
<b>Funen County</b>	459 354	467 695	471 974	476 580	3.75
<b>Southern Jutland County</b>	250 612	251 992	253 482	252 980	0.94
<b>Ribe County</b>	218 582	221 750	224 345	224 454	2.69
<b>Vejle County</b>	330 398	336 663	347 542	358 055	8.37
<b>Ringkøbing County</b>	267 295	270 128	272 857	274 574	2.72
<b>Aarhus County</b>	597 143	619 232	637 122	657 671	10.14
<b>Viborg County</b>	229 775	230 778	233 681	234 434	2.03
<b>Northern Jutland County</b>	484 543	488 303	494 153	495 068	2.17
<b>Total - Jutland/Funen</b>	2 837 702	2 886 541	2 935 156	2 973 816	4.80

Source: StatBank Denmark

One of the features of recent demographic developments is that, in spite of a rising population graph, the labour force has become smaller in the last ten years as the population has grown older and the occupational frequency has lowered. The latter is an expression of the growing component of the potential labour force (of a working age group) that is statistically outside the labour force. The labour force in the Jutland-Funen region is 1.579 million and constitutes approximately 55% of the total Danish labour force. The fall in the labour force is smaller in the Jutland-Funen region than in the capital region, which is due primarily to a growth in the labour force around the series of cities described above, where the growth is greatest. In the other part of region, meanwhile, the labour force has fallen by more than the average – a decline that is expected to continue in the coming years.

All in all, 90,000 new jobs have been created between the years 1994-2001, which has led to a fall in unemployment down to 3%. The highest level of unemployment in the region is to be found in the northern part of Jutland and in the southern part of Funen.

Migration is not the only factor in the region; immigration also has an influence on the statistics. This can be seen in the growth in the number of immigrants and their descendants in the region. The analysis below provides the figures for all immigrant groups and their descendants. Country of origin is not represented in these figures.

**Table 1.2** Number of immigrants and their descendants 1995-2005

	1995	2000	2005	Change 1995-2005 in %
<b>The whole country</b>	278,459	378,162	452,095	62.36
<b>Funen County</b>	19,172	27,343	33,791	76.25
<b>South Jutland County</b>	11,368	15,067	18,274	60.75
<b>Ribe County</b>	6,648	10,580	12,983	95.29
<b>Vejle County</b>	10,879	17,732	22,985	111.28
<b>Ringkøbing County</b>	6,955	10,923	14,154	103.51
<b>Aarhus County</b>	30,943	41,685	50,985	64.77
<b>Viborg County</b>	4,546	7,273	9,252	103.52
<b>Northern Jutland County</b>	12,471	19,174	23,969	92.20
<b>Total - Jutland/Funen</b>	102,982	149,777	186,393	80.99

Source: StatBank Denmark

#### **1.4. The economic and social situation in Jutland-Funen**

The Jutland-Funen Co-operation of Business Development is not only concerned with achieving a better balance between eastern and western Denmark. The internal balance within the Jutland-Funen region is also of considerable concern to the project. It is not enough that the large cities and cities in the region enjoy the fruits of progress; positive developments are also needed in the peripheral areas. In order to analyse the internal balance within the region, the Jutland-Funen Co-operation of Business Development looked at how individual municipalities in the region have done compared to average conditions for Jutland-Funen, using four different criteria: The four criteria are:

- The percentage of 25-64 year-olds with a career based education.
- Average personal taxable income.
- Employment.
- Net inbound migration of taxable persons – number of inbound migrants per 100 outbound migrants.

Source: Den jysk-fynske erhvervsredegørelse

##### **1.4.1. Education**

A rising percentage of the population in Jutland-Funen has received some form of higher education. This is illustrated by the fact that in 2003 23% of 25-64 year-olds had a higher degree, whereas the figure for 1996 was 18%. The corresponding figures for the capital region are 30% in 2003 against 25% in 1996. There are, however, significant internal differences in the Jutland-Funen region. The figures show that it is in and around the large towns and cities that the population has the highest level of education, whilst peripheral areas in the west and north west of the region have relatively few inhabitants with a higher education (Key data for the Jutland-Funen Co-operation of Business Development, June 2005). If one looks at today's school leavers, the latest figures from the Danish Ministry of Education show that approximately 44.5% partake in a higher education programme, and this figure is expected to rise. The figures cover both the Jutland-Funen analysis and also the

situation nationally for all types of higher education, and not only for that percentage of the population attending long-term courses of higher education. With regard to the long-term courses of higher education, it is those counties which have a university that occupy the higher end of the scale, whilst the rest of the Jutland-Funen counties find themselves at the bottom end of the scale. On a national scale, however, a shift can be seen to be taking place from shorter higher education programmes to medium and long-term higher education. From 1994-2004 the number of people taking short-term courses in higher education fell by 8.9 %. However, this decrease is more than compensated for by the rise in the number of young people taking up medium or long-term course of higher education (Danish Ministry of Education 2005).

Within the long-term higher education programmes being offered by universities, the trend has grown from only approximately 4% of school leavers beginning a university education in the 60s, to a figure of approximately 10% in the 80s. Around 18% of school leavers began a university education programme in 2003.

#### ***1.4.2. Personal income***

A significant levelling out has taken place in terms of average personal income in the Jutland-Funen region within the period 1996-2003, where a larger number of the municipalities in 2003 come in at a level on, or above, the average for Jutland-Funen in comparison to 1996. However, the greater part of Northern Jutland along with a number of municipalities in Southern Jutland and on Funen, lag behind in comparison to the rest of the region.

#### ***1.4.3 Employment***

Employment is the area where the internal balance within the region is most favourable. It can be seen that in 2003 only south Funen lay under the average for the region whilst several areas came into this category in 1996. Finally, the studies carried out by the Jutland-Funen Co-operation of Business Development show that net internal inbound migration within the region has fallen. It has become more difficult for municipalities in western and southern Jutland to retain their population volume. Net internal inbound migration is concentrated instead in still fewer municipalities, with the majority of these being in the eastern part of Jutland.

### **1.5. Occupational structure**

The occupational structural development can be categorized in relation to a breakdown of the Danish occupational sectors based on a number of resource areas. This breakdown is inspired by Michael Porter's theories about industrial clusters that try to categorize sectors according to their internal relations. The Danish resource areas consist of the following areas:

- Foodstuffs
- Furniture/clothing
- Tourism
- Construction/housing
- IT/communication
- Transport
- Energy/environment
- Medico/health

- Other occupations such as:
  - Metal industry/production technology
  - Trade
  - Operation services
  - Knowledge services

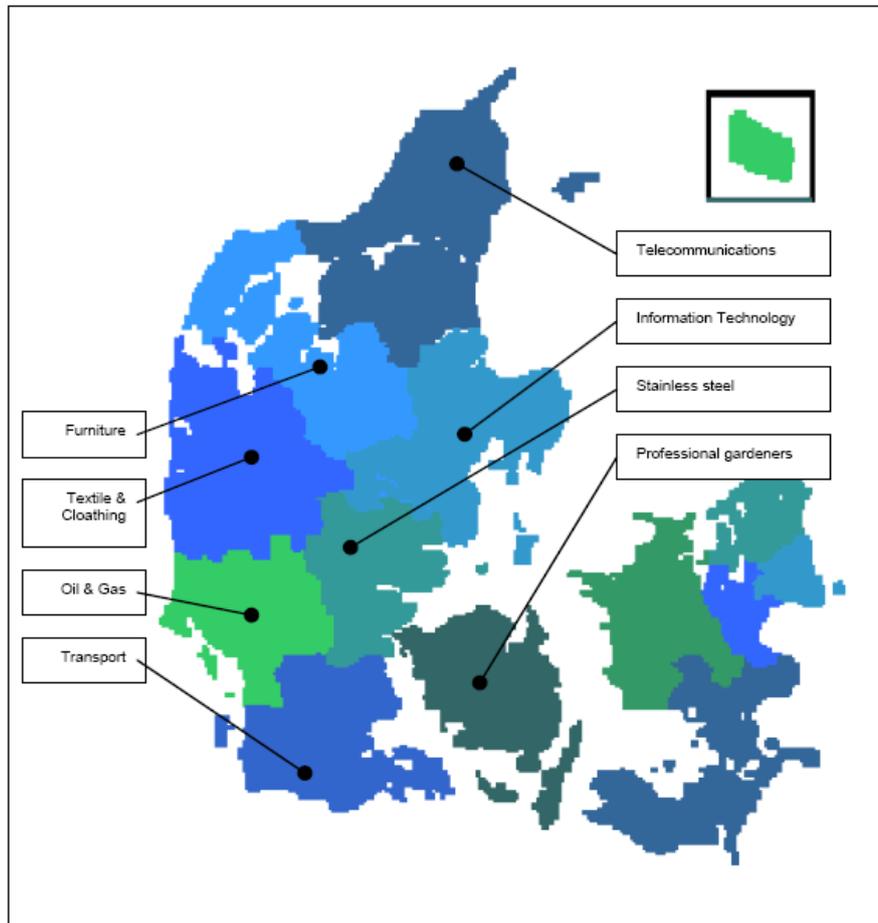
As to occupation and growth in value, the predominant resource areas are construction/housing, and trade and foodstuffs. Transport and IT/communication are also important. If we examine exports, it is foodstuffs that constitute the predominant area, but trade also plays a central role. In relation to the rest of Denmark, it is seen that Jutland-Funen in particular is specialized in the foodstuffs area and the minor areas such as furniture/clothing, energy/environment and metal/production technology, whereas knowledge heavy sectors such as IT/communication, Medico/health and knowledge services are primarily specialized in the capital region. As to occupation, growth was highest within IT/communication and energy/environment by almost 4% per year from 1995 - 2001, but also Medico/health and the other knowledge heavy areas saw a growth rate above the average in the region (Source: Den jysk-fynske erhvervsredegørelse).

The importance of separate resource areas is more noticeable at the regional/local level, which shows a much clearer specialization pattern of significance for the development in the western regions and the local areas of Denmark.

#### ***1.5.1. Resource area geographical specialization***

With a starting point in the degree of specialization of the resource areas, the following will chart the regions that have special competences in relation to certain business areas. The charting is based on a number of quantitative and qualitative analyses that the Jutland-Funen Co-operation of Business Development has prepared as a basis for its business strategy.

Figure: 1.1.: Geographical location of business areas



Source: Den jysk-fynske erhvervsredegørelse

The analysis places emphasis on identifying essential clusters that have obtained a particular competence due to an interplay among the businesses of the cluster and between businesses and the public actors, including knowledge and educational institutions.

#### 1.5.1.1. Foodstuffs area

The foodstuffs area is a Jutland-Funen cluster specialized in the Jutland-Funen region, but which has particularly high specialization in the county of northern Jutland and the county of Viborg. The area comprises four sub-areas: primary businesses, production businesses, support businesses and service businesses, which have different geographical specializations.

- Primary businesses are specialized in the counties of northern Jutland, Viborg, Ringkøbing, the southern part of Jutland and Funen
- Production businesses: the counties of northern Jutland, Viborg, Ribe, and Vejle
- Support businesses: the counties of Aarhus, Vejle, and Funen

#### *1.5.1.2. Furniture and clothing*

The resource area has very strong regional specialization that can further be divided into its two main areas: furniture and clothing.

Furniture:

- Production: the counties of Viborg, Ringkøbing, Ribe, and Aarhus
- Services: the county of the southern part of Jutland

Clothing:

- Production: the counties of Ringkøbing, the southern part of Jutland, and Aarhus
- Services: the county of the southern part of Jutland

#### *1.5.1.3. Energy/environment*

The energy/environmental area is highly specialized in a number of counties.

- Primary businesses: the counties of northern Jutland, Viborg, Ringkøbing, Ribe, and the southern part of Jutland
- Production: the counties of northern Jutland, Viborg, Ringkøbing, Ribe, and the southern part of Jutland
- Services: the counties of Vejle and Ribe

As an example, three of the world's largest producers of wind turbines are located in the Jutland-Funen area with a high degree of specialization in central Jutland, which however has moved towards Aarhus County due to the merger between Vestas and Bonus.

#### *1.5.1.4. Construction/housing*

The cluster is evenly distributed across the Jutland-Funen area, and the county of the southern part of Jutland is the only area with a high degree of specialization.

- Primary businesses: the counties of Viborg and Ringkøbing
- Production: the counties of Viborg, Ringkøbing, Vejle, and the southern part of Jutland
- Support businesses: the counties of Viborg and the southern part of Jutland

#### *1.5.1.5. Transport*

Specialization is located primarily in the counties of the southern part of Jutland and Funen.

#### *1.5.1.6. Metal/production technology*

Specialized in all counties except Aarhus County.

- Metal industry: the counties of Ringkøbing, Funen and the southern part of Jutland
- Production technology: the counties of the northern part of Jutland, Viborg, Vejle, and Ribe

#### *1.5.1.7. IT and communication*

Specialization is rather low in the Jutland-Funen area, but rather high for Aarhus and Aalborg.

#### *1.5.1.8. Tourism*

The entire Jutland-Funen region is specialized in tourism, though especially the counties of the southern and northern part of Jutland.

## 1.6. Research and development in the public and private sectors

Public sector research and development plays a central role in Denmark which, amongst other things, is a result of the structure of industry in the country, dominated as it is by small and medium sized businesses. There are significant regional variations in the type and volume of R&D (Research and Development) work being carried out in the business community. Thus we can see that expenditure for R&D in the business community comprise approximately 3% of GNP in the capital region against around half that figure for east, west and north Jutland. In the rest of the country the percentage is under ½%.

**Table 1.3:** R&D in business and industry as a percentage of GNP within ICT (Information and Communication Technology)

	1993	2003	Growth
<b>The capital</b>	1.45	3	107
<b>Eastern Jutland</b>	0.6	1.75	192
<b>Western Jutland</b>	0.75	1.5	100
<b>Northern Jutland</b>	0.2	1.45	625
<b>Southern Jutland</b>	0.7	0.8	14
<b>Funen</b>	0.3	0.45	50
<b>East of the Great Belt</b>	0.2	0.4	100

Source: The Economic Council of the Labour Market, "Regional differences in research initiatives " (2005)

Note: In the above table, the Jutland-Funen Region comprises eastern Jutland, western Jutland, northern Jutland, southern Jutland, and Funen.

The explanation for the large regional differences in industry research initiatives is, amongst other things, that in industry, R&D work is concentrated in relatively few sectors in Denmark, and these have an uneven geographical distribution. Regardless of the business type there is also a tendency to locate R&D departments close to university research environments. It is worth noting, *inter alia*, that the growth within the ICT sector in northern Jutland has been an impressive 625% during the period 1993-2003, which illustrates local industry's changeover from a manufacturing economy to a knowledge-based economy.

There are also significant variations in the volume of R&D being carried out in the public sector. In the capital region and in eastern Jutland, expenditure on R&D comprises approximately 1.2% of GNP whilst on Funen the figure is 0.9%, and in northern Jutland approximately 0.7% of GNP. In those regions that do not have a university, the share is ¼% or less.

**Table 1.4:** Public sector R&D as a percentage of GNP

	1997	2003	Growth
<b>The capital</b>	1.3	1.3	0
<b>Eastern Jutland</b>	1.16	1.16	0
<b>Western Jutland</b>	0.2	0.28	40
<b>Northern Jutland</b>	0.42	0.7	67
<b>Southern Jutland</b>	0.08	0.09	13
<b>Funen</b>	0.56	0.9	61
<b>East of the Great Belt</b>	0.12	0.12	0

Source: The Economic Council of the Labour Market, "Regional differences in research initiatives " (2005)

Note: See note above.

The uneven regional distribution and development within R&D projects strengthens the distorting effect which regional educational discrepancies have on the region's ability to compete, and also on its ability to create a higher standard of living.

### ***1.6.1. Innovation***

If we look at business innovation, there is no great difference between western and eastern Denmark, but a tendency for businesses in western Denmark to be generally more innovative than their eastern counterparts does appear to exist. Den jysk-fynske erhvervsredegørelse reports that approximately 56% of Jutland-Funen manufacturing companies are innovative, against only 52% in the capital region.

It is, however, important to remember that this pattern may cover up differences in types of innovation, as the studies only report whether businesses are innovative or not, and not which type of innovation the businesses are involved in carrying out. There may thus be marked differences in how significant the innovation actually is, and to what extent the innovation helps to ensure continued growth and prosperity.

### ***1.6.2. The interaction between knowledge institutions and local industries***

The interaction between knowledge institutions and local industries is important for innovation impetus in the various regions. Studies show that, on average, only 25% of businesses are working in conjunction with universities, governmental research institutions and the GTS – Advanced Technology Group on development projects, something which represents both a major concern and challenge for the Jutland-Funen region. New figures show however, that stagnation has set in with regard to the business community's co-operation with the GTS – Advanced Technology Group, whilst at the same time there has been a powerful growth in business co-operation with universities (DISKO 2004).

One also finds great divergence as to how data-covering co-operation between universities and industry is reported when one attempts to discover to what degree businesses are cooperating at a regional level. Some statisticians report their findings according to where the relevant company is located, others according to where the company's R&D department can be found, and yet others according to the department which is actually working in a partnership with the universities.

### ***1.6.3. Use of highly qualified labour force***

The employment of highly qualified labour is generally seen to be the most decisive factor for companies seeking to transform research-based knowledge into innovation that works for their businesses. The use of a highly qualified labour force is especially concentrated around the large university cities, Copenhagen and Aarhus, whilst the other university cities in western Denmark do not particularly stand out. It is especially small and medium sized companies that do not take on highly qualified staff.

### ***1.6.4. Knowledge based entrepreneurs***

In relation to the changeover from traditional manufacturing to a more knowledge-based economy, entrepreneurs play an important role. There is a great difference between eastern and western Denmark in this regard, where western Denmark generally is stuck at a lower level in relation to the number of knowledge-based entrepreneurs the area has at its disposal. The trend in western Denmark is that the areas with large university cities do best, whilst the western side of west Denmark suffers from having a much lower number of knowledge-based entrepreneurs.

## 1.7. The Danish system of government

### 1.7.1. Public sector financing in Denmark

The relationship between the state and municipality has, since the local government reforms in the 1970s, been marked by a commitment to the decentralisation of specific duties from the state to municipalities and counties. The overall intention has been to seek to ensure that national targets can be attained (here including political and economic targets) whilst at the same time giving local government room for political manoeuvre so that given tasks and problems can be solved on the basis of the varying conditions and preferences at local levels.

The counties and municipalities administer the main part of civic authority and service responsibilities, and they also constitute a substantial portion of total public consumption and the imposition of taxes; cf. table 1.5. Individual councils and counties have therefore their own capacity to determine developments regarding levels of taxation and service charges. That said, as of 2002, the government has introduced taxation limits. These require that the average percentage for the imposition of taxes within local council and county areas must not be allowed to rise.

The public sector is financed primarily via taxes and duties. The state receives by far the largest share of tax income – approximately 62% – whilst municipalities and counties receive approximately 35%, cf. table 1.5.

**Table 1.5:** Financing of services within government sub sectors, 2002

In billion DKK	The State	Municipality	County	Social insurance funds	Total public admin./ service
Services to be financed (Billion DKK.)	260.1	329.1	103.5	49.5	742.2
Services to be financed as %	35.0	44.3	13.9	6.7	100.0
Revenue from taxes and duties (Billion DKK.)	412.9	160.6	72.7	22.6	668.8
Revenue from taxes and duties as %	61.7	24.0	10.9	3.4	100.0

Source: *The report of the Commission on Administrative Structure*, The Ministry of the Interior and Health 2004

However, a redistribution process then takes place where these combined incomes are moved across government sub-sectors. Of particular interest are the incomes coming from the state to local government, i.e. local councils and counties. Here we see that approximately 42% of state income is distributed across the local government sector. This should be seen in the context of the responsibilities borne by local government in providing a series of substantial public services, which account for approximately 58% of combined public expenditure.

### 1.7.2. Distribution of public sector services in Denmark

The state is responsible, amongst other things, for the following services:

- Policing, defence and the judicial system
- Foreign diplomatic services and overseas aid
- Higher education, industrial training and research
- Unemployment insurance and working environment inspectorate
- Various cultural provisions
- Subventions to industry and commerce
- Provisions for asylum seekers

Local government is responsible, amongst other things, for the following services:

- Primary school education
- Child care and care for the elderly
- Libraries, local sports facilities and other cultural areas
- The awarding of and the provision of cash payments, premature pensions and certain other social benefits
- Stimulation and employment projects for non-insured unemployed
- Supply depots, environmental measures and rescue services

The counties are responsible, amongst other things, for the following services:

- Hospital services and sickness insurance
- Upper secondary education - and HP (Higher Preparatory Exam) Courses
- Care for psychologically and physically impaired people
- Certain cultural activities
- Regional public transport
- The environment

### ***1.7.3. Distribution of health services***

The counties hold the responsibility for hospital services. Using the finance from health insurance, the counties finance free general practitioner and specialist doctor consultations, subventions for treatment provided by other medical personnel, e.g. physiotherapists and dentists, and subventions for medicines, etc.

The municipalities have responsibility for district nursing arrangements and for providing free local dental services to school children. The municipalities also have the responsibility of providing preventative health care for children and young people. Finally, municipalities have the responsibility for a range of services dealing with the elderly and disabled.

### ***1.7.4. Distribution of responsibilities in relation to the promotion of industry and economic development***

Formally speaking there are no obligations on the part of local government to develop policies around the promotion of trade and industry, but counties and municipalities have a right to adopt initiatives that promote local and regional industries. Above and beyond industrial policies themselves, local and regional initiatives are to the fore in, for example, the labour market, education and training, cultural endeavour and also in the area of infrastructure and housing, all of which represent substantial resources for the creation of a favourable environment for business and industry. In practice, municipalities, counties and the state are all involved in initiatives to promote industry and further economic development in Denmark, and these can be broadly identified:

#### ***1.7.4.1. Municipalities***

- A range of business-oriented services and municipality projects (e.g. provision of building space and infrastructures) and legal issues (e.g. in connection with disputes linked to construction)
- Services and municipality projects aimed at individual members of the public, such as labour market initiatives and other measures that help to attract and retain the labour force within the region
- Non-mandatory business services in the form of, for example, the provision of information, business consulting, network formation, and projects for the promotion of industry and marketing
- Participation in regional strategic co-operation projects

#### *1.7.4.2. Counties*

- Municipality services which impact on the business community's regulatory framework, including regional planning and environmental inspection
- The administration of EU-programmes supporting regional development
- Service tasks that impact upon competency development, accommodation and general development
- Business advice and co-financing of the Centre for Technological Innovation and local contact points for entrepreneurs
- Participation in regional strategic co-operation projects

#### *1.7.4.3. The State*

- The national strategy for industry is converted into regional and local objectives
- Overall political objectives, etc.; housing, for example, urban development and physical planning, as well as training, labour market and cultural policies
- Participates in overall industrial strategy and co-finances a range of local and regional initiatives
- Participation in regional strategic co-operation projects.

Since the beginning of the 1990s counties have been involved, via state support, in developing strategies for the promotion of industry. These strategies form the basis for increased co-operation between regional industrial players, whilst at the same time aiming to give direction to the initiatives that emerge from those same strategies. The state, counties and municipalities have, furthermore, sponsored the establishment of business hub centres, which are intended to strengthen coordination between regional labour force and industrial policies.

In recent years, the state, counties and municipalities have cooperated in devising a special industry promotion initiative in areas affected by decline in dedicated target areas such as Samsø and Frederikshavn. There is no such thing as an overall regional development policy but, within chosen areas, there are strategies for the promotion of industry. As of autumn 2003, nine regional joint growth initiatives have been established in geographically remote areas, with the participation, amongst others, of the relevant players from state, county and municipality departments.

### ***1.7.5. The distribution of responsibilities for educational services***

#### *1.7.5.1. Primary schools*

Denmark's 1,665 primary schools are anchored in the municipal structure, but the extensive demand for special education is addressed via co-operation with, amongst others, the state and counties. In the last few decades, a decentralisation process has taken place, from the state to the municipality, with regards to responsibilities for primary school administration.

#### *1.7.5.2. Education for teenagers*

The two central authorities with regard to teenage education are the state and the counties. The state determines the overall framework for all types of education and retains, furthermore, the executive responsibility for the operation of industrial college training, industrial training, and agricultural training and also for specific youth training programmes at skill centres and remedial training school courses for the labour market. The counties have operational responsibility for most of the other courses available.

#### *1.7.5.3. Shorter courses of higher education*

The shorter higher education courses (KVU in Danish) are higher education courses that typically last two years. The courses are primarily offered at industrial training colleges, which are self-governing institutions financed

by state subventions. Expenditure for KVV courses amounts to just under DKK 1 billion a year (2003 figure). Annual uptake amounts to over 9,000 students (in 2003).

#### *1.7.5.4. Higher education courses of medium term duration*

Higher education courses of medium term duration (MVUs in Danish) involve more than 20 different kinds of courses, with subjects ranging from technical, pedagogical, social, health, media and commercial areas. The courses will typically last two to four years and are career and function orientated. Training is primarily offered at Centres for Higher Education, which are self-governing state institutions.

#### *1.7.5.5. Long-term courses of higher education*

The long-term higher education courses (LVUs in Danish) cover that range of courses offered at university level. Completion of the courses can result in a bachelor or master's degree. The majority of students in higher education courses opt to continue their studies to master level after completion of a bachelor's degree. The courses are offered by the 12 institutions, which come under the Universities' Act.

#### *1.7.5.6. Adult education*

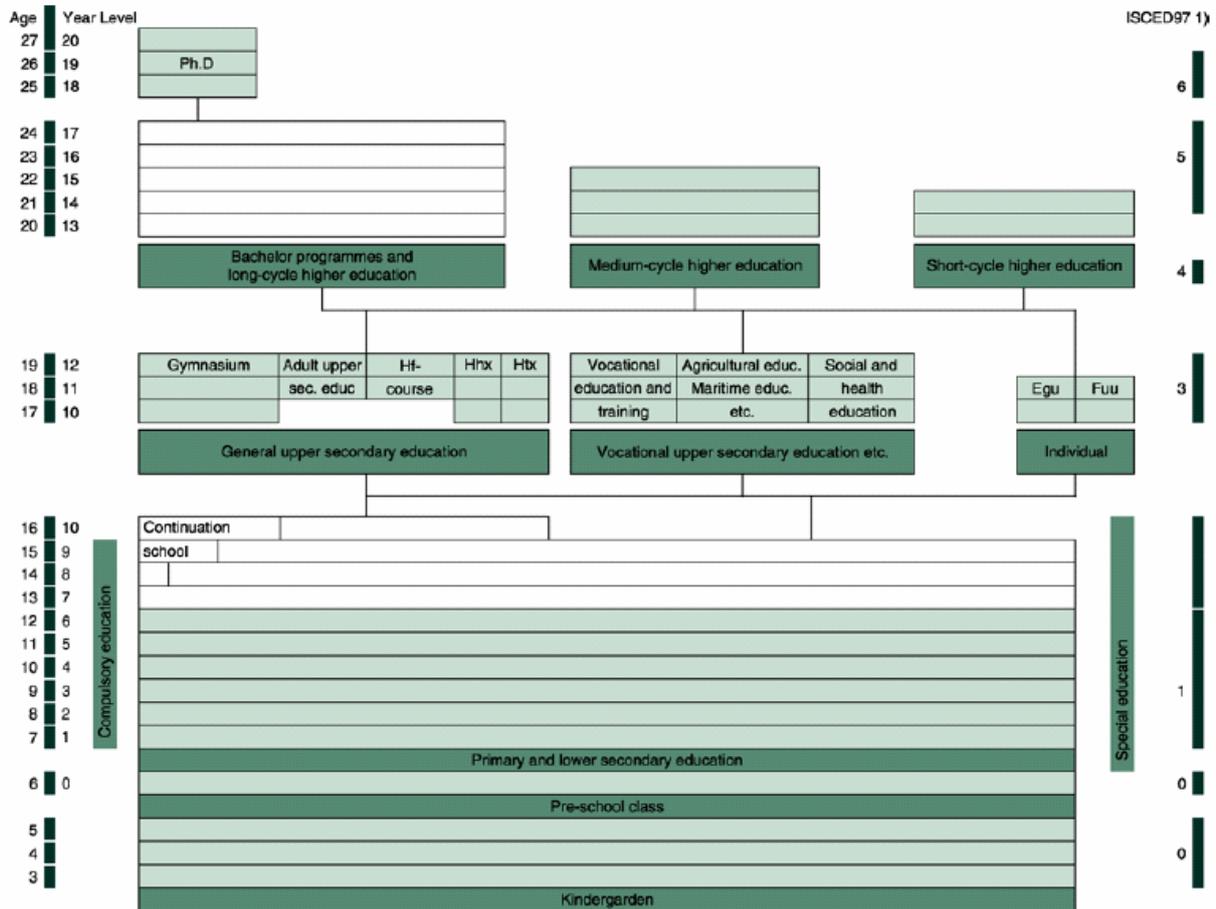
The adult education system can largely be grouped together as follows:

- Public information
- General adult education
- Career-based adult and further education

Public information is administered by the self-governing institutions with state subvention, general adult education is administered by local government auspices, and career-based adult and further education is split between the state and the counties.

The diagram below gives a schematic overview of the Danish education system.

**Figure 1.2:** The Danish education system



Source: The Danish Ministry of Education 2005

**1.7.6. Responsibilities for cultural initiatives**

The distribution of responsibilities for cultural initiatives amongst public authorities is under continual development but within the last 20 years or so, more and more executive decisions in this area have been delegated to regional and local departments.

The main principle for the distribution of responsibilities between, the state, counties and municipalities is that the state has the responsibility for that which has a local as well as a national importance, both for culturally historic reasons and for developmental reasons, whilst municipalities and counties look after cultural initiatives relating to local cultural provision where there is also a local engagement in the service or project on offer. (Source: The report of the Commission on Administrative Structure, The Ministry of the Interior and Health 2004).

### ***1.7.7. Financing of the educational system in Denmark***

In Denmark, the state, the counties and the municipalities finance the education system. A number of institutions are self-governing, whilst others are owned by the state, county, councils or municipalities. Figure 1.3 below covers selected groups of institutions with a view to illustrating financing sources and ownership. Over and above government financing, there are payments from parents at, for example, independent primary schools and payments for participation in a number of adult education or training courses.

Primary and lower secondary schools along with local county colleges are owned and financed by the municipality, whilst the independent primary schools and residential schools are self-governing institutions, which receive state support.

Industrial training colleges, private upper secondary schools and remedial colleges are also self-governing institutions financed by subvention from the state. The remaining upper secondary schools, adult and special education centres, along with social and health care centres are owned and financed by the counties. From 1 January 2007, all the institutions under county control will become self-governing institutions financed by the state. Maritime schools and first engineer schools are state institutions under the auspices of the Danish Ministry of Economic and Business Affairs.

Institutions which come under the Universities' Act are self-governing institutions financed by the state. Since November 2001, the universities have been placed under the stewardship of the Ministry of Science, Technology and Innovation.

Architect schools and music conservatories are state institutions under the responsibility of the Danish Ministry of Culture.

Teacher and pedagogic seminaries are typically self-governing institutions, which receive subventions from the state. Most of these now come under the auspices of the Centre For Higher Education (CVU in Danish).

In the case of adult education, for example the folk high schools, day colleges and labour skills centres (arbejdsmarkedsuddannelsescentre in Danish) are self-governing institutions primarily financed by the state. Evening courses at colleges and schools, on the other hand (along with language schools) receive grants from the municipality. Apart from the above-mentioned institutions, there are a range of private training and educational institutions, some of which are entitled to receive state support (SU in Danish).

**Figure 1.3** Summary of types of financing for selected training/educational institutions - 2004

	<b>State institutions</b>	<b>State financed, self-governing institutions</b>	<b>County financed institutions</b>	<b>Municipality financed institutions</b>
<b>Primary schools</b>		Independent primary/ Residential schools		Primary/Lower secondary schools. County colleges
<b>Youth training/education.</b>	Maritime schools Mechanic schools	Industrial colleges 1) Private upper secondary school Remedial colleges 2)	Upper secondary school Adult Education Centre (hp) Social- and Health Centre	
<b>Higher education courses</b>	Architect schools Conservatories of music	Universities Teacher and pedagogic seminaries	Schools of nursing	
<b>Adult education and public information</b>		Folk high schools Day colleges 2) Lab. skills-centres	Adult education centres Special training centres	Evening colleges, etc. Language schools 3)

Note: The summary only contains selected training/educational institutions.

1) Industrial training colleges also have shorter higher education courses.

2) Financed partly by municipality. As of 1 January 2003, day colleges are no longer state financed. However, local councils and counties can adopt a policy of providing a grant to a day college.

Source: Danish Ministry of Education 2005.

### ***1.7.8. Regional influence on higher education and research***

Danish municipalities and counties have no direct influence on higher education and university based research. Likewise, they have no formal influence on national policies in relation to higher education and university based research. However, given that universities are central players within the sphere of regional development and promotion of industry, municipalities and counties do, to some extent, have an influence upon higher education and the research taking place under the auspices of those universities located in the various regions.

### ***1.7.9. The Jutland-Funen Co-operation of Business Development***

The Jutland-Funen Co-operation of Business Development has no formal executive capacity and no right to impose duties or taxes. At issue here, is a trans-county co-operation body whose aim is to strengthen development in the region. One of the initiatives especially relevant in relation to interaction with research and training/educational institutions is the Science and Enterprise Network.

### ***1.7.10. The Science and Enterprise Network***

The Science and Enterprise Network has as its aim to support active professional networks, where researchers and businesses exchange knowledge for the benefit of development in local industries in the Jutland-Funen region. This is brought about by, amongst other things, in particular the smaller Jutland-Funen businesses participating in networks, which exist to ensure that new knowledge is processed and targeted according to their needs. All networks within the Science and Enterprise Network, furthermore, are encouraged to keep their sights set on regional development and to maintain a general interest in relation to the Jutland-Funen business community. The Science and Enterprise Network's activities are coordinated in close co-operation with the region's business services administration and counties in general.

The Science and Enterprise Network is supported financially by the Jutland-Funen Co-operation of Business Development with 28 million DKK being granted to Science and Enterprise Networks in the period 2004-2008. Local Science and Enterprise Network branches can be found at the five research institutions in the region. It is these five institutions that are the subject of this self-evaluation. The main secretariat is based at the University of Southern Denmark. At the start of the new year 2005, around 35 networks between researchers and some 400 small to medium sized businesses had been established in the Jutland-Funen region.

The Science and Enterprise Network's steering group was, furthermore, appointed as a steering group for this self-evaluation. The reason for this is that the Science and Enterprise Networks steering group already has a focus on the interaction between research institutes and the societies around them. The steering group also contains a broad representation of figures from industry and university life – the chairman, for example, is the rector of Aalborg University, and the vice chairman is a representative from industry.

## 2. CHARACTERISTICS OF THE HIGHER EDUCATIONAL SYSTEM

### 2.1. Summary of the national university system

The Danish university system consists of 12 universities with a total student population of 110,000. The universities are spread geographically across the country with universities located in the four largest cities – Copenhagen, Aarhus, Odense and Aalborg, as well as feeder campuses in Esbjerg, Kolding and Sønderborg. All university courses are, with the exception of medicine, law and theology, structured according to the Bologna Declaration of 1999 and thus show a course architecture of 3+2+3. Over and above the universities, there are 16 institutions that offer long term and medium cycled courses under the auspices of the Danish Ministry of Culture (music conservatories, drama schools, art academies, design schools and library schools). In addition to this, there are 55 non-research based institutions, under the auspices of the Danish Ministry of Education, which offer a variation of shorter and medium term courses.

The total student population in Denmark, as of 2001, was 213,000 students; of which 110,000 are university students, 6,100 are students at institutions under the Danish Ministry of Culture, 22,000 students are attending shorter higher education courses and 75,000 students are attending medium cycled higher education courses.

The Danish university system may be characterised by the following points:

- 12 very different universities in relation to historic background, size, academic profile and range of courses. In the year 2000, 18% of school leavers had begun a university course, and 13% had completed a university course
- There are approximately 110,000 students at Danish universities
- 10,000 researchers and lecturers are employed at Denmark's universities
- University expenditure amounts to 12 billion DKK.
- Courses of a longer duration are offered at 16 institutions, which come under the category of "Culture" (music, drama schools, art academies, design schools and library schools), along with 55 non-research based institutions.

The combined Danish university system consists of five universities, which have more than two faculties involved in research, offering bachelor degrees, MA courses, and PhD programmes; as well as extended master's programmes. The universities are spread across the country in the four largest cities in Denmark: Copenhagen, Aarhus, Odense and Aalborg. In addition to this there is a university in Roskilde.

In addition to this, there are five universities with only one faculty carrying out research and offering courses in a small number of specific professions within technology, agriculture and veterinary practice. These universities are: the Technical University of Denmark, the Danish University of Education, the Royal Veterinary and Agricultural University, the Danish University of Pharmaceutical Sciences, and the IT University Copenhagen. They are all located in Copenhagen and, apart from the IT University, founded over 100 years ago. Finally, there are two Schools of Business (which also receives the title university in accordance with the Universities' Act) located in Copenhagen and Aarhus, which are develop and offer courses within industrial economy jurisprudence, language and business communication.

A university shall conduct research and offer research-based education at the highest international level in the disciplines covered by the university. The university shall ensure a balanced relationship between research and education, on a regular basis screen for the relevancy of its research and educational disciplines, prioritise and develop them further, and disseminate knowledge of scientific methods and results. The university shall

collaborate with society and contribute to the development of international collaboration. The university's scientific and educational findings should contribute to the further growth, welfare and development of society, engage with the society around it and contribute to the promotion of growth, welfare and social development.

## 2.2. Other players involved in research

The universities apart, there are a range of state and semi-state institutions involved in research and co-operation with businesses in relation to research and development. Below is a table with specific details.

### 2.2.1 State Sector Research Institutions

In Denmark, there are 22 state sector research institutions, which come under nine different ministries. The primary task of the state sector research institutions is to undertake research, development, reporting and advisory programmes, as well as participating in the training of new researchers. In this regard, the state sector research institutions perform a range of activities from the compiling of statistics to monitoring and advisory functions. State sector research institutions also help to train, in co-operation with the universities, PhD candidates. Around 20% of government research is carried out by state sector research institutions. Over and above state responsibilities, state sector research institutions are involved in considerable, and well developed, interaction with a range of businesses regarding R&D programmes.

**Table 2.1:** Governmental research institutions, staffing and expenses in million DKK, in 2001 figures

Institution	R&D full-time equivalents	R&D Costs
Danish Institute of Agricultural Sciences	707	548
Risø National Laboratory	631	493
National Environmental Research Institute	133	162
Statens Serum Institut (Government body for the prevention and control of infectious diseases and congenital disorders)	200	112
Danish Veterinary Institute <sup>1</sup>	137	107
Geological Survey of Greenland and Denmark (GEUS)	152	101
Danish Institute for Fisheries Research	117	90
The Danish Veterinary and Food Administration	90	84
Danish Building and Urban Research	93	62
National Institute of Occupational Health	106	60
Royal Danish Defence College (military intelligence)	22	52
Danish Space Research Institute	50	50
Danish Forest and Landscape Research Institute	92	44
Danish National Institute of Social Research	78	39
National Institute of Public Health	36	35
Danish Pest Infestation Laboratory	19	30
The Survey and Cadastre Agency	33	26
Danish Research Institute of Food Economics	32	23
Danish Transport Research Institute	23	12
Centre for Language Technology	21	12
John F. Kennedy Institute	15	7
Danish Institute for Studies in Research and Research Policy	14	6

Source: Danish Institute for Studies in Research and Research Policy, The University of Aarhus

Notes: 1. The figures for Danish Veterinary Institute are based on figures for Danish Veterinary Institute for Virus Research and Danish Veterinary Laboratory that merged in 2002.

Only one of the above state sector research institutions has its headquarters in the Jutland-Funen region. This institution in question is the Danish Institute of Agricultural Sciences, which together with the Jutland-Funen universities is included in this self-evaluation report. The Danish Pest Infestation is from 2004 and a part of the Danish Institute of Agricultural Sciences.

### 2.2.2. Hospital based research

Apart from state sector research institutions, research is also carried out at hospitals in Denmark, of which the largest share takes place at the university hospitals.

Aarhus University Hospital liaises between the Health Sciences Faculty at the University of Aarhus and the following six hospitals in Aarhus County and Northern Jutland County: Skejby Hospital, Aarhus Hospital, Aarhus Psychiatric Hospital, the Children's Psychiatric Hospital, Aalborg Hospital and Aalborg Psychiatric Hospital.

### 2.2.3. The GTS Advanced Technology Group

There are ten GTS institutes in Denmark. The GTS institutes specialise in various disciplines and play a role in relation to the dissemination of research knowledge, especially to the private sector. Thus, all GTS-institutes can boast a well-developed level of co-operation with primarily small to medium sized businesses within their relevant areas of expertise. The service on offer is primarily related to the testing and certification of advanced technology, which is carried out as a consultancy service. The GTS institutes are semi-state bodies that in 2001 received DKK 240 million from the state, which corresponds to approximately 11% of their turnover of DKK 2.2 billion, of which almost DKK 1 billion was sourced from sales to Danish companies.

**Table 2.2.** Approved technological service institutes, staffing and expenses in million DKK in 2001 figures

Institute	2001 turnover MDKK	No. of employees 2001	Public funding million DKK 2001
Danish Technological Institute	678	931	95.1
FORCE Technology (incl. Danish Maritime Institute)	574	818	35.7
DHI Water & Environment	301	363	28.9
DELTA Danish Electronics, Light & Acoustics	233	249	24.3
Danish Standard	133	173	17.6
DK-Teknik (energy & environment)	111	156	6.0
Biotechnological Institute	83	144	15.0
Danish Institute of Fire and Security Technology	58	93	6.3
Danish Toxicology Centre	29	44	4.3
Danish Institute of Fundamental Metrology	17	24	9.3
Total	2,233	2,977	242.5

Source: Data from GTS – Advanced Technology Group.

The above figures can be abstracted into the following presentation of state and semi-state research institutes and facilitators in Denmark:

- The universities: Research, the provision of research based courses, and facilitating access to (and the exchange of) knowledge
- State sector research institutions obliged to deliver research-based knowledge which can form a basis for executive decisions, along with guidance and monitoring obligations. Further they contribute to education at university and PhD level.
- Hospital and health services. The bulk of research takes place in the country's three university hospitals, where 18 hospitals are engaged in regional co-operation with the University of Aarhus, University of Southern Denmark and Copenhagen University.
- Ten authorised technological service institutes, which, for a fee, make professional knowledge available to the business community. They play an important role as producers and communicators of practical knowledge for the benefit of especially small and medium sized businesses.

### **2.3. The training and education system in the Jutland-Funen Region**

There are three universities in the Jutland-Funen area which have several faculty disciplines: the University of Aarhus, Aalborg University and University of Southern Denmark, all of which carry out research and offer bachelor degrees and master's degrees, PhD degrees, as well as extended masters' programmes.

The University of Aarhus is one of Denmark's two traditional universities, whilst University of Southern Denmark and Aalborg University are newer universities established when the growth in university degrees began to occur. The three universities are located in the three largest cities in western Denmark, and Aalborg University and University of Southern Denmark have also established other departments via feeder campuses in a series of medium-sized cities in the south of Jutland. Over and above this comes the Aarhus School of Business, a single faculty university, which as the other universities, offers bachelor degrees, MA and PhD degrees as well as continuing education programmes.

The Danish Institute of Agricultural Sciences, a state sector research institution, is also included in the study, as it is regarded as being on equal footing with the universities in the Science and Enterprise Network under the Jutland-Funen Co-operation of Business Development, which is referred to in Chapter 1.

There is also a range of further education institutions in the region offering both short and medium cycled higher education courses, but the focus for this self-evaluation report is exclusively on the institutions that fall under the Science and Enterprise Network's parameters and contribute to development in the Jutland-Funen region. Table 2.3 below presents a schematic summary of a range of key statistics for the five institutions, as well as a short description of the individual institutions:

**Table 2.3.** Key statistics for knowledge institutions under the aegis of the Science and Enterprise Network

	AAU	AU	ASB	DIAS	SDU
<b>Number of students (total)</b>	13,324	20,176	5,546	-	16,187
<b>PhD students</b>	535	799	58	127**	416
<b>Number of employees (total, one person's year of work)</b>	2,090	3,617	485	929	2,059
<b>Number of scientific personnel (total, one person's year of work)</b>	1,269	1,965	-	369	1,153
<b>Number of MA degrees / year</b>	1,129	1,893	533	51	1,045
<b>Number BA degrees / year</b>	1,071	2,031	655	-	1,223
<b>Number of PhD awards / year</b>	87	188	9*	38**	90
<b>Total income (mill. DKK.)</b>	1,439.3	2,414.0	319.5	300.4	1,466.5
<b>State subvention (mill. DKK.)***</b>	1,012.1	1,631.1	245.4	265.0	1,052.5
<b>Figures coming from (year)</b>	2004	2004	2004	2004	2004

Source: Facts about Aalborg University; Key statistics for the University of Aarhus; Annual report 2004, School of Economics and Business Administration, Aarhus; Yearly Report 2004, the Danish Institute of Agricultural Sciences; and Statistical Year Book, University of Southern Denmark

Note:

\* Total number of authorised theses/dissertations for researcher courses

\*\* The students are registered at a Danish or foreign university. PhD students and MA students complete the main part of their research projects at the Danish Institute of Agricultural Sciences.

\*\*\* Given that the institutions assess state subvention in different ways, the figures may not be immediately comparable across the range of institutions

### 2.3.1. Aalborg University (AAU)

Aalborg University was founded in 1974 on the basis of an amalgamation of already existing higher education courses – engineering, social work, business economy – with a range of new courses within technical science, natural science, humanities and sociology. In 1995, the College of Engineering in Esbjerg became a part of the university. Added to this is the establishment of a department in Copenhagen, in co-operation with the College of Engineering there. Aalborg University is based upon multidisciplinary and problem-based project work.

### 2.3.2. Aarhus School of Business (ASB)

The Aarhus School of Business was founded in 1939 and offers courses in industrial economy jurisprudence, language and business communication.

### **2.3.3. *The University of Aarhus (AU)***

The University of Aarhus was founded in 1928 following local initiatives and functioned as a private institution until 1970 when it became a state-run institution under the first Universities' Act. The University began life by offering courses in the humanities, after which came medicine (1933), economics and jurisprudence (1936), theology (1942) and the natural sciences (1954). In 2006 the Herning Institute of Business Administration and Technology will be merged into the University.

### **2.3.4. *Danish Institute of Agricultural Sciences (DIAS)***

The Danish Institute of Agricultural Sciences (DIAS) is a state sector research institution, under the auspices of the Ministry of Food, Agriculture and Fisheries, which performs high-level research, planning for the authorities and national guidance, as well as contributing to research courses and higher education courses, cf. the State Sector Research Institutions Act of 2004. The Danish Institute of Agricultural Sciences consists of five research centres, three of which are in the Jutland-Funen region (Foulum near Viborg, Bygholm near Horsens and Aarslev near Odense). DIAS carries out research within natural, technical, agricultural and animal husbandry sciences and development. The research is organised in departments covering DIAS's major research areas in the production chain from farm to fork.

### **2.3.5 *University of Southern Denmark (SDU)***

The University of Southern Denmark was founded in 1998 as an amalgamation of Odense University, the Southern School of Business in Kolding, Syddansk College of Engineering in Sønderborg (1984) and Sydjysk University Centre in Esbjerg (1972). The largest of the four institutions – Odense University – was founded in 1966 with two faculties: Humanities and Medicine. Today, the University consists of four faculties: The Health Sciences, Natural Science, Sociology and Humanities. The University of Southern Denmark is a multi-campus university with a presence in the following cities: Odense, Sønderborg, Esbjerg and Kolding. As of 1 January 2006, the university will possess a fifth faculty: the Faculty of Technology.

## **2.4. The new Universities' Act of 2003**

The new Universities' Act of 2003 was an attempt to change the regulatory framework of the universities in order to adapt to changing needs and requirements as the global information village grew exponentially. Universities are seen as important institutions within the context of ensuring prosperity and the ability to compete, things which demand that universities be afforded the chance to be flexible and innovative when faced with new conditions for competition – a demand that is impossible to fulfil within a traditional detail and regulation administration combined with restrictions placed on the universities' horizontal and vertical distribution of labour.

The Universities' Act paves the way for a fundamental break with the previous detail administration so as to bestow upon the universities a greatly increased room to manoeuvre in terms of arranging courses, the organising and recruiting of researchers, talent promotion, and co-operation with the business community.

The new Universities' Act, in other words, paves the way for major changes in the relationship between the government and university, where management is replaced by dialogue, openness and transparency, as well as marked changes in the social functions of universities so as to include the role of mediator and exchanger of knowledge. Functions which will be strengthened via a reinforcing of the universities' management and leadership structures via a change in management practise, and by having external members on the board of management.

The most important changes in the new Universities' Act are:

The strategic goal of the universities:

- A university's obligation to carry out research and offer courses based on the highest academic standards, and the dissemination of information regarding scientific methods and research findings will be expanded with the inclusion of a duty to communicate and exchange knowledge, which involves the following measures:
- To exchange knowledge and skills with society, including the business community
- To participate in the public debate
- To secure research relationships with other providers of long term education courses
- To improve the scope for strategic prioritising

Research and type of courses offered:

- The university has freedom of research and shall safeguard this freedom and ensure the ethics of science. The university shall contribute to ensuring that the most recent knowledge within relevant disciplines is made available to non-research oriented providers of higher education.

Interaction with society:

- The Act lays stress on the obligation on the part of universities to interact with society and upon their need to engage in international relations. Emphasis is also placed on the role of the university as an institutional standard bearer for knowledge and culture, and also emphasises the importance of research and know-how in creating growth, prosperity and the development of society. Stress is also, therefore, placed on universities needing to cooperate with social players, private institutions, industry, public authorities, as well as research and training/educational institutions.

New principles of management:

- Strengthening management is emphasised via the adoption of the following principles:
  - Employed managers in preference to elected managers
  - The elimination of collegiate bodies at all levels
  - The introduction of a board management, having a majority of external members, as the university's highest body

## **2.5. Development contracts as a strategic development tool**

The setting up of development contracts will have a core function in strategic planning as a tool giving strategic direction in the university's development and dialogue with government departments and other interest groups.

The contract is a tool for determining guidelines for the strategic prioritising of the university's combined resources, in a situation where contracts will be used as a starting point for the monitoring and evaluation of future actions and plans.

In relation to external interest groups, the contract will help to make visible the strategic prioritising and choices that were made. The contract will also play a central role in relations between the university and government department as a starting point for a dialogue regarding the university's goals and priorities

Development contracts were first introduced in 2000, where they primarily focused on overall goals within research, intermediation and internal arrangements. With the advent of the new Universities' Act, there is now in

2005 a new generation of contracts in operation, where there is a focus on targets and outcomes that will be of benefit to society.

An examination of these new contracts shows how the changes in the Universities' Act have contributed to changes in strategic practise at universities, and their wider interaction with the world around them.

In general, the changes stemming from the development contracts show that the universities have been able to make use of these contracts by developing strategies and visions based on the individual university's unique set of abilities. And that they had been used to focus on their own particular positions of strength in relation to the three core areas:

- Research
- Training/Education Courses
- Communication and knowledge exchange

(Source: The Ministry of Science, Technology and Innovation 2003).

## **2.6. Management and direction of higher education courses**

The universities are state institutions under the aegis of the Ministry of Science, Technology and Innovation, whilst other parts of the education system come under the Danish Ministry of Culture and the Danish Ministry of Education. This means that the two regional authorities do not have any formal ties to the decentralised authorities (municipalities and counties). The geographical placing of universities is therefore a matter for the ministerial department on behalf of the Danish Parliament.

As described above, universities are managed by the ministries in accordance with the Universities' Act. A form of management that has gone from specific detail management to broad framework management and which has required a cultural change both on the part of the universities and also in government departments.

The rector collegiate, which represents the combined political mouthpiece for universities in Denmark, has in the meantime, and in the context of its experiences with the new Universities' Act, drawn attention to the fact that it has not proved possible to give the universities the desired autonomy; a fault which the rector collegiate believes is related, amongst other things, to the manner in which the government department chooses to interpret and enact the law.

## **2.7. Financing**

The financing of universities is based on various forms of grants. In the first place, the universities operate on base grants from the ministry, which the universities may use to defray running costs. Secondly, they depend on a subvention per (full time) student. Thirdly, there is a national system of research councils, pooled finances and funds to which the universities may apply. Fourthly, it is possible for universities to obtain external financing from the EU, national, regional and municipality, industry and from private funds, etc.

Seen from a Danish viewpoint, it is surprising that the cost per student is lower for university courses compared to courses provided at lower levels, which is very unusual in the European context. Added to this is the fact that financing, when compared to other countries, has fallen since the middle of the 90s, which is totally against the trend in Sweden and Finland, where there has been a marked increase in expenditure for public research. This has led some commentators to regard the high international standards within Danish research as being primarily

a result of the efforts made in previous times, where there is then a risk of a significant fall in the scope of international research, as opposed to the situation in Sweden and Finland, countries that have moved right up to the front in this field (Source: The Ministry of Science, Technology and Innovation).

### **2.8. Growth via greater co-operation between universities and society**

The new legislation discussed above also paves the way for a change from the old hierarchical and demarcated system in favour of a more flexible system, which seeks to strengthen both competition and co-operation between universities, and between universities and other interest groups.

These institutional changes will be strengthened by, amongst other things, a series of action plans, which have the aim of promoting the exchange of knowledge. The starting point for this is that knowledge, by itself, will not encourage growth. If local industries and knowledge institutions are to have a close and beneficial relationship, it is necessary to build bridges between private and public research and innovations. The action plans take the following as their starting points:

- Co-operation in research and development
- Access to the relevant and necessary talents
- Commercial development of publicly funded research
- The universities own framework for co-operation
- Focus and prioritising in publicly funded research
- Access to qualified technological services

### **2.9. The prevalent culture within the universities**

A series of studies and evaluations have shown that universities are very favourably disposed to co-operation with outside agencies, be this in relation to research, training or intermediation.

Thus Danish universities can be characterised by the fact that research co-operation is a top priority where, for example, publishing in international journals is concerned. There is also the fact that there is a high degree of co-operation with other institutions, especially other research institutes both inside the country and abroad.

In relation to the business community, studies have shown that, in the case of the Jutland IT initiative for example, researchers have no worries about contact with the business community. This does not mean that they are uncritical in their opinions on such co-operation. There is nowadays, to a much higher degree than previously, a focus on the practical value of these types of co-operation and the results gained thereby.

### **2.10. Universities as regional hothouses for growth**

Copenhagen University goes back as far as 1479, and the University of Aarhus to 1928. The development of new universities is rooted in the baby boom of the middle 60s onwards, and also in the need to create growth and development in cities and regions. These developments meant that there was a need to locate universities in various parts of Denmark.

The location of a new university is decided by the Danish Parliament on the basis of considerations regarding national development and demand. The placement of a university in a particular area represents an acknowledgement of the central role played by universities in the development of prosperity and competition; whilst at the same time also being an acknowledgement that the proximity of a university has an enormous influence on a town or region's ability to develop and renew itself. It was for these reasons that the country's

newer universities, if one leaves out Roskilde University, were located in the Jutland-Funen region in order to create a more level playing field in terms of development.

The central importance which a university has for regional development also means that there is great competition between the various regions in attempting to attract a university to a particular area; for which reason coalitions are formed in the regions in question amongst the various interest groups with the aim of lobbying for the procurement of a university to their own region.

The extensive preparatory work, which has already preceded an order from the Danish Parliament to place a university in a particular area, means that, by the time the university is established, a dialogue is already in place between the region and the university. This type of dialogue has helped to create special conditions for the anchoring of a university in the relevant area.

All universities have, from the start, engaged in a dialogue with the local society that was instrumental in setting up the co-operation between the university and its surrounding community.

This can also be seen by the fact that universities have primarily developed relationships with those cities/counties in which they are located. In Aarhus, for example, a broad range of citizens from the city's business community, organisations and institutions joined together in 1921 to form an organisation entitled the University Association Aarhus (Universets-samvirket) which, along with Aarhus Municipality, represented the driving power in the fight to get Denmark's second university located in Aarhus. Other universities have received similar regional support where university campaigns have been fought.

### 3. RESEARCH AND INNOVATION

#### 3.1. Introduction

Compared to the capital region, the Jutland-Funen region as a whole is characterised by relatively few private and public investments in research. The same applies with regard to the range of business innovation and to the number of knowledge based entrepreneurs.

A substantial challenge facing the Jutland-Funen region is, therefore, how to increase the scope of research based innovations and how to stimulate conditions in order to increase knowledge based entrepreneurial activity. One of the possible measures is to strengthen the interaction between research and industry.

It is therefore important to look at the context between, on the one hand, regional development needs and circumstances, and on the other, existing research-related activity within the university system; as well as the interaction between external interest groups and universities.

##### *3.1.1. Regional development potential*

The dominant private industries are still foodstuffs, energy and environment, along with the metal/machine industry; even though growth-based industries such as IT, biotechnology and health have grown strongly in recent years, if from a very low base line. It is therefore decisive that research projects at universities are able to give support to both the renewal and replacement of traditional industries, and to new areas of growth.

##### *3.1.2. Interaction between universities and external interest groups*

Interaction and co-operation between research institutes and surrounding society with regard to the development, usage and dissemination of new knowledge has gained an increased focus in recent years. In the first instance, political initiatives and the universities' own efforts have been specially focused on how interaction between research and private business might be strengthened. From a regional development perspective, it is however also crucial to broaden the research co-operation out to areas within the public sector – not least into areas covering social and health services, local business and services, tourism, sport and culture.

What follows below is a range of examples of research, innovation and co-operation between research institutes and the Jutland-Funen region's business community. The research institutes' own self-evaluation reports have, to a large extent, focused on research activities and interaction relating to manufacturing companies and this focus has been retained in this summarising report.

The central research and innovation-related challenges facing the Jutland-Funen region can be summarised into the following headline questions:

- How can research and innovation be used at a higher level to contribute to the development of prosperity and ability to compete in the Jutland-Funen region?
- How can research and innovation stimulate power centres for growth?
- How can research and innovation combine for the development of both the external and the internal balance in the Jutland-Funen region?
- How can interaction between the universities and state sector research institutions, and the area's interest groups, be increased?

### 3.2 How does research relate to regional strategies

The regional structures mean that it is the counties and cities in which the universities are located that primarily will regard universities as a resource for development, and at the same time and in an increasing way, regard co-operation with universities as an important part of their development. Those regions that do not have their own university have, on the other hand, been active in trying to attract research and educational activities, partly by working to establish a regional university, and partly via co-operation with the existing universities and state sector research institutions. A part of these activities is organised under the Jutland-Funen Co-operation of Business Development banner and its related initiatives within IT initiatives and the Science and Enterprise Network.

The universities' increasing importance for regional development can be clearly seen in the development strategies of the municipal and regional authorities and in activities where the universities are playing an ever more central role in the development of future areas of growth:

- Aarhus City and Aarhus County: Strategies for the development of IT projects, foodstuffs and biotech/health
- Odense City and Funen County: Strategies for the development of Biotechnology, Robots, Gardening as well as IT and communications
- Aalborg City and Northern Jutland County: Strategies for the development of ICT, Health/biotechnology, Nanotechnology, price sensitive markets and consumer experience business markets

Such developments are mirrored in developments in the southern and western parts of the region, where the smaller institutions/departments are situated:

- Viborg City and Viborg County: Foodstuffs and Agro industry
- Esbjerg City and Ribe County: Offshore industry and the maritime sector
- Sønderborg City and Sønderjylland Counties: Mechatronics
- Kolding City and Vejle County: Foodstuffs as well as Transport and Steel sector

The importance of the universities to the Jutland-Funen region is, however, far more extensive and deep rooted than appears even from the above-mentioned development initiatives, given that universities and state sector research institutions interact with interest groups and players in all parts of the Jutland-Funen region. A process which the Jutland-Funen Co-operation of Business Development and its related initiatives within IT and the Science and Enterprise Network continually seek to enhance.

The work involved in widening the interaction and co-operation between universities and knowledge institutions into a geographically larger group of businesses and interest groups is supported by a series of initiatives that the Jutland-Funen Co-operation of Business Development has set in motion in conjunction with the Ministry of Science, Technology and Innovation. These initiatives aimed at promoting the development and dissemination of knowledge to new groups of players and geographical areas take place in the form of a series of network initiatives based on the development of competency centres, knowledge environments and new networks.

- IT initiatives: development of regional key competencies and smaller co-operation projects.
- Regional growth environments: The construction of binding networks between businesses and knowledge institutions in the whole region.
- Network initiatives: Development of networks that can increase competence and development potential.

### 3.3 The strategic framework of universities

Universities are state institutions whose activities are primarily financed via state grants for research and teaching. The new Universities' Act places an increased focus on the social benefit of research and also places direct requirements on universities to make those benefits visible via the above-mentioned development contracts. These requirements mean that universities, to a much higher degree than was previously the case, must provide clear explanations as to their policies and objectives and how they intend to contribute to social development in a global and regional context. A set of requirements which appear natural both as a consequence of the often global nature of research, and where social benefit can be tied to a particular locality.

Development contracts, therefore, place great emphasis on measures which, on the one hand, seek to ensure that research production is internationally competitive whilst, on the other, ensuring a focus on social effect in relation to defined regions and/or sectors. The integration of research and social benefit in the form of interaction and exchange of knowledge is a learning process which, of necessity, takes as its starting point the different characteristics of the universities themselves. Thus the new universities and the Danish Institute of Agricultural Sciences appear to be a lot further down the road in the process with regards to clarifying the interaction between the development of research related key competencies and the regional benefits obtained thereby. All research institutions in the Jutland-Funen region are, however, obliged to be actively involved in utilizing their research in a dialogue with the regions, with key competencies being the starting point for that dialogue.

The University of Southern Denmark's development contract is a case in point where the strategic interaction between research and the development of industry forms an integrated part of the development contract:

“The University of Southern Denmark will continue its efforts in developing its own dedicated research related key competencies, in areas where the university wishes to become an international leader. This applies to key competencies within the areas of Media & Communication, Health & Biotechnology and Technology & Management, which have recently been chosen as initiative areas. The university engages with regional industry promotion initiatives, and public institutions, within these professional areas.”

The University of Aarhus intends to increase the exchange of knowledge with the business community and to this effect has introduced an amalgamation into its development contract:

The University of Aarhus has decided to take in the Herning Institute of Business Administration and Technology (HIBAT). This absorption aims to combine the significant experience of HIBAT, with regard to innovation in smaller business activities, with the University of Aarhus' very strong research competency. It is expected that the synergy effected by the absorption will lead to further development and a strengthening of the University of Aarhus' co-operation interface with the business community.

In the same way, the state sector research institution, the Danish Institute of Agricultural Sciences, views the interaction with regional interest groups as an important part of the institution's strategic basis:

“With regard to regional co-operation, part of the strategy of the Danish Institute of Agricultural Sciences is an intention to: Develop regional co-operation around the five regionally placed research centres which will hereby contribute to regional development in Denmark; whilst at the same time seeking to develop the best possible professional and organisational network internally within the Danish Institute of Agricultural Sciences in order to facilitate multidisciplinary solutions.”

The universities' choice of co-operation partners is, however, often primarily based on those partners' ability to contribute to research and innovation, and there is less emphasis on a potential partner being located in the

vicinity of the university. This means that universities' interaction and co-operation with the business world, and interest groups, is primarily aimed at businesses and organisations that are dynamic and development-orientated regardless of their geographical position. There is, in other words, a complex pattern of interaction and co-operation between universities, research institutes and players and interest groups that runs across the administrative structures in this area. It is a geographical pattern that to a great extent is formed by the location of dynamic businesses, clusters, and institutions often engaged in co-operation with several universities and research institutes.

### **3.4 Development of industry via research, innovation and co-operation**

The development of national and international key research competencies takes place on the basis of selective processes within the individual research areas in a global context. It is therefore interesting to see to what extent it is possible for universities and state sector research institutions to combine the requirement for key competencies with the utilization of research in a Jutland-Funen perspective.

The individual research institutions' self-evaluation reports show that there is not necessarily a contradiction between efforts, on an international and national plane, to obtain key competencies within research and regional utilization. On the contrary, the reports show that having key competencies within specialised research areas contributes to a raising of the bar in public and private research and research based innovations. The result is an improvement of the existing business areas' ability to compete, whilst at the same time there is increased growth within growth-oriented business areas such as IT, biotech/health and business services via the establishment of new businesses and business activities.

#### ***3.4.1 The relationship between research and existing business areas***

Growth and prosperity are, in the context of the Danish welfare state, linked to development and interaction between private and public sectors, welfare and the market. A set of relationships which mean that the development of competitive competency clusters is also linked to the development of social priorities in production, welfare, health and the environment. This is reflected in the dominant industry and competency clusters in the Jutland-Funen region: foodstuffs, the environment and energy, metal and machine industries.

##### ***3.4.1.1. The foodstuffs sector***

The foodstuffs sector is a business sector of regional importance in all parts of the Jutland-Funen region. The sector has traditionally been tied to the national research and innovation system with special emphasis on the Centre for Advanced Food Studies established by the Royal Veterinary and Agricultural University and the Technical University of Denmark, which is located in the capital region. Parts of the Danish Institute of Agricultural Sciences and Aarhus School of Business are linked to the Centre for Advanced Food Studies. The development of technology and marketing has led to a shift in development in the direction of a greater emphasis on research-based technological skills, natural science, consumption and marketing – competencies that are developed in the different parts of the west Danish university and state sector research system.

The value chain within the Danish foodstuffs sector, generally speaking, is characterised by a dominance of large businesses producing standardised quality products on a large scale with a restricted scope for an increase in value. It is an area of production where global competition is very intense, and where the traditional differentiations regarding quality and distinction are no longer sufficient to guarantee a position as a unique supplier with high prices.

If the ability to compete is to be retained and the attractive parts of the value chain (and their workplaces) are to remain in Denmark, a focus on innovation and market orientation/innovation is required, which will contribute to increased effectiveness not only in the value chain's individual parts but also in its whole approach combined with market-orientated products and process development.

Research into market innovations at the Aarhus School of Business will play a central role by virtue of their international key competencies within market economy research – a research initiative that has already formed the basis for the development of methods and tools which can make businesses more innovative and market orientated. This research has played a central role in the development of national and regional strategies within the foodstuffs sector.

**MAPP** The Centre for research in customer relations within the foodstuffs sector works to make Danish foodstuff companies more market orientated and has developed many methods and tools for helping businesses to develop market-based innovations.

Research-based knowledge has had a major effect on the big players in the sector and has formed the basis for the development of new strategies for market-orientated innovations in the various parts of the value chain; including helping in the development of new strategies for research and development in the different value chains and regional clusters in the Jutland-Funen region.

#### **Foodstuff Cluster in Aarhus**

An example of research-based innovation strategies is the development of the foodstuff cluster in Aarhus/east Jutland, a cluster which mainly consists of the large foodstuff companies' departments of administration, sales and marketing, research and development, as well as different supplementary and complementary activities within business service. Among the companies here are the foodstuff companies Danish Crown, Arla Foods, Tulip International, AarhusKarlshavn and Danisco-Cultor. York Refrigeration and Invensys Process Systems meanwhile are examples of companies that manufacture machines for the foodstuff industry. Here, a consortium has been established with the aim of developing foodstuffs which are categorised in terms of healthiness by the use of nano- and biotechnology and which thereby call on the expertise of the universities and health experts.

#### *3.4.1.2. Regional clusters within the foodstuffs sector*

The Danish Institute of Agricultural Sciences' placement as a state-sector research institute within agricultural sciences plays a central role for agriculture and foodstuff production by virtue of its high level of key competencies and its role in technology transfer. Thus, there is a clear context between research-related specialisation and regional specialisation within agriculture and the foodstuff industries.

**The DIAS Research centre at Foulum**, which is located in Viborg County, an area with the country's largest volume of pig production. The centre has a research-related key competency in the field of animal husbandry and of agro ecology. **Research centre at Aarslev** in Funen County has a key competency within horticultural production, which is closely connected to the area's dominance in the gardening business sector. **Research centre at Bygholm** specialised in the field of agricultural engineering is located in Vejle County, which boasts a very strong foodstuff cluster.

One example of this interaction can be seen in the Danish Institute of Agricultural Sciences' interaction with regional interest groups within the development of plant cultivation and health on Funen. Danish gardening production and its key players are primarily located on Funen, which also forms the historical background to the

Danish Institute of Agricultural Sciences' gardening research department being located at Aarslev on Funen. Through the establishment of the DevelopmentCenter Aarslev, in co-operation with University of Southern Denmark, counties/municipalities and private businesses, it has been possible to exploit regional key competencies for the development of the gardening business sector.

#### **DevelopmentCenter Aarslev**

DevelopmentCenter Aarslev is a regional growth environment uniting the competencies and technologies available in the area within a range of development projects: plants for health and gardening technology. The aim is to effect a combined development of the agricultural business sector, subsidiary industries and the processing industry, both within the gardening business sector and also within the other foodstuff production sectors. The partners involved in the projects are: University of Southern Denmark and the Danish Institute of Agricultural Sciences', Aarslev, in conjunction with training/educational institutions, industry promotion organisations and private businesses within the region.

The centre plays an important role in the development of a series of new and alternative commercial areas in relation to the gardening business sector. The development centre is thus the driving force and coordinator in projects which combine key competency research at the Danish Institute of Agricultural Sciences', Aarslev, University of Southern Denmark, Odense University Hospital and the College of Engineering - Odense Teknikum, around robot technology and health respectively.

The robot technology project within the foodstuff sector is related to research competencies within another local competency centre, RoboCluster, which is a co-operation project with University of Southern Denmark and the College of Engineering - Odense Teknikum.

The health project has been initiated with a view to making Funen a centre for the development and production of plant medicines. A consortium, TCM Denmark, has been formed which will be responsible for the development and marketing of products within this business sector. Both projects are receiving support via the Jutland-Funen Co-operation of Business Development.

#### **TCM Denmark - Funen.**

As an offshoot of the "Plants for health" project under DevelopmentCenter Aarslev, the consortium, TCM Denmark, was formed in 2004 with a view to establishing business links with China. The name TCM stands for "Traditional Complementary Medicine", i.e. natural medicine which in China is broadly speaking used as the norm in the medicine application. Participants in the consortium are Funen County, Funen Business Centre, Odense Municipality, the Danish Institute of Agricultural Sciences, the University of Southern Denmark, Odense University Hospital and the Science Parks of Southern Denmark. Companies from countries where there is widespread use of "TCM", are offered a combined packaging solution consisting of plant research, testing and authorisation and commercialisation of products in the EU. In the same way, it is hoped to make Funen a natural gateway for natural medicine into Europe.

#### *3.4.1.3. Energy and environment sectors*

The energy and environment sector is one of the larger business sectors which in recent years have seen the biggest growth in the Jutland-Funen region and this business sector is of great importance to the region. The development of an internationally dominant industrial cluster within the wind turbine sector is one of the best Danish industrial success stories of recent years, where research and innovation played a central role. The wind turbine industry is located in the mid Jutland area but has, in terms of research, called upon the national knowledge system with Risø National Laboratory, the Technical University of Denmark and, in recent years, also Aalborg University as the dominant players.

The Jutland-Funen university system has historically played a smaller, less prominent role than its counterparts elsewhere. It is a role however which is now seeking promotion via the development of a competency network under the auspices of the Jutland-Funen Co-operation of Business Development. The knowledge and competency centre for the wind energy sector is located at the Herning Institute of Business Administration and Technology and also involves the participation of Aalborg University and the Aarhus School of Business.

#### **HIBAT-Wind**

HIBAT-Wind is a knowledge and competency centre operating within the energy sector. The centre is involved in ensuring investments in research and new knowledge is put to good use for businesses within the industry and thereby it contributes to an increased ability to compete, and to employment in the wind turbine industry and its subcontractors. The centre is located at the Birc Innovation & Research Centre at Herning Institute of Business Administration and Technology (HIBAT), which lies within 75 km of the heart of 50% of the world's combined wind turbine production areas. The following groups stand behind the centre: RISØ National Laboratory, the Technical University of Denmark, Aalborg University, Skjern Technical School and HIBAT.

#### *3.4.1.4. Metal/machine industry*

The metal and machine industry is of great importance to parts of the western Danish region and is supported by a series of research related key competencies with Aalborg University and the University of Southern Denmark being the most substantial players.

Aalborg University possesses a range of key competencies which are used in the metal and machine industry, amongst others, via the Centre for Industrial Production, which is a national centre for the promotion of the industry's ability to compete. The centre works with businesses that are development orientated and it has extensive experience of working with companies within the metal and machine industry in relation to the development of businesses processes.

The centre contributes to the development of businesses' ability to compete via technical and organisational innovations, and has a distinctive inter regional relationship with development-orientated companies in the greater west Danish region. That said, there are relatively few companies from the Northern Jutland area involved in the project.

#### **Centre for Industrial Production**

Centre for Industrial Production was established in 1999 with a view to strengthening Danish industry's international ability to compete via high end research, engineering courses, PhD courses and co-operation with industry. Its establishment was financed by the Ministry of Science, Technology and Innovation, the Danish Ministry of Economic and Business Affairs and Aalborg University. The goal of the centre is to develop future-orientated, innovative and interlinking industrial solutions for the benefit of Danish industry. This is brought about by creating a context between people, organisational design management, work processes, technology and systems with a view to ensuring an effective flow of knowledge, materials and other resources within the company, which can then help to increase productivity and customer value. The centre's activities are concentrated on the following activities: strategic management, supply chain management, innovation and transformation. The centre has an external board of management, with representatives from companies and industrial organisations and an international advisory panel. More than 75 companies and 20 international and national research institutes have been directly involved in the centre's research. An experimental laboratory has been established in connection with the centre.

The Marks Mc-Kinney Møller Institute for Production Technology at the University of Southern Denmark has specialised in robot and automation technology. In co-operation with the College of Engineering - Odense Teknikum, the institute has developed key competencies within robot technology, partly by virtue of a long-term relationship with Odense Shipyard.

#### **RoboCluster**

RoboCluster is a south Danish competency network for the development, innovation and utilization of robot and automation technology. The network embraces suppliers and technology developers from the robot and automation sector and research and training/educational institutions (University of Southern Denmark, College of Engineering - Odense Teknikum and Odense Technical School) along with specialists in robot and automation technology.

#### **Lacklustre**

Lacklustre is a knowledge and competency centre concentrating on the use of aluminium. The centre's starting point is an industrial specialisation in aluminium for south western Jutland. Every fourth employee in south western Jutland is employed in the aluminium industry and the sector has grown by 150% in Denmark in the last 10 years. The aim of the centre is (via co-operation between companies, educational and research institutions, as well as GTS-institutes) to create practical knowledge regarding aluminium production. Aluminium is a relatively narrow field and there is not much of a tradition for research and training within this field in Denmark. AluCluster's vision is therefore to develop a regional and national aluminium competency cluster in order to create and retain new jobs, not least in the region itself.

#### **Offshore Centre Denmark**

Offshore Centre Denmark is a regional development initiative, where 35 companies in the Esbjerg area have come together to promote the offshore sector's international competition prospects via knowledge development/sharing. This sector is very competition oriented but has no tradition for sharing knowledge. The centre was established in conjunction with Aalborg University Esbjerg, University of Southern Denmark Esbjerg, a range of other training/educational institutions, private companies, the county and the municipality.

#### **The Centre for Product Development**

The Centre for Product Development was established on the basis of the close co-operation between the University of Southern Denmark, Fachhochschule Flensburg and Southern Jutland County. The centre is intended to function as a link between companies and research and knowledge institutions on both sides of the national border. The focus is on intelligent mechatronic products. The centre's work leads to the development of, amongst other things, tools for the handicapped, environmental protection and environmental improvement systems, energy saving measures, measuring equipment for measuring and checking, information systems, light weight constructions and patient monitoring solutions.

It becomes clear from the above analysis of the most important trade and industry areas in the Jutland-Funen region, and related research key competencies:

- that there is an overlap between industrial priorities and the development of key competency research
- that key competency research at the universities contributes to the dissemination and development of research-based knowledge and innovations in companies
- that the interaction between key competency research and companies needs to be developed via the building up of competency centres and networks
- that this interaction is related to development-orientated companies and has an inter-regional pattern

- that there are particular initiatives to strengthen the interaction with local companies and institutions

It is not apparent from the self-evaluation studies whether the scope of research within these areas is sufficient thus far, when seen in relation to the huge importance attached to the industries concerned and the challenges which these same industries now face. The profile of the external players involved in the promotion of industry and business systems illustrates that:

- the relative scope of the areas of research does not reflect their social importance.
- these areas do not have sufficient emphasis on knowledge and the state system of administration; in which case, priorities and grants are too small when compared to the actual requirements.

### ***3.4.2 The relationship between research and growth-oriented business areas***

Business sector areas within high technology and knowledge-intensive production and services have, within the last few years, had a noticeable growth in the Jutland-Funen region. The new growth clusters are primarily located around the larger university cities, where there is good access to knowledge and labour force potential. This development threatens to further upset the balance in the region.

The trend in these business sector areas to locate in a small number of cities means that growth in some of the smaller areas of industry has been viewed as also being a powerhouse for growth for the cities where they now play an important role in the local economy. These new areas of growth, therefore, play a central role in the interaction between universities and regions in these areas.

#### ***3.4.2.1. Information and communication technology***

The development of information and communication technology has a decisive importance for the industrial ability to compete, for prosperity and for growth. There are, within the knowledge network, extensive research and development competencies at the three universities: Aalborg University, University of Southern Denmark and the University of Aarhus – competencies which form a starting point for development and the specialisation of regional growth clusters. In Aarhus, for example, an industry cluster has been developed which has emerged from the “pervasive computing” research area, whilst Aalborg has developed a competency cluster within wireless communications.

The development of the IT City of Katrinebjerg is also a good example of how researchers, the municipality and the business sector can interact together in completely new ways, where the universities come to play an active role in the development of frameworks for a quickly growing industry cluster; an industry cluster that will have transformed a traditional business sector area into a cyber village within a few years.

#### **Katrinebjerg – an IT City**

The combination of research, training and private initiative, which are all geographically closely connected, creates the ideal breeding ground for high technology innovation. This was the philosophy behind the IT City of Katrinebjerg, which has emerged out of the shell of an old industrial quarter on a plot northwest of the University of Aarhus. The University of Aarhus has clustered all its IT courses and all its IT research in this IT city. The IT city is also home to the Alexandra Institute Ltd, a research based limited company which functions as bridge builder between public research and private companies. A range of private IT companies have established themselves at Katrinebjerg, and several more are on the way. Denmark’s first actual IT research hub will, furthermore, be opened here in the beginning of 2006. Katrinebjerg is also a leading Nordic and European growth centre for IT projects.

#### 3.4.2.2. *Development of a competency cluster within mobile communications*

Research within wireless communications and co-operation between the Centre for PersonKommunikation and local companies has been decisive in establishing a wireless cluster in the Aalborg area. This co-operation was decisive in being able to build up local business competencies, which then made it possible for local players to become the central players in the development of the new Nordic mobile system in the beginning of the 80s; and then to be able to maintain and develop this position with the transition to digital technology at the end of the 80s and beginning of the 90s; and then subsequently to maintain the importance of local competencies during the process of internationalisation throughout the 90s – a development which was illustrated by a large growth in the number of companies and jobs in the region, and a continued development of cluster diversity with the establishment of telephone operators, etc.

Today CTIF at Aalborg University plays a central part in the development of the next technological generation by virtue of a broad-based research competency within some of the new generation's core areas – a position that is underwritten by the fact that CTIF is the coordinator of a large project which is to develop the EU's 4<sup>th</sup> generation technologies as part of the EU's 6<sup>th</sup> Framework Programme. CTIF is also the coordinator, along with the Danish Technological Institute, of a national "mobile systems" program for the development of competencies within wireless communication.

#### **The Centre for TeleInFrastruktur**

The Centre for TeleInFrastruktur is a leading centre for research and training in wireless technologies and methods. The centre was first established as a logical progression from the international key competencies that had been built up via the research activities at the Centre for PersonKommunikation, which operated on the basis of national research grants in the period 1992-1997 and 1997-2002, around radio-communications and speech recognition. The financial basis for CTIF comes from a combination of national research funds, international research funds, private companies and grants from Aalborg University.

Over and above these specialised clusters, a general business sector has emerged from within the whole IT area, where Aarhus in particular, along with Aalborg, has made noticeable progress in terms of employment. This growth has received a further boost from the fact that universities, authorities and companies have come together in a series of initiatives to promote interaction between research projects and companies. These initiatives have also revealed completely new ways of working together.

The research centres under the Jutland-Funen IT initiatives are good examples of how to establish such centres with practical goals, whilst at the same time retaining the researchers' connection to long-term research. A linkage which is decisive, because it is precisely the rooting of the centres in key competency research that makes it possible to contribute with new knowledge, whilst at the same time the practical goals are being pursued. This ensures that the centres prioritize innovations for companies. This practical approach is strengthened further by the type of management structure at the centres, with external boards of management, advisory panels and professional leadership.

#### 3.4.2.3. *IT initiatives*

The aim of the IT initiatives is to strengthen the particular key competencies found in the different areas and to make the use of IT technology widespread throughout the Jutland-Funen region, with special emphasis on those areas which are not in close geographical proximity to an IT environment. IT initiatives are built up in close co-operation between public knowledge and training/educational institutions and the private business sector. Half

the recipients of grants have used them to establish four competency centres, whilst the other half has used the funding for so called IT corridor projects. Here though, there is an exclusive focus on the centres as an example of a mechanism for the exchange and sharing of research-based knowledge.

The four centres (see below) have been developed from a starting point in research-related specialisation at the three universities and an independent research institute – specialisations which have facilitated the development of activities within a broad spread of needs in relation to the usage and development of IT.

Emphasis was made, from the initial building up of the centres, on exploiting the particular advantages which lay in individual areas of research and their key competencies, as well as in promoting the exchange of knowledge and competencies between the centres via reciprocal representation on the board of management and/or the arrangement of mutual relations, etc.

The four Jutland-Funen IT competency centres as part of the Jutland-Funen IT initiative are:

**Centre for Embedded Software Systems – Aalborg University**

The centre focuses on getting electronics and software to function together at an optimal level. The aim of the centre is to initiate as many collaboration projects as possible between researchers and the private sector. In the first instance via quicker communication of research findings and effective turn over of new knowledge in new products; and secondly, by presenting the research environment at the centre to new research related challenges with a starting point in concrete problem solving which companies decide upon.

**Centre for Software Innovation, CSI – University of Southern Denmark**

CSI is a competency centre in southern Jutland which specialises in the innovation, development and improvement of embedded software in mechatronic products, as well as general processing improvements in software development. The aim of the centre is to build bridges between researchers and industry so that research findings and key competencies can quickly find a practical use within company product ranges and competency development.

**ISIS Katrinebjerg – Aarhus**

ISIS Katrinebjerg has as its aim the strengthening of research and development co-operation between the business community and the Aarhus region's IT knowledge environments. ISIS has three initiative areas: Interactive, Space, Pervasive Healthcare – Health and Software development. Those projects in which ISIS is involved are designed so that they present great potential both for new research findings and new and attractive business ideas.

**Knowledge Lab – University of Southern Denmark**

It is Knowledge Lab's primary task to strengthen interaction between the university and the business community. Knowledge Lab embraces a large range of projects within the areas of knowledge management, digital competency development and the theory of knowledge.

An evaluation of the initiatives taken up by these centres shows that, in a very short time, they have been able to surmount a range of traditional barriers in the exchange of knowledge and sharing of knowledge amongst companies. It has thus been possible to establish co-operation where:

- companies look positively on co-operation for the development of the ability to compete
- over half of the participating companies are located outside university cities
- almost half of the participating companies are small companies with less than 50 employees.

A range of institutional conditions are deemed to have been decisive for the success described above. Amongst the most important factors is the requirement that the centres' projects do not have a duration beyond 18 months, which is the typical period for innovation projects in smaller industrial companies, has been stressed. As a comparison, basic research based projects very often have a time scale of 5-10 years.

#### 3.4.2.4. *Biotech/health*

The health/biotechnology area has great importance for the development of health, prosperity and employment and is, to an increasing extent, establishing itself as a meaningful business sector, as a result of an explosion of interest in this area in recent years.

West Danish research environments have a very strong research foothold within this area. A research foothold which is primarily related to health science faculties at the University of Aarhus and the University of Southern Denmark and the university hospitals which are linked to them; along with the research environment at the Department of Health Science and Technology at Aalborg University.

In the area of health science, there is a very close interaction between regions and universities, given that it is the counties which are responsible for the operation of the hospitals, whilst universities are responsible for teaching and research at university hospitals.

The competency cluster in Aarhus is built up around research-related strengths within medicinal areas and, in the main, interacts with international medicine companies and firms from the Copenhagen region. There is, however, the beginnings of co-operation with local companies across certain clusters as a consequence of the rising interest in health foods stimulated by regional initiatives.

#### **The University of Aarhus and Aarhus University Hospital**

Aarhus University Hospital liaises between the Faculty of Health Sciences Faculty at the University of Aarhus and the following six hospitals in Aarhus and Northern Jutland counties: Skejby Hospital, Aarhus Hospital, Aarhus Psychiatric Hospital, the Children's Psychiatric Hospital, Aalborg Hospital and Aalborg Psychiatric Hospital. Extensive research is being carried out at the Aarhus University Hospital, where, all told, there is a research grant of DKK 500 million, where the greatest share comes from external sources. This is research which is of direct benefit to patients in the region, in the form of new types of treatment, and then of benefit to the wider population in the form of different types of preventive and occupational medicine. On top of this, external partners and the state authorities and companies receive the benefits from the development of new knowledge, as well as new products and methods of treatment. The external partners are primarily national or international medicine companies based outside of the region, but interest is also emerging from the large local foodstuffs industries, e.g. the local development programme for healthy foodstuffs.

It is now hoped that the research related position of strength enjoyed by the University of Southern Denmark and Odense University hospital can be exploited in order to create a competency cluster within biotechnology and health. Efforts are being made, furthermore, to develop a position of strength on an international basis within plant medicines using the area's research-related key competencies within plant research as a starting point; a research effort which has its roots in the Danish Institute of Agricultural Sciences department at Aarslev, and in research carried out at Odense University hospital and at the University of Southern Denmark.

**The University of Southern Denmark and Odense University hospital**

In relation to regional development initiatives, two initiatives should be singled out for mention: the bioTEAMSouth network is a network which was established with a view to identifying the regions as key competency areas within the biotechnology and the health sectors. TCM Denmark is another initiative, which was established in co-operation with the Development Centre at Aarslev and the Danish Institute of Agricultural Sciences, with the aim of establishing Denmark as a European hub within plant medicine.

In Aalborg, it is key competency research within the area of health technology that forms the starting point for an initiative to create a competency cluster.

**Aalborg University**

The Department of Health Science and Technology at Aalborg University contributes to the development of new methods of treatment/techniques via the utilization of Information Technology. This, therefore, embraces the related Centre for Sensory-Motor Interaction, an international key competency factor within the development of Information Technology for the treatment of patients. The centre has created a launch pad for the development of a range of spin-off companies and contracts within the industry. The Health Technology key competency has been the prerequisite for the development of a series of initiatives for the promotion of industrial development via the attraction of companies to the area and the establishment of new spin-offs. A centre, working in co-operation with Aalborg Hospital, has thus been established which will coordinate initiatives with a view to developing projects and companies. Indeed, a research building at Aalborg Hospital has just been unveiled whose primary task is to accommodate new projects. The industrial development initiative, BioMed, is an initiative, in which Aalborg University, together with Northern Jutland County, Aalborg Municipality and private companies, has created a network which aims at developing competency clusters within Health Technology via the attraction of research projects and companies, as well as the development of new companies on the basis of cluster competencies.

*3.4.2.5. Culture and the consumer experience sector*

Culture and the consumer experience sector have, to an increasing degree, come into focus in the regional development sphere, partly as an independent growth generator and partly as a means to attract and retain a creative labour force and/or companies.

The universities play a central role in the attraction and retention of a creative labour force, as universities are involved in creating a social and cultural dynamic regarded as attractive by creative groups in society. Reference is made to chapter 5 to a more expansive discussion of the social and cultural dynamics involved in these issues. The focus here is primarily on the importance of research for the development of regional potential in broad-based research.

The University of Aarhus has a long tradition of research within the humanities, and has over the years developed research across a range of traditional areas within the humanities which have been important for regional development. In this way, research within religious pluralism has been stressed as an important means in creating dialogue between Aarhus Municipality and interest groups and various religious groups, where the university can function as a neutral platform and create space for that dialogue. It is assumed that it will be involved in promoting the integration process in Aarhus, and that it will be of use in building up capacity in the municipality social and health sector. Another example of the possible importance of humanities based research for the region, is the development of a model for the evaluation of artistic quality, which might be included as a factor in planning, in the case of municipalities' prioritising of cultural activities.

Aalborg University has recently drawn together its activities within cultural and consumer experience business markets in a trans-faculty centre which is intended to coordinate and make research in the consumer experience sector visible to the public. This centre involves a broad spectrum of competencies within design, communication and media, technology and finance.

Aalborg University has been heavily involved in work around the regional culture agreement, the establishment and the organising of a Scandinavian culture and consumer experience conference in Aalborg, in conjunction with regional companies, institutions and organisations. The university has, in addition to this, contributed to the analyses of culture and consumer experience industry in Northern Jutland, and to the establishment of a greenhouse for the creative industry.

#### **ExCITe**

ExCITe is a trans-faculty research centre which draws in researchers across faculties, institutes and subject areas. The centre was established in June 2005 and involves 12 research groups/institutes and just under 85 scientific employees. The starting point for ExCITe was a need to gather, and make visible, research and teaching activities within the consumer experience business sector, which plays an increasingly central role in the development of production and consumption of products and services, as well as the development of regions and cities. There was therefore a need for a greater knowledge of perspectives and barriers for the consumer experience business market and about design processes and the construction of consumer experience products. Extensive research is required to strengthen the basis for teaching Intermediation and contact with the business community and wider society.

An analysis of developments within the new areas of growth and the development of research shows:

- that a large scale process of merger is taking place together between industrial areas and key competency research
- that research based competencies within universities and public research institutes are central power houses in the development of the areas in the start-up phase
- that it is possible to achieve substantial growth potential within areas where there are key competencies interacting with companies and industry
- that the barriers between university research and business innovation appear less daunting, which may be linked to the fact that companies are more willing to take on employees with a university degree, and that more companies are research and innovation orientated
- that the public sector is very eager to give backing to development and co-operation within these areas

It appears to be the case with external interest groups:

- that research within the knowledge intensive/high technology area has a very high priority at universities and public authorities, whereas the more low technology and commercial problem-solving projects attract far less attention in relation to resource distribution and political initiatives.
- that the increase in value, and the number of jobs resulting immediately from these initiatives in the high technology arena, are modest when compared to the extent of the investment
- that there is a tendency to concentrate on knowledge-based clusters in the immediate vicinity of the universities

### 3.5 Contact interfaces which facilitate the utilization and transfer of knowledge

As can be seen from the above, research institutions play a central role in the creation of research and innovations in the Jutland-Funen region. A switch has taken place in the universities and research systems' contribution to the upgrading of the regional research and innovations competencies from a rather general competency assurance which has a starting point in the individual knowledge institutions research profiles to, increasingly, being based on a dialogue between the knowledge institutions' research interests and the needs and interests of the regional interest groups. A rising tendency can therefore be seen, where research and training/educational institutions are contributing to the elevation of research and innovation within a range of areas which are of central importance to the area's ability to create development and growth.

There is a large variation in the way in which universities and research institutes contribute to the upgrading of regional research and innovation competency which is linked, on the one hand, to the individual knowledge institution's research profiles and the tradition of co-operation with external interest groups, and on the other, the ability of the regional interest groups to cooperate with knowledge institutions. There is therefore a tendency for the interaction to be primarily orientated towards areas and activities where there is already a tradition of co-operation and dialogue, and where at the same time, there are regional interest groups which have both the knowledge and ability to enter into such co-operation.

In relation to the evaluation studies, both the universities and regional interest groups stress the importance of the existence of mechanisms which facilitate communication and dialogue. Not least the non-development orientated companies have difficulty in discerning who does what at the universities, and how they can make contact and enter into a dialogue with the relevant people and areas. In the same way, it can be difficult for universities to seek out relevant partners in the business community. There is thus a huge need to develop mechanisms and channels which can help to promote closer and more direct contact between universities and the regional players. This is a blockage which has been the basis for the development of a range of national initiatives to promote the exchange of knowledge and knowledge sharing; and a blockage, furthermore, which has been a central element in Jutland-Funen initiatives in relation to the establishment of the Science and Enterprise Network and IT initiatives.

**Strategic research centres** are dedicated to the improvement of interaction between university research and the practical needs of external interest groups. The strength of the research centres lies in their bridge building between the more long-term research taking place in university research environments and the more strategic problems which arise in companies, and because of the regional interest groups' need for innovation development with a more restricted timescale.

The development of a broader **knowledge and competency centre** plays an important role in the national programmes for the exchange and dissemination of knowledge. A knowledge and competency centre is characterized by attempts to bring together all the relevant players, from across the whole region, within a defined initiative area. These growth environments promote competency assurance via intense and binding interaction between companies and knowledge institutions. The companies get a usable competency assurance and knowledge institutions get useful input into research and teaching. The centres can thus be seen as a means of giving these areas access to existing research in these same areas.

In addition to this, a range of **regional networks** play a central role in the regional exchange of knowledge and knowledge sharing. The regional networks are often more loosely organised networks having a starting point in industry promotion networks, where companies and industry promotion players enjoy a more central role in the coordination of knowledge exchange and sharing. Here there is a focus on the transfer of knowledge to existing clusters and companies. The universities and state sector research institutions participate, to an increasing

degree, in such local knowledge networks with a view to promoting regional development via knowledge development and knowledge sharing.

The University of Aarhus and Aarhus School of Business are thus actively involved in the IT forum, which consists of representatives from companies, organisations, public authorities and knowledge institutions with the aim of promoting the IT industry in the area. In a similar way, the University of Southern Denmark participates in IT Forum Funen and Aalborg University in the Northern Jutland ICT Forum.

University of Southern Denmark is an active co-player in the “Brobyggerprojektet 4Frontregion project”, a regional bridge-building project between the business community, knowledge institutions on Funen and, in the southern Danish region, Funen County and Odense Municipality. The bridge-builder project focuses on the development of industry within four regional areas of strength: i) Biotechnology and health – bioTEAMsouth, ii) Robot and automation technology – RoboCluster, iii) Communication and IT – BizzKIT and iv) Gardening – Development Centre Aarslev.

Danish Institute of Agricultural Sciences is involved in a series of regional networks in conjunction with counties and municipalities. In particular, the Knowledge Centre of Manure and Biomass Technology may be mentioned. This involves *inter alia* Viborg County and the Viborg Business area, Agricon Valley network project, with *inter alia* Horsens Municipality, training/educational institution Vitus Bering, approximately 80 companies and the DevelopmentCentre Aarslev on Funen as mentioned above.

The Danish Institute of Agricultural Sciences works very closely and in a coordinated way with Danish Agricultural Advisory Service of which the National Centre located near Aarhus has approximately 460 employees and has partnership with local advisory centres all over Denmark. DIAS delivers a major part of the research behind new knowledge that the advisory service transmits to farmers and to companies in the agriculture and foodstuffs sector.

Aalborg University has been involved in networking as an integral part of the university’s activities since the establishment of the Knowledge Exchange Office in 1996. The intermediation concept builds on networking and co-operation as the dynamo for development. The Knowledge Exchange Office functions as a forum for the intermediation and exchange of knowledge within specific training courses and areas of research. The networks comprise frameworks where researchers and practitioners can meet and organise activities such as network meetings, go-home meetings, theme days, professional exhibitions with the most recent research, etc. The Network model has shown itself to be effective in creating interaction between researchers and practitioners. Today there are 24 such networks in operation with approximately 2,800 members. Most networks are long-term projects and have as their aim the development and build up of knowledge and linkages of yet greater value for the partners concerned. The main part of the networks mentioned address themselves to industrial companies, but there are also networks which engage with the education sector, the administrative sector and university employees. The Knowledge Exchange Office’s role has developed from being primarily to take on administrative and coordinating tasks in connection with the networks to taking on projects, and this to an increasing extent, in relation to a range of new institutions which are central to the region’s development. The Knowledge Exchange Office is centrally involved in the development of networks which aim to promote development within the biomedical and ICT areas.

Thus a range of institutional mechanisms have been developed between universities and the regional players in order to promote the exchange and sharing of knowledge. The different institutional systems may be regarded as network types which differ in the scope of their strategic dimensions, the central players involved, and the degree of binding together. Differences which give greater flexibility in relation to the types of knowledge being exchanged and shared, who participates, and what demands are placed on resources.

It appears from the self-evaluation studies that participation in the three forms of networking plays a central role in interaction between research and innovation, and that an ongoing development of new methods of exchanging and sharing knowledge is happening between research and training/educational institutions and between research institutions and companies. For many small and medium-sized businesses, it is the absence of employees with a higher education that presents a substantial barrier for interaction.

### **3.6 Commercialisation of research, incubators and research parks.**

The increase in the number of research based entrepreneurs acts as a very important driving force in the promotion of prosperity and growth in the regional development strategies. Thus the Jutland-Funen Co-operation of Business Development has a target of halving the difference between the capital region and the Jutland-Funen region in this regard before or in the year 2008.

The universities have been proactive in establishing research parks in co-operation with regional companies and other interest groups. The focus has shifted through time from bricks and mortar to a much greater support for the various business matters which are necessary in transforming research into business activities. A greater focus has therefore emerged on the business aspects to the commercialisation process's various steps.

#### ***3.6.1 The process of commercialisation***

The universities and state sector research institutions have established activities which aim to promote effectiveness and quality within the various parts of the commercialisation process with a view to increasing the number of project contracts, patents and licenses in the coming years. A development which is pushed by the new legislation on technology transfer, which gives universities, state-sector research and researchers, economic incentives to develop research projects that are potential commercial ventures.

The Contract and Patent offices function as the first link in the commercialisation process by offering advice and guiding researchers on the possibility of exploiting commercial possibilities in joint contracts, licenses and patents. The objective behind the development of patent and contract units is to improve the effectiveness of the commercialisation process so that a greater amount of projects reviewed are realised as patents and licenses.

Research parks and innovation areas have been established in order to strengthen the framework for the development of commercial ideas. In the first instance, the focus was, as already stated, aimed at physical and organisational targets for the development of innovation and entrepreneurship by the co-location of research and businesses, but since then there has been more focus on the commercial barriers to the commercialisation process. Thus, in connection with the research parks, innovation companies have been established which have the capacity to assign venture capital and business knowledge to the most promising projects.

A third step in the commercialisation process is the establishment of developments that, together with regional authorities, can combine to strengthen the commercialisation of research findings and development and growth in small companies via the addition of seed and venture capital. Such companies have already been developed in connection with the University of Aarhus, whilst Aalborg University is engaged in forming similar companies. The University of Southern Denmark has founded a holding company, Science Ventures Denmark Ltd, which gives the university the right to establish and own independent limited companies that in the usual market based approach, can help to commercialise research.

### 3.6.2 Research parks

Universities and state-sector research agencies regard the establishment of spin-off companies as a substantial contribution to regional development and have therefore, in co-operation with regional interest groups, established research parks with direct links to the universities. These parks function as incubators for the development of companies based on research and knowledge from universities. The first research park in Denmark was established back in 1984 in a co-operation project between the University of Aarhus and a local group of companies, institutions and organisations.

**Science Park Aarhus** creates synergy between new start-up companies, universities, the research world and the established business community. Science Park Aarhus offers an optimal framework for both small new start-up companies and development projects, or departments of larger companies. For small companies, the joint facilities make start-up less costly, whilst the larger companies can benefit from being in a knowledge environment, where synergy emerges with others focusing on the development project at hand. Research Park Aarhus consists of three separate departments:

**Science Park Aarhus - Gustav Wiedes Vej:** The department is characterised by a multidisciplinary approach so that companies and research departments go from IT, to electronics, to biotechnology and medicine. The 11,500 m<sup>2</sup> location includes offices, laboratories, conference and canteen facilities.

**Science Park Skejby:** The 3,600 m<sup>2</sup> building is Denmark's first dedicated biomedical research park, and is sited in attractive grounds adjacent to Skejby Hospital. The underlying ambition is that Science Park Skejby will become a catalyst and focal point for the development of companies within Biotechnology (medicines), Medico-technology (apparatuses), Bioinformatics (data processing of health related information) and Functional Foods (foodstuffs possessing other added properties)

**IT Launch Pad at Katrinebjerg.** The IT launch pad is dedicated to IT companies and their projects. The IT launch pad is a forerunner of the 10,000 m<sup>2</sup> IT research park, IT-Huset, which is under construction in the middle of the IT City of Katrinebjerg, where the University of Aarhus has drawn together its IT training courses in unison with *inter alia* the Alexandra Institute and the Centre for Pervasive Computing. IT-Huset opens in the summer of 2006.

NOVI Knowledge Park was established at Aalborg University in 1988/89 within the county's Nord-Tek programme as a reaction to the closure of three large companies and the loss, thereby, of 2,000 jobs.

#### NOVI

In 1988 three of Northern Jutland's larger companies closed down and an area already affected by unemployment lost 2,000 jobs. On that basis, the idea for NOVI (Northern Jutland Knowledge Park Ltd) grew like a new shoot in the soil of Northern Jutland's industrial development projects, and as a link up between research and production. NOVI was developed and established within the framework of the county's Nord-Tek programme, and 100 shareholders subscribed to a share issue of DKK 35.5 million. The EC Regional Fund and the Danish Ministry of Education also supported the project. From day one, NOVI was different from all other Danish institutions. The fact alone that NOVI made money available from its share capital for the early phase of project development (max. DKK 2.5 millions in company capital or subordinated loan capital per project) was ground breaking.

In 1998, NOVI Innovation Ltd became an independent part of NOVI (with NOVI Ltd as the management operator) and was recognised as a development environment for new, knowledge-based ideas. In the first four years, NOVI Innovation has considered over 500 project ideas, completed 230 pilot studies and on the

basis of these, initiated an active portfolio covering 55 companies, which are now on the way towards viable independence. The close proximity to a university environment has been a substantial bedrock in NOVI's development. The role as a catalyst in the process between research projects and the business community is a business opportunity that benefits the whole innovative environment. In recent years, NOVI has been constantly expanding with new building developments. The research park today measures 44,000 m<sup>2</sup>.

The research park in Odense was established in 1991 by Odense University in co-operation with Funen County, Odense Municipality and a range of companies.

#### **South Danish Research Parks**

South Danish Research Parks are situated centrally in southern Denmark – in Odense, Vejle and Sønderborg. There is also a department being set up in Kolding. In all, the South Danish Research Parks occupy at the moment over 21,500 m<sup>2</sup>.

- The Odense branch, at 8,000 m<sup>2</sup>, is situated on a 30,000 m<sup>2</sup> site, which is centrally placed between the two co-operation partners, the University of Southern Denmark and the College of Engineering - Odense Teknikum
- The branch at Ellegårdsvej in Sønderborg is located in particularly active business/industry area. The building's 4,300 m<sup>2</sup> houses, amongst other things, offices and meeting rooms, equipment rooms and a canteen.
- The new department in Sønderborg is situated along with the University of Southern Denmark in the Alslion building at the harbour front and covers in all 7,000 m<sup>2</sup>.
- The South Danish Research Parks branch in Vejle is, at the moment, 2,200 m<sup>2</sup> and houses mainly IT-related companies and derives great benefit from being situated in direct connection to the IT school.

The Agro Business Park was established in Tjele near Viborg in year 2000 by the Danish Institute of Agricultural Sciences in conjunction with regional companies, institutions and organisations, and is particularly aimed at activities within agriculture and the foodstuffs sector.

#### **Agro Business Park Ltd**

The Danish Institute of Agricultural Sciences was one of the initiative takers for the Agro Business Park Ltd innovation area, which was set up in the year 2000. Amongst the shareholder group, can be found DLG, DDH consulting Ltd. ("Det Danske hedeselskab"), and Aarhus University Research Foundation, a range of banks, innovation area investment companies, and also Viborg County and Viborg Area Trades Council. Agro Business Park is located directly adjacent to the research centre at Foulum, and it is an important partner for the Danish Institute of Agricultural Sciences, partly in relation to the establishment of spin-off businesses. The Park's most important role is the seeking and intermediation of knowledge, and also the provision of guidance to new start-up companies within agriculture and the foodstuffs sector. Today, there are approximately 20 companies and projects in the Park, of which four have a direct origin in DIAS, and almost 80% of the park is currently being utilized. In August 2005 an innovation pool, Agro Business Innovation Ltd, was set up offering the opportunity to invest in particular business projects.

#### **3.6.3 Development of differentiated incubators**

A change in the nature of the incubators has occurred from their being primarily *general* high technology incubators to their being, to a great extent, *differentiated* incubators for more specialised types of knowledge and competency.

This kind of specialisation has taken place in Aarhus in interaction with the two dominant competency clusters (Health and IT), which has created a basis for the establishment of new research parks in relation to health research at Aarhus University Hospital/Skejby Hospital (ResearchPark Skejby) respectively; and then activities in the IT City of Katrinebjerg (IT Launch Pad as a forerunner to the establishment of an IT Research Park).

Østjysk Innovation Ltd was established in 1998. The company's aim was the investment of venture capital in new start-ups, innovative and mainly research-related companies, and also to make knowledge, competency and administrative services available for those companies in which the company was investing. The company offers innovative entrepreneurs the best possible development conditions and functions as a technology mediator on behalf of others, including portfolio companies, research institutes, companies, etc.

INCUBA Ltd was established in 2001 by Danish Kapitalanlæg Ltd, the limited company Schouw & Co, and the University of Aarhus's Research Fund. The company's aim is, in conjunction with state and regional authorities, research institutes, the cultural and business community, to help coordinate and strengthen initiatives for the commercial utilization of research findings, as well as to help develop growth amongst small and medium-sized innovative companies in eastern Jutland.

This specialisation can be seen in Aalborg, amongst other places, within the biomedical area with the formation of HEALTHnTECH Research Centre, located at Aalborg Hospital. In addition to this, Aalborg University is working with Aalborg Municipality to establish incubators linked to the consumer experience business sector such as Dreamhouse and Adventure, as well as with the computer games at Gamehouse.

#### *3.6.3.1. Development of a new type of pre-incubator in the university area*

A new concept for embedded incubators has been developed at Aalborg University, aimed at the earliest phases in the commercialisation process. The concept aims primarily to support opportunities for students, new MA students and researchers to transform ideas into commercial activities and develop competencies related to their own business start-up.

One of the biggest barriers to this type of potential entrepreneur in trying to develop ideas towards a more concrete level is the lack of access to professional knowledge, laboratory equipment and personal dialogue. By establishing incubators in a professional environment, it is possible to make research-based knowledge and laboratory equipment readily available. In this way, budding entrepreneurs can discover the potential in their ideas by having them tested through professional and business advice, multidisciplinary dialogue and competency development; so that at the end of the process, the entrepreneur stands with a much clearer business idea, contacts with potential partners and a plan for further development.

Two embedded incubators have been established here: at the Department of Computer Science (Greenhouse) and at the Health Technology area in the Research House.

The goal is that the two embedded incubators will increase the number of student projects which become commercialised, and that the number of students who choose to become entrepreneurs is increased.

The universities are very active in the development of initiatives to promote commercialisation. The setting up of the internal departments for patents and contracts has taken place with the clear goal of increasing the number patents and licenses and co-operation agreements with external interest groups.

The development of research parks and innovation areas, where universities have been central initiative takers, has provided a set of important instruments for the creation of growth in the regions. The co-operation between research parks/innovation companies has had a positive affect on the development of innovations in companies,

and on the establishment of new companies. There has thus been a marked growth in the number of companies which have emerged out of the research parks/universities. At the same time, there is a trend emerging for new areas to become subjects for business development, so that the focus is not just placed on areas of knowledge in high technology.

### **3.7 Conclusion**

Danish universities and state-sector research institutions are state institutions whose activities are directed by government; hence the interaction between universities is to a great extent defined within the framework of the state's research policies. Research resources are distributed partly via base grants in relation to individual institutions and partly via prioritised means of research. The trend is for a reduction in base grants at the same as the prioritised means of research are increased. This is a trend which implies changes in the interaction, both within institutions, and between institutions and the government department, and thereby offers an opportunity for redistribution in relation to existing grants.

There appears, however, to be an increasing degree of co-operation between universities around joint interests, where precisely that geographical imbalance in state research policy has helped to create the establishment of a series of joint initiatives.

Both within and between research areas, and between the universities, there is a formal and informal interaction which shifts between competition and co-operation. This has its roots in the fact that researchers within the individual fields of research are working to develop definite areas of knowledge and competency where they then must (concurrent with the co-operation and comradeship) also compete for scant resources in the form of research grants.

DIAS' function as a state-sector research institution takes in many types of co-operation with the west Danish universities, as DIAS' approach is complementary to the more base-research orientated activities at these universities.

It is a policy which, on the one hand, promotes competition between areas of research with a view to creating international key competencies, while on the other also goes in the direction of promoting co-operation by supporting areas of research and research initiatives between the various research institutes.

#### ***3.7.1. Co-operation with non-university knowledge environments***

Research-based co-operation with non university and research institutes is growing steadily; initiated, not least, by changes in state-research policy which aim at developing the research competencies of these institutions.

A co-operation arrangement which is partly based on the advantages of regional co-location and on the advantages in sector specialisation.

Regionally speaking, there is therefore strong co-operation between the various BA/MA and professions-based training/educational institutions and the regional university, where universities will go in and support the research related anchoring of these institutions, e.g. in the absorption of the Herning Institute of Business Administration and Technology into the University of Aarhus.

The sectors show co-operation taking place between research-based institutions and the non-research-based institutions with a view to supporting the development of research and development. This can be seen within engineering and the health sector.

On the inter-regional level, these activities are supported via the building of competency clusters and networking via institutions under the umbrella of the Jutland-Funen research project.

### 3.7.2. Co-operation with other regional interest groups

Co-operation with other regional interest groups is taking place at many levels. Thus a strong co-operation ethos exists within the development orientated companies, the development orientated company clusters as well as with counties and municipalities around the development of dedicated initiatives.

### 3.7.3. SWOT

On the general level the SWOT analysis has identified the following issues:

<b>Strength:</b>	<b>Weakness:</b>
<ul style="list-style-type: none"> <li>▪ International and national key competencies</li> <li>▪ Breadth and diversity in subject and methods</li> <li>▪ Breadth and diversity in research organisation</li> <li>▪ Breadth and diversity in interaction and co-operation</li> </ul>	<ul style="list-style-type: none"> <li>▪ International key competencies absent in several, areas</li> <li>▪ Activities spread over many areas</li> <li>▪ Too many and too small research units</li> <li>▪ Need for more focus on interaction and co-operation Regions have restricted possibilities to support development</li> </ul>
<b>Possibilities:</b>	<b>Threats:</b>
<ul style="list-style-type: none"> <li>▪ Globalisation and changes in international distribution of labour</li> <li>▪ New regional structures and growth</li> <li>▪ Rising prioritising of knowledge and technology in companies and institutions in west Denmark</li> </ul>	<ul style="list-style-type: none"> <li>▪ Lack of priority on research grants</li> <li>▪ Lack of strategic priorities and narrow focus</li> <li>▪ Lack of room for manoeuvre for universities</li> <li>▪ Restricted understanding of universities' role and function</li> <li>▪ Globalisation and internationalisation</li> <li>▪ The new regional structures</li> </ul>

The SWOT analysis emphasises a series of dilemmas in the contribution of research to innovation in the Jutland-Funen region:

- Universities and research institutes have a double role, where it is the universities and research institutes' primary task to create new knowledge in an international context, and yet, on the other hand, contribute to knowledge development, knowledge sharing and exchange of knowledge both regionally and nationally. Research and intermediation must therefore address several different needs which require strategic priorities in relation to both international knowledge production and regional needs for innovation, by combining specialisation in key competencies with a broad and diverse research agenda which can contribute to regional and national need. Globalisation and the transition to a knowledge and consumer experience business sector are helping to promote possibilities for using universities and research institutes as powerhouses for regional development. A development which is supported by the newly established regional growth areas, but at the same time is restricted by the narrow framework in which the regions are placed when trying to participate in the development of research and innovation, as well as restrictions in states research which, on the one hand, talks about world class research and on the other stresses the necessity of promoting regional needs.

- Universities and research institutes have developed international and national key competencies within a series of centrally important areas in terms of growth and development in the Jutland-Funen region. There is a rising need for an expansion of the international and national key competencies, along with the development of new key competencies seen in the light of globalisation and knowledge development. Globalisation, outsourcing and transformation to knowledge and consumer experience-based markets opens up new possibilities in developing and exploiting these opportunities. If these possibilities are going to be exploited to the full, however, it will be necessary for the regional players to receive a greater autonomy which would to a great extent make it possible to exploit the potential which already exists in the region. Exploitation of the present possibilities is being restricted by the central administration of research institutions and a narrow framework for the region and municipality. The national research policy, as it stands, represents a threat to continued development because of the restricted prioritising of public sector research, lack of long-term prioritising of research grants, and the regional imbalance in research grant provision. Retention and development of the existing key competencies, as well as the upgrading of existing competencies to key competencies requires increased priority.
- The interaction between research competency and industry and development potential in the Jutland-Funen region shows that there is a need for the building up of national and international key competencies in relation to a series of areas where the region has good development potential. This applies not least within research for foodstuffs and energy, where the main part of business-based competencies are located in the Jutland-Funen region. There is, therefore, a need for the opportunities here to be utilized by conveying resources that will build up and expand research-related key competencies within these areas via the development of the existing research institutes in the region. The development of networking between business areas and western and eastern Danish research institutes has been an important, but not sufficient, initiative for retaining development on a long-term basis. There are great possibilities for development within the above-mentioned business areas, as they feature as important strategic priorities for all parts of the Jutland-Funen region. Strategies which point to research and knowledge as being decisive in maintaining and developing the foodstuffs sector's core activities in the area. Globalisation and outsourcing has changed from being an opportunity to being a threat, if no development of innovation abilities takes place in business areas. The imbalance in state research policy may become a decisive threat for the continued research development of competencies and resources in the region.
- Universities and research institutes' co-operation with external interest groups is characterised by great diversity and breadth, as a consequence of the difference in areas of research and traditions, as well as differences in regional interest groups' absorptive capacities. There is a need for further development of research organisations which promote the research/research areas' ability to perceive and utilize the possibilities in external co-operation; as well as a strengthening and development in the external interest groups' opportunities to perceive and utilize research competencies at research institutions. Centre formations and bridge-building initiatives have been important mechanisms in strengthening co-operation between research institutes and regional interest groups on many levels. There is, however, a need for this work to be reinforced via the addition of further resources which will attract the most sought after researchers and research areas. There are great possibilities to strengthen such priorities because of an increased focus on the central role of research institutes in the development of knowledge and innovation in the globalised world, and also as a consequence of changes in local and regional structures. However, proper exploitation of these possibilities is threatened by state policies which do not in a satisfactory way prioritise resources for the development of the area, as well as the lack of autonomy for research institutes and regional authorities.

### *3.7.3 Proposals for initiatives in certain areas*

#### State initiatives

- Increased grants for research
- Universities and research institutes have a need for long-term investment and greater freedom
- Strategic prioritising of sharing and exchange of knowledge must be supported by grants
- There is a need for increased grants for regional and inter-regional research, as well as an improvement in the opportunities for the regions to support development in research and innovation
- There is a need for strategic initiatives which strengthen development within existing resource and competency areas as well as the development of new resources and competency areas
- There is a need for initiatives which promote companies' and other interest groups' ability to utilize sharing and the exchange of knowledge

#### Universities

- There is a need for an increased strategic co-operation and coordination between universities and research institutes
- There is a need for development, expansion of strategic co-operation and coordination with the other knowledge and training/educational institutions
- There is a need for further development of organisations and mechanisms that can promote knowledge sharing and exchange of knowledge with a view to strengthening innovation
- There is a special need for the development of mechanisms that make it easier for companies and organisations to establish contact and co-operation with universities.

#### Regional interest groups

- There is a need for regional interest groups to prioritise and invest resources in the development of their ability to seek and exploit research-based knowledge
- There is a need to create a framework for the development of formal and informal interactions and co-operation in the sharing and exchange of knowledge

## 4. EDUCATION, LEARNING, QUALIFICATIONS, AND THE LABOUR MARKET

### 4.1. The regional framework

#### 4.1.1. *Level of education and qualifications*

The level of education in the Jutland-Funen region is characterised by a lower level than in the metropolitan region. Only 23% has a short-cycle, medium-length or long-cycle education in Jutland-Funen compared to 30% in the metropolitan region. The difference becomes even more obvious when we look at the research-based university education only, which contributes to research and innovation in the private and the public sectors. This difference has increased in recent years due to the fact that the growth in the population with a further and higher education has been lower in Jutland-Funen than in the metropolitan region.

The tendency towards a regional imbalance is also recognised within the Jutland-Funen region as people with long-cycle education tend to stay in the areas around the large university towns, and the growth here is more significant than in the rest of the region.

Characteristics of the industrial structure show that the manufacturing sector is relatively more important in the Jutland-Funen area whereas the public and the private service sectors are less important, especially outside the major university cities. In addition, the manufacturing sector is dominated by occupational fields such as the construction industry and the foodstuffs industry where the share of highly-educated employees is relatively limited. The more knowledge-intensive occupational fields constitute only a small proportion.

The company structure is dominated by small businesses with a very limited tradition of employing highly educated people.

The development within the public sector is a dual development as the large districts and institutions, like hospitals, offer attractive jobs and seek qualified labour, while minor districts and institutions only to a limited degree offer attractive jobs and seek highly-educated employees.

This means that the labour market and the demand for highly-educated employees' qualifications vary considerably among the different areas of the region, and in many cases the demand is quite limited. This tendency is especially seen within social science and the humanistic areas where there is an overproduction of graduates. Top graduates have, however, no problems getting a job in Copenhagen or abroad.

Thus, it is a challenge for Jutland-Funen stakeholders to improve the interplay between the regional development requirements and the degree programmes in order to upgrade and develop the region. This calls for a development in the labour market demand and supply situation. Consequently, there is on one hand a need for the region to create incentives for companies and organizations so to a larger degree will use highly educated labour, and on the other for the universities and the research institutes to develop and adjust their portfolio of degree programmes, including continuing education, to the demands of the companies and organisations. A prerequisite for this is a dialogue between universities and regional stakeholders with the objective of creating new forms of co-operation and to adjust the ongoing forms of co-operation.

As a starting point, the region has a university system with numerous degree programmes for both the private and the public sectors which can form the basis for an implementation of the ambitious objectives.

## 4.2 The universities' strategic framework

A new Universities' Act has given the universities more freedom to develop their educational portfolio and profiles within the framework of the national educational policy, but new kinds of education still have to be approved by the Ministry of Education.

The more flexible frames are reflected in the universities' strategic objectives from which it appears that all universities are in the process of modernising their educational portfolio so it corresponds to the knowledge society's changing demands for professional and personal qualifications.

A number of new educational activities are offered by the individual universities and/or universities together. The educational activities, which take their starting point in the changed societal needs and thus prioritise the development of new kinds of for example interdisciplinary degree programmes, new types of education for the individual institution, as well as systematic adjustment and modification of existing degree programmes.

University of Southern Denmark: continuous adjustment of its portfolio of degree programmes in order that they follow the developments in society and the need for new competence skills.

Aalborg University: special focus on interdisciplinary degree programmes as well as degree programmes that are completely new in the framework of the university.

The increasing number of new degree programmes seriously challenges the previous division of labour between the universities, which is based on national educational planning with subsequent options of competition and co-operation.

This tendency will be further intensified by the educational institutions, which in the development of new educational initiatives take the regional societal needs into consideration and thus co-operate with regional and inter-regional stakeholders. As a result the University of Aarhus has been awarded permission to offer engineering degree programmes at a Master's level in order to comply with the region's shortage of engineers, whereas Aalborg University has been given permission to offer a degree programme in medicine with special focus on industry needs.

## 4.3 The regional dimension in degree programmes

Traditionally, the universities have seen it as their task to offer comprehensive research based on degree programmes, which were fundamental academic subject traditions. These were degree programmes that supplied the regions with knowledge and competences by offering the region's youngsters new educational options simultaneously with regions gaining access to employees with research-based competences within numerous subject areas and professions.

With regard to the universities in the western part of Denmark, they have emerged as a consequence of local initiatives and extensive popular support. This support is based on the recognition of the universities' importance to regional development and readjustment. The regional dimension has been of particular significance to new universities as it was combined with new kinds of research and degree programmes through interplay and dialogue with other parts of the surrounding society than the traditional universities which have a tradition for co-operation with the education and health sectors.

The new Universities' Act focuses on how the universities' educational strategy can contribute to meeting societal needs, increased efficiency in the educational system, as well as a better adjustment between educational competence and societal needs for competence and qualifications.

Thus, focus has in earnest been drawn to how universities can contribute to changing the trend of the general educational pattern which is characterised by youngsters initiating their degree programmes at a relatively late stage and then taking a long time to complete their studies, if at all.

The universities' more specific contributions consist in developing and adjusting the educational portfolio in relation to changes in the general pattern in the demand for degree programmes. At the same time an increasing involvement of users through user panels and the like is seen in connection with the development of new degree programmes and in connection with major restructuring of degree programmes. If the competence and resources are available locally, regional stakeholders are involved in this process as much as possible as it facilitates dialogue and co-operation.

However, it applies to all universities that the demand for highly educated people in the regional labour markets is small compared to the number of graduates produced. For this reason the universities consider their production of graduates in a national and international view.

#### **4.3.1. Interplay between degree programmes and regional needs**

Due to the development of the new Universities' Act, the development of new degree programmes that take specific regional needs into consideration has experienced a significant boost as a consequence of a higher degree of freedom and more rigorous demands on the notion of documenting societal needs.

In this manner we consider all universities' development of a number of degree programmes using special regional needs for certain kinds of qualifications and competence as their starting point. Degree programmes with a general research-based profile enable them to aim at a larger geographical market nationally and internationally.

- At the University of Aarhus the establishment of engineering degree programmes at the Master's degree level is an example of new degree programmes that have arisen from a regional demand of trade and industry and public authorities for engineers in the region and will thus have a positive impact on industrial development. In 2002, the Centre for Applied Sciences was established in co-operation with the Engineering College of Aarhus with representatives from the county, the local district, and companies on the board of the centre.
- In co-operation with Aalborg University, nanotechnology, which has been selected as a driving force for this century's development of new technologies within for instance materials, the environment, communication, and health, has been established as a degree programme.
- Physical education is another example of an establishment of a degree programme based on a regional need arisen from close co-operation with local upper secondary schools that needed graduate teachers for their physical education.
- Arabic is an example of a degree programme that is to meet the need for a Bachelor's degree in the largest immigrant language. Arabic is offered in co-operation with the Aarhus School of Business.

At the University of Southern Denmark the regional challenge is to develop and adjust degree programmes in a dialogue with regional stakeholders. This existing specialization already reflects local needs, but continuous efforts are made to profile these more in relation to the individual region:

- Esbjerg: Maritime degree programmes and environmental planning
- Sønderborg: Mechatronics
- Odense: Degree programmes within health and biotechnology, and the development of engineering programmes which take place in collaboration with Odense Engineering College
- Kolding: Focus on small and medium-sized businesses

Aalborg University has developed a number of new degree programmes that play a role in the development of regional growth initiatives:

- The degree programme, Architecture and Design, has been established to comply with needs for strengthening the engineering aspects of design and architecture.
- The degree programme, Nanotechnology, has been established through interaction with the University of Aarhus with the development of nanotechnology as a regional growth area as its focus.
- Medical degree programmes *with industrial focus* have been offered to strengthen the development of a regional health cluster.
- Event economy is a focus area in the process of being established in connection with the regional prioritization for the area.

The regional needs contrast with the existing division of labour within the university system, which up to now, has been based on state/national planning.

Thus, this is a radical change that is particularly notable within technical degree programmes since DTU's and AAU's production of engineering graduates at master's level served as the basis for the former structure.

In addition, establishing degree programmes through interaction with regional needs entails new patterns of co-operation among the universities reciprocally and between universities and other educational institutions.

#### **4.3.2. Regional co-operation**

At the regional level, co-operation on developing technical degree programmes in Aarhus and Odense is taking place. The universities involved also cooperate with the engineering colleges in relation to the supply of new engineering training programmes at Master's level. Also, in these co-operations, local authorities and businesses play an active role.

The joint campus location in Esbjerg of two university units from Aalborg University and the University of Southern Denmark respectively has provided the basis for a close local co-operation. This co-operation is also recognised in connection with the development of degree programmes adjusted to local needs, such as environmental planning.

#### **4.3.3. Interregional co-operation**

The interregional co-operation concerning degree programmes is particularly notable within the IT area where initiatives have been institutionalised into the IT-West co-operation. IT-West is a co-operation among the four universities from the western part of Denmark, and here, a wide-range spectrum of degree programmes within the IT area is offered. These degree programmes are interdisciplinary and combine disciplines from technical, natural science, and humanistic traditions, as well as traditions from the social sciences. The degree programmes are vocational in nature and the focus is on matching the needs required by trade and industry.

One of the innovative initiatives in the co-operation consists in making it possible for the degree programmes to draw on the cutting-edge competences from the individual universities, and thus, it is ensured that the degree programmes are of a high international and professional standard. A standard that it is not possible to offer at the individual universities. This is a concept that has made it possible to develop, for instance, degree programmes within the field of computer games at a high international level.

**IT-West**

IT-West is an educational and research based co-operation among the Aarhus School of Business, the University of Southern Denmark, Aalborg University and the University of Aarhus. The IT-West co-operation was established in 1999 for the purpose of strengthening the supply of IT degree programmes in the western part of Denmark. IT-West offers degree programmes in a wide-range spectrum of degree programmes within the IT area: from analysis, design and construction of IT programmes to IT-integrated areas such as organisation, economics and teaching.

Presently, IT-West offers the following degree programmes:

- 9 Master's programmes for full-time students
- 8 Master's programmes – further studies for trade and industry
- 2 special Bachelor's programmes

IT-West can be regarded as a virtual university that congregates and coordinates IT degree programmes across the four institutions. The IT-West management, which is located at the Aarhus School of Business, is responsible for coordinating, marketing and providing information about the total portfolio of educational opportunities.

**4.4 Recruitment to the educational programmes**

The general tendency in the recruitment pattern is that the universities' primary recruitment area is the area in which they are located. This pattern is supported in the way that the four universities within a number of fields offer the same type of academic degree programmes. At the same time there is a tendency to large differentiation within the individual degree programmes in that, to an increasing extent, the degree programmes are developed and adjusted in relation to industrial functions beyond the traditional academic fields.

The differentiation among the degree programmes is not reflected in essential changes of the regional recruitment pattern. However, apparently there is a tendency in the way that students move to town environments which are regarded as being attractive. Initiatives such as a housing guarantee will not be sufficient as town attractiveness is more a question of town culture and youth environment.

The low youth cohorts have resulted in an increased competition about the youngsters, and subsequently, in recent years the universities have increased their marketing activities. Together with sending university representatives to upper secondary schools in the respective geographical area in which the university is located, the universities take great care to get in touch with the youngsters through educational fairs, visiting days, and open house arrangements. Among educational institutions, there is a growing local co-operation to market educational towns which results in a synergy effect for the degree programmes. In 2005 Aarhus, for the first time, held a joint arrangement for the 24 educational institutions in Aarhus.

Within the upper secondary school area there is a tradition for close networks between universities and the upper secondary schools, which contribute to developing and maintaining recruitment patterns. Such networks are especially widespread in the universities' localities.

The regional areas are relatively small in proportion to the universities' educational capacity and that is the reason why most universities make targeted efforts towards attracting more youngsters outside the region at the same time as they try to increase the intake number locally. The Business School of Aarhus is an example of an institution recruiting 90% of its students from the eastern part of Jutland and consequently works on attracting students from Zealand and the metropolitan area and international students.

A communications centre for natural science and agriculture located in Agro Business Park gives students from elementary schools and upper secondary schools the possibility of being a “researcher for a day” with academic and curriculum related activities. The activities take place in the research departments of the Danish Institute of Agricultural Sciences in Foulum and in Horsens.

The aim of the centre is to provide experiences and knowledge about Danish agriculture and the necessary interaction between an efficient and cost-effective and agricultural production and a sustainable and recreational natural basis. The centre gives a significant contribution to the student’s knowledge about agricultural sciences and in clarification process for the students about their choice of education and career. The centre is a co-operation between the Danish Institute of Agricultural Sciences, the Royal Veterinary and Agricultural University, the University of Aarhus, Aalborg University, the University of Southern Denmark, Viborg County, the Danish Agricultural Council, Danish Agricultural Advisory Service and the Danish Outdoor Council. In addition a co-operation between the Danish Institute of Agricultural Sciences and University of Southern Denmark is established with the focus of educational/didactics research. The Danish Institute of Agricultural Sciences has comprehensive experimental facilities which is a great strength in this co-operation. Evaluations among the users of the centre show a great satisfaction from students as well as teachers and researchers. The universities view globalization as a new growth option, an increasing amount of effort being placed in making courses of study more international and by this means attracting youngsters from overseas, thereby benefiting the university and the region.

A Communication Centre for Natural Science and Agriculture located at the Agro Business Park makes it possible for pupils in primary schools and high schools to be “Scientists for a day” with scientific syllabus-related activities in the research departments of Danish Institute of Agriculture and Sciences in Foulum and Horsens.

The purpose of the Centre is to provide experiences with and knowledge of Danish agriculture, the necessary interaction between an efficient and profitable agricultural production and a sustainable and recreational well-functioning natural basis. The Centre contributes essentially to the pupils’ knowledge of agricultural science, as well as to the motivation and decision-making when it comes to choosing a future education. In Denmark it is regarded as critical, that relatively few young people apply for admission to higher education within natural science.

A broad group supports the centre: DIAS, KVL, Viborg County, The Danish Agricultural Council and The Danish Agricultural Advisory Service, the National Centre, AU, AAU, SDU and The Danish Outdoor Council. Cooperation relations have been established with SDU concerning pedagogical research in the special extra mural and authentic learning methods practised by the centre. In this connection the extensive experimental facilities at DIAS constitute a major strength. The evaluation shows that pupils, teachers and the participating scientists are very satisfied and pleased with this initiative.

#### **4.5 Graduates and labour market**

The development of societal requirements is encountering major changes, and this means that new areas and functions constantly arise with needs for academic labour within the private and public sectors. Consequently, there is a great need for getting an insight into what these changes mean to the substance and function of the degree programmes.

Subsequently, the universities have established independent functions which make systematic analyses of the development of the needs for competence and qualifications regarding both users and graduates with a view to identify the needs for new degree programmes and to evaluate the ability of the existing degree programmes to meet these needs.

In addition, the still faster changes in industrial and work functions imply that there is now more focus on the graduates' needs for information and knowledge about the different opportunities on the labour market, and on supporting the graduates' possibilities to develop different kinds of competence and qualifications concurrently with the changes in industrial and work functions.

Subsequently, the universities have developed and expanded their services towards both recent graduates and past graduates by offering these graduates information and details about special activities, continuing and further education, support for job applications, the job fair for electronics, and networks.

As an example the University of Southern Denmark has established a Career Centre. The centre tries to develop and support the co-operation. This is among other things done by:

- Complete examinations of the graduates and secure an updated knowledge about the job market.
- Establish networks with potential employer in the private and public sector.
- Establish an alumnus programme to contribute to continuing and further education.

#### **4.6 Lifelong learning**

As a result of changes in industrial and job structures, the need for research-based continuing and further education has grown significantly. There is an increasing need for employees in the private and public sectors to continuously develop their professional and personal competence skills. This will make them more flexible and ready for adjustments which is necessary for them to function in a working environment where professional challenges are under continuous development.

The need for improving personal and professional skills is further intensified by the skewed competence and qualification structure in a region where a comparatively large part of the labour force has no competence and qualifications from the research-based degree programmes. Consequently, there is a heavy demand for further and continuing education which can add to the labour force research-based qualifications in the form of long cycle degree programmes such as Masters' and special Bachelors' programmes together with short cycle courses. Further and continuing degree programmes constitute essential elements in the universities' development contracts where objectives for development of new types of degree programmes and competence skills are established and adjusted to the changing requirements. Thus, to secure the development of a broad scope of offerings for short cycle and long cycle continuing and further degree programmes, several of the universities have established centralized and decentralized units.

Such a development is a reflection of the four universities' continuous development of their continuing and further educational offerings. Subsequently, a large portfolio of offerings of long cycle continuing degree programmes has been developed: Masters' and special Bachelors' degree programmes which have especially met a need from a number of areas with employees with medium-length professional education within health, IT, public administration, etc. On the other hand, the offering of short cycle degree programmes has especially been aimed at technical, organizational, and business economic competence skills within the private business sector.

#### **4.6.1. Master programmes and special bachelor programmes**

Within the long cycle degree programmes, the universities have given priority to offering degree programmes within the fields in which they have special competence skills, and to enter into co-operation with other universities and educational institutions regarding the development of a number of master programmes within fields across existing competence structures.

This cooperative pattern is related to the fact that the master programmes more than the traditional degree programmes are adjusted to industrial functions and competence profiles which are interdisciplinary and subsequently often require co-operation among various subject-related environments.

Subsequently, a number of master programmes have been established in co-operation between two universities such as the co-operation between the University of Southern Denmark and the Aarhus School of Business, the co-operation between the University of Southern Denmark and the Engineering College of Odense, and the co-operation between the University of Aarhus and the Danish School of Journalism.

Due to its central importance as a driver of growth, the IT area is a prioritized area in the Jutland-Funen industrial co-operation which is why the four universities of western Denmark in co-operation have established the joint organisation IT-West. Such kinds of co-operation act as frameworks for the offerings of continuing degree programmes from the individual institutions, and as frames for the development of degree programmes which combine the various institutions' competence skills, and in this way, they achieve the required form of specialization and standard.

#### **4.6.2. Short-cycle courses**

Within short-cycle continuing degree programmes, concepts have been developed which make it possible to offer adjusted continuing business degree programmes. These courses can consist both of standardized modules from already existing degree programmes composed and combined according to the client's needs. Or they can consist of modules which are developed in relation to the particular needs of the organization or company.

The totally specific requirements of short-cycle courses imply that a principle of work based learning is applied which is based on experience from problem-oriented project work. A special example of a continuing educational concept developed for small businesses in less urbanized areas is the "Lonely Wolf" project. Here the academic employee is a strategic resource for the company at the same time as the employee participates in the daily solution of innumerable diversified assignments and therefore may have difficulties in focusing on business/innovation development.

In order to support the development of this employee's qualifications, a tailor-made competence programme is developed for the individual engineer and simultaneously a regional network of colleagues is created to be used as sparring partners.

#### **Lonely Wolf**

The target group of this course is small businesses with only one engineer. Such businesses need creativity and ability to renew themselves; it is decisive for the development of the business at the same time as production optimization is decisive for the development of the business. The decisive parameter for these businesses is time, and for that reason a concept has been developed which enables competence development in the daily work life together with the building up of networks to support the individual engineer. As part of the degree programme, a tailor-made competence programme is developed for the individual engineer, and a regional network of colleagues is established which can be used as professional sparring and an exchange of experience. Lonely Wolf is a course developed by ELITE at Aalborg University.

#### **4.7 Types of degree programmes**

The universities offer a broad scope of degree programmes and types of degree programmes within the Master programmes and the continuing educational area from traditional discipline-oriented degree programmes to more interdisciplinary and problem-oriented degree programmes.

All universities work towards the development of an educational portfolio which to an increasing extent integrates external societal requirements into the degree programmes and which integrates external stakeholders into the planning of education and teaching.

##### ***4.7.1. External relations***

In the educational process, more efforts are made to develop and intensify co-operation with external stakeholders. This is done both by drawing on external teachers and by improving the possibilities for cooperating with external partners as part of the study work. Thus, with the purpose of establishing co-operation between students and external stakeholders, and to facilitate the direct communication between external stakeholders and students, the various universities have established different types of contact offices such as business contacts, science shops, etc.

In addition, a number of cooperative initiatives have taken place to support this co-operation with businesses and external stakeholders. The University of Aarhus and Aarhus School of Business have made a project zone to promote co-operation with businesses. Furthermore, University of Southern Denmark cooperates with the Odense Board of Trade regarding access to study assignments.

These types of degree programmes are of great importance to the way in which the universities are able to involve external stakeholders and problems in their educational process. For instance, the Aarhus School of Business makes efforts for instance to involve companies in connection with case teaching.

At Aalborg University, the problem-based type of education, exercised via project work in groups, is an important asset in the area of regional co-operation as the project work, which constitutes 50% of a student's total study period, implies that each semester approximately 2,000 projects take place involving external problems and/or contacts.

##### ***4.7.2. Student placements and student jobs as interplay***

Student placements and student jobs have come more and more into focus as a way to establish co-operation between university students and companies. The companies are offered a possibility of having competent students carry out assignments which otherwise most likely would not be carried out due to, for example, lack of resources. Thus, the students acquire experience and insight into companies' problems, and they get an opportunity of supplementing their CV with relevant work experience. In addition, student placements as well as student jobs may contribute to break down some of the barriers between academics and the business community, and consequently produce openings for university graduates in small and medium-sized businesses.

##### ***4.7.3. Application of new technology in education***

The development of new technology plays an essential role in education. E-learning is an action area at several universities where many resources are invested in the development of pilot projects, platforms, and evaluations with a view to utilizing new technology in professional and pedagogical ways. Subsequently, centres and laboratories have been established to promote E-learning in education.

The University of Southern Denmark focuses on E-learning as a tool in relation to ordinary, continuing and further degree programmes. Considerable investments have been made in a required and future-oriented

infrastructure, and within the next few years the university will work intensively to secure the special pedagogical teacher qualifications required by E-learning. With an intensified effort on E-learning, the university will to a large extent be able to utilize the total expertise within its research-based education for the benefit of students across the campus structure. This strategy will be implemented in the following ways:

- In 2005, each faculty selects at least one pilot project where exemplary ways to implement courses can be developed based on blended learning, distance learning, and the like. The projects are to show examples of different didactic and pedagogical approaches to E-learning. Experience from the projects is distributed via Blackboard.
- All degree programmes/courses offered at the University of Southern Denmark (at present approximately 1,500) per 1 September, 2005, are to be available to teachers and students on Blackboard. Before the start of the degree programme, the student must be able to find materials related to the study and education on Blackboard.
- In the autumn of 2005 an internal investigation of selected degree programmes is implemented which are representative of the university's activities. This initiative is taken to get a better knowledge of the students' expectations, experience, and experiences with E-learning.

The University of Aarhus has established a central E-learning unit. The E-learning unit is a place where the employees, at the university can get guidance and inspiration to use IT in their teaching. The aim is to secure an optimum use of the possibilities for support, efficiency and inspiring teaching which is possible through IT. The E-learning unit offers among other things, an entry to a common E-learning platform for the entire university. At this platform the teachers at the university can create WebPages for their degree programmes. The University of Aarhus also offers Dokeos, an open source programme, as a common E-learning platform. At present almost 1,200 courses and 12,000 users within all disciplines are registered at Dokeos.

At Aalborg University, the establishment of E-learning is based on a research project regarding the development of virtual learning environments and methods initiated under the programme the Digital Northern Part of Jutland. This programme started as co-operation between county/district, companies, and county, which is reflected in the focus of the centre on external users.

#### **E-learning Lab**

Centre for User Driven Innovation, Learning and Design is established by the project Virtual Learning Environments and Learning Methods, which is a project connected to the Digital North Denmark. The object of E-learning is to support development and use of E-learning regionally and internationally. The aim is to create a dynamic research, development, and resource centre that through participation in regional, national, and international collaborations gathers and contributes to the development of the most recent knowledge within this field. The E-learning Lab has four core activities: experiments and support, sparring and participatory research, basic research, and promotion of research and knowledge. The E-learning Lab is characterized by an experimental approach. The laboratory is to contribute to the development of new technology and new solutions in correlation with the users. The approach is interdisciplinary, and it draws upon theory and methods from pedagogy, technology, organization, and design. The E-learning Lab works with concrete IT implementations within different educational environments, and also with the establishment of a research, development, and knowledge centre within E-learning.

## **4.8 Entrepreneurship**

As stated earlier, entrepreneurship is an essential motivating power in the development of regional growth and welfare. Thus entrepreneurs play a central role for the development of innovations in terms of new businesses within both the new growth industry and within the more traditional areas and within existing companies.

Entrepreneurship in the Jutland-Funen area is much lower than in the metropolitan area. This is an imbalance which is much more pronounced in the knowledge based industries with the large development potential, cf. chapter 1. In recent years, this trend has been further intensified which is the reason why the difference between the Jutland-Funen area and the metropolitan area has increased even more.

As it appears from the preceding sections, the four universities and Danmarks JordbrugsForskning have been active in the establishment of framework conditions for knowledge based/high technological entrepreneurs through the development of activities which support the various phases of the commercialization process.

Since the year 2000, the universities have initiated a number of activities which are to inform students of the possibilities of entrepreneurship, and the development of a number of different degree programmes, competitions, etc., with a view of making entrepreneurship a realistic possibility for students.

In the city of Aarhus a Centre for Entrepreneurship was established in 2002. The centre is a co-operation between the Aarhus School of Architecture, Aarhus School of Business, the Engineering College of Aarhus, the University of Aarhus, the Municipality of Aarhus and the County of Aarhus. The aim of the centre is to stimulate and develop the entrepreneurial culture among students in Aarhus. In 2006 the centre became part of the University of Aarhus.

### **4.8.1. IDEA**

Based on an initiative from the Ministry for Science and Technology, an initiative has been taken to develop an entrepreneurship academy whose activities aim at strengthening and coordinating the effort for innovation within the further degree programmes.

With a total government grant of DKK 40 million over a period of four years, the Ministry for Science invited applications for the establishment and operation of an entrepreneurship academy in Denmark. The IDEA consortium which was given the assignment to establish an entrepreneurship academy has been established on the basis of the initiative of the University of Southern Denmark in co-operation with the Business School of Aarhus and Aalborg University, and today the consortium consists of 60 organizations.

Five regional centres have been established to strengthen the co-operation between the educational institutions in the individual regions and the co-operation between the educational institutions, trade and industry, and the regional service and counselling system. The centres are responsible for activity development and the educational co-operation in the area. The centres in Jutland-Funen are as follows:

- the southern part of Jutland: University of Southern Denmark, Kolding
- the central part of Jutland: the Business School of Aarhus
- the northern part of Jutland: Aalborg University

IDEA will work with the following areas in which the potential for change is particularly large:

1. The future generations of youngsters from the further degree programmes – regardless of educational lines – must be much better at seeing and utilizing career opportunities as self-employed people. An intensification of entrepreneurial competence skills among students and graduates from the further degree programmes will strengthen the entrepreneur percentage.
2. Youngsters in degree programmes must be prepared for new types of employment and career opportunities which will characterize an entrepreneurial society. They will differentiate themselves considerably from stable types of employment and the pay earner culture we know from the industrial society. Through their degree programmes, they must strengthen the entrepreneurial approaches in private companies and public organizations where many of them will find employment.
3. The growth potential among the established entrepreneurs and new companies must be exploited in a better way so that their survival rates are raised considerably. This requires a strengthening of the guidance, counselling, and training which – under both private and public auspices – are made available to newly established businesses and to businesses within their first years of existence.
4. Established businesses constitute a potential, so far unobserved, for the development of new business opportunities, business areas, and new businesses. Denmark is one of the countries in the world where the management culture is most accommodating to the employees' independent creativity. Nevertheless, many Danish businesses die with the idea upon which they were started, and there are only a few examples of businesses where the employees' entrepreneurial attitude is supported by the management. Subsequently, there is a considerable potential, if the management supports the richness in ideas and the need for entrepreneurship among the employees, in both private and public companies. This potential is addressed through IDEA under the heading "Entrepreneurship".
5. The further degree programmes in Denmark must develop a study and learning environment which does not block but would rather support the youngsters' interest in and learning of competence skills in entrepreneurship and innovation. Consequently, there is a need for new orientation of the further educational institutions in Denmark so that they can create more entrepreneurial study environments and find a stronger foothold in learning circuits with the surrounding society.

#### **4.9 The regional educational system**

The combination of the new Universities' Act and the changed requirements for research-based degree programmes has led to new competition and cooperative patterns and horizontal and vertical relations in the regional educational system.

##### ***4.9.1. Horizontal relations among universities***

The horizontal relations among universities have led to an increasing degree of co-operation about activities offered, which contribute to meeting the changed regional requirements for research-based competence areas. This is a development which is promoted by the requirement for cross-curricular and interdisciplinary competence areas in both master's degree and continuing education programmes.

In the localized Master education programmes, co-operation is typically based on a local area, such as the co-operation between the Business School of Aarhus and the University of Aarhus about an Arabic degree programme, and co-operation between the University of Southern Denmark and Aalborg University about a degree programme in environmental planning on a common campus.

In the IT area, IT-West is an example of a network co-operation aiming to promote co-operation among the universities by functioning as an organizational framework for offering both Masters' degrees and continuing education programmes.

A common credit transfer system has been developed horizontally and vertically which makes it easier for students to change and/or shift among the different educational institutions' degree programmes and educational activities.

There also seems to be possibilities for developing co-operation among the west Danish universities. Such co-operation can be supported through the Jutland-Funen co-operation.

#### ***4.9.2. Vertical relations among universities and educational institutions offering both medium-length and short-cycle degree programmes***

The vertical co-operation between universities and educational institutions has been given a boost through a number of different initiatives:

First, a number of Master's degree programmes have been established in co-operation between universities and educational institutions with Bachelor's degree programmes:

- Master's degree programme in Journalism
- MSc Engineering

These initiatives have especially been developed with a starting point in locally based co-operation where a number of special activities have been developed in co-operation between universities and the local engineering colleges in Aarhus and Odense respectively.

In Aarhus, this co-operation has been formalized in the form of a regional initiative for the "Centre for Applied sciences" with representatives not only from the educational institutions but also from the county, the municipality and the business community. This initiative was taken on the basis of a wish from local trade and industry to develop engineering competencies.

Secondly, a number of binding cooperative agreements have been initiated between centres for further education and other educational institutions about exchange of knowledge and information. For instance there is co-operation between universities and centres for further education within the health field and co-operation between AAU and the engineering and chief engineering degree programmes.

Third, at the regional level, there is co-operation about other degree programmes to facilitate the composition of degree programmes across the different institutions through credit transfer and cooperative agreements.

#### **4.10 Conclusion**

It appears from the evaluation that education and learning are important elements in the Jutland-Funen efforts to create a balanced Denmark with regards to growth and development. Seen in the light of the growing international competition and technological development, which makes it possible to outsource production to countries with lower costs as to, for example, pay and welfare, education and learning are central elements in maintaining growth and welfare.

This strategy is made difficult by the relatively low educational level and qualification level in the labour force and in companies. Consequently, there is a need to improve the competence of the future labour force and of the existing labour force. The prerequisites for such a strategy are that a higher percentage of the youth cohorts takes research-based further education, and that members of the existing labour force are given an opportunity to develop and improve their qualifications and competence through research-based continuing and further education

Consequently, it is essential that universities and regions go together about the development of educational and learning possibilities which can contribute to an improvement of the labour force. There is an increasing focus on the development of degree programmes and learning sequences which contribute to developing competence levels of strategic importance for the regional development.

A number of new degree programmes have been established based on special regional requirements, but they also have a broader aim as the regional labour markets are too small to form a basis for research-based education. A number of these new degree programmes are offered in co-operation with non-research based further-education educational institutions – the so-called research Bachelor degree programmes, for instance at engineering colleges, and they are implemented in competition with existing degree programmes at other institutions. As something new, local authorities and companies play an active role in coordinating and developing these initiatives.

A rising prioritization is also seen in the degree of practice orientation in the degree programmes with an emphasis on the students' ability to work with problem formulations in companies and organizations as an essential element in their competence profile. At the same time, it makes it possible to develop the labour markets which are basically characterized by a limited demand for labour with research-based education.

To an increasing extent, the continuing education field is subject to a strategic prioritization from the universities which develop a number of new educational initiatives within the traditional educational fields. However, an increasing orientation is also seen in the direction of areas that have not traditionally been prioritized and which demand new forms of competence levels across the existing professional standards. In the continuing educational area, a higher degree of co-operation is seen between the different universities, and IT-West is an example of the strategic prioritizing of the development of IT competence levels in the western part of Denmark.

Entrepreneurship is another field subject to strategic prioritization where the west Danish universities have gone together to develop a national consortium to promote entrepreneurship activities as an integrated part of the degree programmes at all levels in the educational system. This regional perspective is promoted through the development of regional centres at the University of Southern Denmark in Kolding, the Aarhus School of Business and Aalborg University, and its purpose is to coordinate the regional initiatives in the entire educational system.

In terms of organizational aspects, there is an increasing tendency to involve external stakeholders in the planning and development of the educational portfolio and degree programmes through user panels where regional users are also represented.

There are two fundamental conditions characterizing the regional partners' co-operation on education and training for regional development, and these are:

- The co-operation between the regional partners' regarding the contributions of further and higher educations to the labour market and qualifications are within the framework of the Universities' Act which determines the conditions for development and offers existing and new forms of education that are to be approved by the Danish Ministry of Sciences, Technology and Innovation. The co-operation is also characterized by small, local labour markets which is why the production of people with a Master's degree is aimed at the national and international labour markets.
- The co-operation between universities has its starting point in the existing division of work between the institutions that are decided and based upon national education policy.

As the regional labour markets and the surrounding areas have a limited size and limited basis for recruitment, most of the academic courses of education compete for the recruitment of students and for the allocation of people with a Master's degree to the labour market. Within certain areas of education the competition is limited though. This is due to the fact that for some educations, the government has decided on a specific distribution of educations on some institutions.

The increasing demand on the labour market for academic competences within all areas has increased the requirements for the development and adjustment of current and new Masters' degrees. This requirement has intensified the co-operation across faculties and universities. IT-West is an example of an area in which the universities have cooperated on offering inter-disciplinary educations that correspond to the needs of the trade and industry.

#### ***4.10.1 Regional and inter-regional co-operation regarding the supply of academic educations***

Within the area of supplementary education, the co-operation between universities seems to be closer. The close co-operation is due to the fact that several of the supplementary educations are based on a combination of the universities' core competencies and specific regional requirements for qualifications. Institutions cooperate on offering complementary educations within all areas in which the institutions themselves do not possess the required core competencies.

#### ***4.10.2 Co-operation with non-university colleges of higher education***

Within recent years, the co-operation between universities and non-university colleges of higher education has been highly prioritized. This is partly in response to the education policy's requirements of the upgrading of skills within the medium-length educations, and partly in response to an increased demand for a development of new competencies within these educations and/or in continuation of these.

Through the establishment of regional co-operation not least within the areas of health and engineering, the co-operation has been particularly successful. Within the area of engineering, the regional co-operation has resulted in a development of new engineering degrees at graduate level at the universities.

The location at campus in Esbjerg – University of Southern Denmark, as well as Aalborg University has served as the basis for a developed co-operation within existing educations, as well as the establishment of new educations meeting the local needs.

The co-operation across sectors has also been wide ranging. The co-operation across sectors has played a part in the upgrading and the development of the supply of competencies at the medium-length engineering degrees, as well as giving those with a medium-length engineering degree the possibility of continuing their studies within the area of engineering. As a governmental research institution, the Danish Institute of Agricultural Sciences has an obligation to contribute to the area of higher education. The Danish Institute of Agricultural Sciences is actively and increasingly involved in connection with the supply of student activities within the education areas of farming, food, and the environment.

#### 4.10.3 Co-operation with other regional interested parties

The regional interested parties have increasingly been involved in the co-operation on the educations' contributions to the labour market and qualifications. A number of the above-mentioned initiatives have been introduced based on initiatives from regional interested parties. This development is being supported by the establishment of institutions in which the regional interested parties play an active role. A development that has been particularly successful in connection with the establishment of the Centre for Technical Educations (Centre for Tekniske Uddannelser) in Aarhus, as well as in connection with the creation of the various educations' advisory boards.

#### 4.10.4 SWOT

Strength, weakness, opportunities, and threats (SWOT) related to the institutions' contributions to the regional development through education and learning to the labour market and the qualifications in the region.

<p><b>Strength:</b></p> <ul style="list-style-type: none"> <li>▪ Professional and research driven university degrees</li> <li>▪ A great variety of and diversity in the supply of university degrees</li> <li>▪ Solid competencies within central areas of growth</li> <li>▪ An increasing focus on the societies needs of educations</li> <li>▪ An increasing focus on co-operation on the development and the establishment of educations</li> <li>▪ An increasing regional and inter-regional co-operation within the education system</li> </ul>	<p><b>Weakness:</b></p> <ul style="list-style-type: none"> <li>▪ Numerous university degrees originates from traditional areas</li> <li>▪ Despite a great variety in the supply of university degrees, a number of limitations exist with regards to central areas of the development existing and new areas, particularly related to business educations</li> <li>▪ An increase in the competition between the educational institutions, as well horizontally as vertically</li> <li>▪ A limited capacity inhibits the development of specialized and advanced educations</li> </ul>
<p><b>Opportunities:</b></p> <ul style="list-style-type: none"> <li>▪ Globalization and outsourcing create new needs for research-based qualifications</li> <li>▪ Creative industries economy and knowledge economy create a need for new types of qualifications</li> <li>▪ The Danish structural reform creates a new need for qualifications</li> </ul>	<p><b>Threats:</b></p> <ul style="list-style-type: none"> <li>▪ A diminished basis for recruitment and an increase in mobility intensify the competition for talents</li> <li>▪ The education policy inhibits the development of specialized and advanced educations and the drawing of talents</li> <li>▪ Regional structures constitute a limitation in the drawing of talents</li> <li>▪ A limited business development and labour market within specialised and advanced areas</li> </ul>

The SWOT analysis stresses a number of dilemmas for the educational and learning contribution to the labour market and the build-up of qualifications in the Jutland-Funen region.

It is of critical importance for the universities and the regional parties to deal with the demand for the development of production of advanced and specialized graduates, at the same time as the universities contribute to the support of acute regional needs for research-based competencies and qualifications within a number of traditional business and service functions. In this connection, there is a need for an extension of the co-operation

between the universities and the regional interested parties. The increased focus on high-level competencies seems to exceed the importance of the general upgrading of skills in the regions.

The universities offer a wide variety of further and higher educations that constitute a solid basis for contributing to the development of competencies that can ensure a continuation of the Danish competitive position and welfare. In relation to the increasing demand for academic competencies within the various corporate areas, the challenge is to maintain a continuing supply of educations that at the same time corresponds to the new demands.

The ongoing transformation of the economy creates a good opportunity for developing and benefiting from existing competencies through an extension of the institutional co-operation within and across institutions. However, for this to take place the government's education policy needs to be adjusted so it to a greater extent creates the framework necessary in the way of incentives and autonomy. If this does not happen, the education policy as well as globalization will become an increasing threat.

An important challenge is to establish a geographical balance within the Jutland-Funen area via a development of educational reform and supply that to a larger degree than has previously been the case. This will contribute to the development of qualifications and the labour market in outlying areas. The possibilities of setting up new universities are limited which is why other solutions are needed, for instance: distance learning, campus, and co-operation with other educational institutions that can be a decisive factor in recruiting and keep students in the areas outside the university towns. Some of the initiatives of the Jutland-Funen business co-operation show just how difficult it is to encourage highly-educated students out of the cities once they first have settled there. For a procedure like this to succeed, a wide range of initiatives are required.

## **5. THE CULTURAL, SOCIAL AND ENVIRONMENTAL DEVELOPMENT**

### **5.1 The regional framework**

The skewed socio-economic development reflected in the formulations about a distorted Denmark is an essential reason for why the Jutland-Funen industrial co-operation was established. The phrase, “the distorted Denmark”, refers to the fact that there in Denmark is a geographically uneven development in economy, occupation, and living conditions. In order to break this “geographical inheritance”, it seems necessary to first break the decisive patterns behind the development.

Culture, social conditions, and the environment all play an increasing role in the geographically uneven development of Denmark. Culture, social conditions, and the environment constitute essential prerequisites for the Jutland-Funen area to maintain and attract creative persons who have the potential to break the uneven development through renewal, innovation, and entrepreneurship. In a knowledge society, the universities play a central role as distributors of knowledge and competence, and in co-operation with regional stakeholders the universities are able to create good prerequisites for a creative development and dynamism.

The geographical importance of the universities’ contributions to the development of the Jutland-Funen area is related to the functions that the universities play in relation to the three areas of social, cultural, and environmental importance:

- The universities’ social importance is connected to recruitment patterns, as well as the direct and indirect effects of innovation and labour market.
- The universities’ cultural importance is primarily connected to the attraction and maintenance of employees and students who as a group constitute “the cultural distributors” of a knowledge society, and who form a cultural growth layer. This development is intensified by the special competence and potential related to the creative degree programmes.
- The universities’ environmental importance is primarily communicated via networks of education and research. Research competence forms the basis for development of competence and industrial clusters which again generate growth and development within the environmental and energy sector.

### **5.2 Universities’ frames**

The universities’ function has moved from primarily being in charge of research and education to include communication in relation to the surrounding society.

The Universities’ Act indicates a broad understanding of the universities, including the universities’ role as a cultural distributor and a visualization of their societal benefit. The role as a cultural distributor is only to a limited extent reflected in the present development contracts. The universities’ role as a cultural distributor is furthermore limited by the fact that no finances are attached to these activities. In addition, the universities are currently financially squeezed and subsequently choose to primarily prioritize their core activities.

The universities’ function as a cultural distributor is in a broad sense seen in their ability to attract and maintain creative people by creating environments that stimulate development and creativity. Such environments are characterized by diversity and challenges.

### **5.3 The socio-economic development**

The universities' contributions to the social development are made directly because the universities are large workplaces and educational centres, and indirectly through their impact upon the development of companies and occupation.

As the universities as a workplace occupy many highly-educated employees and attract many students, the direct impact of the universities is large.

This implies that by attracting many highly-educated people who are attractive for several reasons, the universities contribute to a change in the socio-economic development.

- First, the highly educated are attractive because their average income is higher than the average, which contributes to an increase in local income and tax base.
- Secondly, the highly educated are attractive due to their role as “cultural distributors” who are active in the development of local activities, which contributes to the creation of social and cultural activities which again make areas attractive.
- Thirdly, universities act as magnets for highly-educated people due to their offering of industrial, social, and cultural activities, which contribute to maintaining and attracting other highly-educated people to the area.

By contributing to changes in the industrial development, the universities indirectly have a large impact upon socio-economic development. From the evaluations it appears that the universities play a central role in the growth within such areas as IT, health, and biotechnology, i.e. areas that contribute to a generation of growth and development. Particularly the IT sector has been a distinctive growth area where especially Aarhus and Aalborg have been starting points for the development of competence clusters which have generated comprehensive growth. Such growth contributes to a large increase in the number of employees who at the same time have a higher income than the average in the industrial sector. See section three about competence clusters within the IT sector.

### **5.4 Urban renewal**

In recent years, several towns have experienced a revitalisation which makes them attractive to the creative growth layer in knowledge economics. The universities play a central role in this development.

- First, universities act as magnets for highly educated people as they offer a number of industrial and cultural events, which make the area attractive to other creative groups.
- Secondly, through localization of research and educational activities, which contribute to the creation of creative environments, the universities contribute to the development of the urban environment.

An example is the increasing tendency to locate activities which contribute to making activities attractive for universities, companies, and users such as the music house (“Musikkens hus”) in Aalborg where the music house will be the centre for many of the university's creative degree programmes. Another example of urban renewal is the IT City Katrinebjerg, an old industrial area converted into a modern IT town. This project has been established in co-operation between district/county, companies, and the university, where the university plays a central role by moving its research and educational activities to this area, together with the establishment of a research park, knowledge institutions, and knowledge-based IT companies.

Attracting and holding onto young students is an important factor in the creative development of towns. Thus, due to its 25 educational institutions and 130 further degree programmes, Aarhus has the largest share of youngsters between the age of 17–24 in Denmark. This concentration creates a sound basis for a diversified urban environment with a broad offering of activities which contribute to promoting the city's position within event economics. This tendency is also seen in the other university cities, though to a less extent.

Furthermore, since the attraction of researchers and students from different cultures contributes to enriching the life of the city, the universities contribute to the development of urban diversification. Consequently, attraction of international researchers and students often have a catalyzing impact upon urban renewal as it creates variation and diversification which may make the city attractive for companies and institutions that are dependent on international and creative labour to settle there.

The need for diversity is not only important for cities, but may also contribute to profiling towns and thus making them more attractive for people and companies from the outside. If these towns are to cope with the increasing competition for creative labour, it is essential that they develop an attractive urban environment. In these towns, minor research institutions such as the Danish Institute of Agricultural Sciences' five research centres can play an important role due to its international dimension, and together with other institutions, it may contribute to the attraction and/or maintenance of employees. Thus, it seems that there is a joint interest for the town and institution to invest in the development of the qualities of the town.

This applies also to the minor university cities where, for instance, the University of Southern Denmark has established a campus. If these towns do not succeed in creating an attractive town environment, it will, in the long run, not be possible to secure the necessary intake of qualified researchers and students. The evaluation indicates that these towns are not sufficiently aware of the local dynamism. Investigations of the distribution of the creative class in Danish cities show that it is possible for towns to be attractive to the members of the creative class. Thus, towns like Sønderborg and Kolding are placed at the top of the list of urban areas with many highly-educated citizens.

## **5.5 The cultural development**

The universities are distributors of the cultural development through both humanistic research and education, and through the attraction of youngsters and employees interested in arts and culture.

The extent of cultural activities varies among the various universities. The University of Aarhus is an example of a university which, on the basis of research and education, offers many cultural activities via a large number of museums and institutions connected to the university.

The attraction of students and employees interested in culture and event activities is an essential motivating power for the development of a rich and varied cultural life. Thus, there is a tendency that higher educational institutions, regardless of size, act as a growth layer for cultural entrepreneurship in a broad sense. In addition, the students are users of culture and event products, which contribute to the creation of a large and varied market.

Generally speaking, highly-educated citizens participate in a committed way in a rich and varied cultural life which is seen in the way they are committed to the performance of cultural activities and/or the creation of frames for such activities. Subsequently, many tend to commit themselves to boards, societies and other kinds of organizational work.

The universities located in Odense, Aalborg and Aarhus have also been involved in the development and prioritization of a cultural policy. Thus both management and employees at Aalborg University have been active contributors to the development of a regional cultural agreement, an event conference, and analyses of the regional culture and event economy.

#### **ExCIT**

ExCIT employees offer support and visualization of research projects within event economy, event design, and creative industries. ExCIT employees implement conferences, workshops, attract guest researchers and publish research publications. In addition, ExCIT employees act as a focus for new interdisciplinary research projects and applications for research funds. This particular AAU profile is seen in the way that the centre focuses on the design aspect of events and is interested in:

- how to design events which are relevant for the users and society as a whole
- how to systematize the phases of the design process from idea to product – so the event aspect of the product is optimized in relation to the user's wishes and the product conditions
- how to make the event product financially profitable and technologically up-to-date

At the University of Aarhus, Professor Jørn Langsted took the initiative to develop a prioritization tool for the evaluation of the artistic qualities of projects. Such a tool can be applied to improve the effect of municipal culture grants.

#### **The Divining rod model**

The divining rod model was developed by Professor Jørn Langsted with a view to evaluating the artistic quality of projects. It can be applied as a prioritization tool and evaluation instrument for the distribution of municipal grants to projects within the cultural area. The project was developed on the initiative of Jørn Langsted and is primarily financed under the Aarhus Municipality culture agreement.

By organizing a diversity of cultural offerings, the student houses and the student organizations of the university cities act as important actors in the cultural youth life. Subsequently, student organizations are essential for channelling the students' requirements for practising and demanding artistic experiences which are especially seen through the development of musical stages in the large university cities. Consequently, Aarhus, Aalborg, and Odense offer a lively and active music environment which attracts both students and performing artists.

The University of Aarhus plays a central role in the local cultural life through its relations to a number of museums such as the "Moesgaard Museum", the Museum of Ancient Art, the Steno Museum (history of science and medicine), and the Natural History Museum, all of which have a close research co-operation with the university and have as their aim to communicate research to the public.

#### **5.5.1. Culture and natural sciences**

Technical science and natural sciences are an important part of the cultural basis of society which the universities see as a challenge for communication, and thus contribute to making natural sciences more visible and interesting as a cultural factor.

All universities and research institutions are actively involved in the development and communication of natural science subjects which, for instance, takes place through institutions like the Orion Planetarium, the Steno Museum, and the Botanical Gardens which cooperate with the Faculty Sciences at the University of Aarhus. The Centre of Arts and Science – under the faculty of health sciences at the University of Southern Denmark – organizes and performs science theatre plays for the citizens of the region, and develops educational sequences for the higher grades of the primary and lower secondary education. Various arrangements are held, such as the

research day, the cultural night, etc., where children and youngsters get a possibility to devote themselves to the natural science world.

## **5.6 The environment**

The universities' contribution to the development of the environmental conditions in the Jutland-Funen area is primarily related to research and educational activities in co-operation with public institutions, authorities, and companies. All the universities have built up various kinds of expertise which are involved in various types of environmental and communication networks with authorities and companies which have contributed to improving the environment and building up industrial and development competence.

Through a number of years Geophysics at the University of Aarhus has had a close co-operation with Aarhus County – a co-operation which has been of great importance to research within the area, to improvements of the environment in the region, and to public regulation. Such activities have been made possible by the fact that the Aarhus Municipality granted DKK 18 million to Geophysics to develop a method of how to map drinking water areas. On this basis, a network has been developed with representatives from all the counties of Denmark and consulting engineering firms, which, for instance, offer courses to ensure an appropriate application of the methods. Through the establishment of new businesses and through local engineering firms' expansion of their environmental departments, the development of the mapping method has led to 200–250 new workplaces in the region.

As to their operation, the universities are involved in various activities in the terms of reducing the environmental effect of their activities without describing it as best practice. The Danish Institute of Agricultural Sciences, which is a sector research institution, differentiates itself, however, from other organizations by using a new building and operations to demonstrate environmental opportunities for improvements. The proactive use of the environment is also seen in the way that Danish Institute of Agricultural Sciences prepares green accounts which can verify energy consumption, handling of dangerous waste, and reduced paper consumption, etc.

Within the energy field, centres have been formed at respectively the Danish Institute of Agricultural Sciences and Aalborg University which work with environment and energy together with a competence network project coordinated by Herning Institute of Business Administration and Technology.

The Danish Institute of Agricultural Sciences has in 2004 established a Knowledge Centre of Manure and Biomass Treatment Technology in Foulum with the purpose of maintaining Denmark's leading position within this field by collecting and utilizing the knowledge available and initiating new research projects. In this project participate among others The University of Aarhus, the University of Southern Denmark and Aalborg University, the counties of Viborg and Funen, Danish Agricultural Advisory Service and approximately 30 companies, and the centre has contributed to generating development in the local Agro Business Park.

## **5.7 The social development**

The universities' involvement in social development is directly related to research and educational activities, and indirectly when employees and students participate in voluntary work.

The universities' impact upon social development and health is primarily related to research and degree programmes within the social and the health fields where there is a tradition of dealing with social issues. Together with the university hospitals and the rest of the health system, the University of Aarhus and the University of Southern Denmark actively participate in the development of projects and activities within the health field.

CAST at the University of Southern Denmark deals, for instance, with research and application-oriented projects within health service research. Within the social and health fields, the research environment at AAU has throughout the years been very active in the development of research and student projects.

#### **FoSo**

FoSo is a social science research network at the Department of Social Studies and Organization, Aalborg University. FoSo's research focuses on information about the citizens, in particular marginalized groups enabling the users of public services to be better at taking control over their own lives. This research includes user-oriented/consultant (counsellor)-oriented approaches to procedures within social work and the study of institution structures which are the basis for these procedures.

In addition, the University of Aarhus is actively involved in a research project which has proved a basis for a dialogue between the politicians of the Municipality of Aarhus and various religious groups. Here, the university acts as a neutral party and creates space for dialogue which may be of importance for the integration process.

#### **5.7.1. Degree programmes and social development**

The educational portfolio is an essential factor in the development of social recruitment patterns. Consequently, it seems that there is a tendency that the more profession-oriented degree programmes appeal to social groups which have no tradition for long-cycle degree programmes.

This implies that the profession-oriented degree programmes play an important role in the recruitment of students from these environments and at the same time explain why it is possible to recruit so many engineering students in the northern part of Jutland. This experience is to be used in parts of the western region of Denmark as it is the same groups which are primarily recruited because a university is situated in the region.

#### **5.8 Conclusion**

Up to the new Universities' Act, the universities have been in charge of developing knowledge through research and research related degree programmes at a high international level. The regional obligations have not been part of the universities' tasks, and consequently, there have been no mechanisms to promote a local and/or regional commitment. Nevertheless, the universities of the western part of Denmark have had different degrees of regional commitment and obligations, and the reason for this is that they all have been established on the basis of regional initiatives and support. The extent and substance of the regional commitment is determined by the particular institutional conditions such as research and educational cultures, the subject area and the special regional issues, and the stakeholders.

Historically, the interplay between universities and regions has been far-reaching in the Jutland-Funen regions, also for the new universities, which have based research and educational concepts on an interdisciplinary dimension and project-oriented problem-based education with its starting points in problem formulations from the everyday life of companies, organizations, and local society.

As a consequence of the societal development, the universities' importance has increased and there is an increasing tendency that the universities are in charge of societal tasks and take an active part as organizations in strategic development initiatives in the form of the development of creative and knowledge based trades, the development of town's physical and social space and the development of the environment.

<b>Strengths</b>	<b>Weaknesses</b>
<ul style="list-style-type: none"> <li>▪ Strong environments of competencies within the environment and the energy</li> <li>▪ The universities play a central role in the development of diversity and tolerance</li> <li>▪ The university cities are to serve as a cultural driving force via growth layer and consumption</li> <li>▪ The universities draw and retain academic talent</li> <li>▪ Via education and research, the universities serve as a driving force for social development</li> </ul>	<ul style="list-style-type: none"> <li>▪ The universities do not take advantage of the opportunities of being leading institutions within the environmental area and the energy sector</li> <li>▪ The universities' role as a cultural producer and consumer is limited</li> <li>▪ Lack of cultural diversity is a limitation</li> <li>▪ The universities' latitude for social development is limited</li> <li>▪ The geographical impacts of the universities' cultural and social effects are limited</li> </ul>
<b>Opportunities</b>	<b>Threats</b>
<ul style="list-style-type: none"> <li>▪ An increased focus on the cultural development as a driving force</li> <li>▪ An increased focus on the cultural development as a driving force for regional development</li> <li>▪ The creative industries' economy presents new possibilities for cultural and social development</li> <li>▪ Globalisation and internationalisation promote the possibilities of cultural and social development</li> <li>▪ The cities' and the regions' competition for development and talent promote local development</li> <li>▪ Development of an international environment by drawing foreign researchers and students</li> </ul>	<ul style="list-style-type: none"> <li>▪ A lack of recognition of, for example, the culture's impact on regional development</li> <li>▪ Lack of openness and tolerance in official politics</li> <li>▪ An intensified competition for the drawing of academic talent</li> <li>▪ An ongoing division of the metropolitan region and the rest of the country</li> <li>▪ The governmental policy of drawing foreign researchers and students is limited</li> </ul>

The SWOT analysis stresses a number of dilemmas in the universities, research institutions, and in the regional parties with respect to the cultural, social, and environmental development.

- The universities' and the research institutions' influence on the social and cultural development has been an important motivating factor for the set-up of universities in the Jutland-Funen area. The importance of this has been intensified by the new Universities' Act's requirement for the universities' social functions, as well as the increased impact of creativity and knowledge in the globalized economy. The universities and the research institutions play a central role in the development of the conditions for drawing and keeping talents. It is therefore a limitation that better possibilities for the universities and the research institutions to play a more active role in this development do not exist. A development under pressure from the fact that state policy does not provide the necessary framework.
- Diversity in urban and rural areas and in institutions within specific geographical areas can serve as a good basis for creating environments in the western part of Denmark that are attractive to the type of academic talent that the region requires. Diversity in knowledge institutions, cultural institutions, and in urban and regional areas can therefore serve as a strength that grants the possibility of combining several needs and wishes. This development will be limited though if the knowledge institutions and the regions are too locally focused. The Danish structural reform improves the possibilities of exploiting these potentials, but is at the same time under pressure from the imbalance in state policies.

- Nature and the environment serve as a potential strength for the region which is characterized by a great diversity within nature and the environment. However, the weakness in the co-operation is that due to limited resources to maintenance, the universities have limited possibilities of developing a best practice within these areas. Nature and the environment can be used to actively market and develop the various areas of the region. Extensive activities within the areas of research, development and education are to form the foundation for this development.
- The knowledge institutions play an important role in the development of the social structure in the Jutland-Funen area, not least when it comes to the transformation of the industrial and qualifications structure. By promoting the development of the industry and activities that contribute to an improvement of the socio-economic development in the area, the knowledge institutions play an active socio-economic role. The development of globalisation, outsourcing and the creative industries economy provide good opportunities, but they can also become a threat if the state does not give high enough priority to the development of the framework for the knowledge and cultural institutions in the area of western Denmark.

## 6. BUILDING A REGIONAL CAPACITY

### 6.1 The regional regulatory framework

The starting point for the Jutland-Funen Co-operation of Business Development is an acknowledgement of the fact that the present imbalance between the capital region and the western Danish region demands a targeted public sector intervention in order to promote the decisive growth factors in a knowledge-based economy. They are: education and competency, research and innovation, entrepreneurship and ICT.

An intervention that assumes an interaction agenda and coordination of the various state initiatives in the area, which will best be pursued via co-operation between the players in the Jutland-Funen region, and which is formalised within the auspices of the Jutland-Funen Co-operation of Business Development.

The development of the region is a matter for the individual counties and municipalities who orchestrate the development strategies on the basis of the individual area's particular regional circumstances. The regions have an interest in utilizing those state resources which the efforts of the Jutland-Funen Co-operation of Business Development can attract to the institutions, networks and projects in the Jutland-Funen region.

There is therefore no combined strategy for the Jutland-Funen region but, rather, a range of regional and local strategies for the individual regions and municipalities whose aim is precisely that of developing the opportunities in these areas for combining an ability to compete with an ability to build prosperity.

The fact that these strategies are developed at the county and municipality levels means that the regional role of the universities is primarily linked to the areas in which they are located, and that the institutional co-operation for regional development primarily has its roots within the counties and municipalities.

As is discussed in section three, the universities are primarily embedded in regional development networks in the following areas:

- The University of Aarhus and ASB: Aarhus Municipality and Aarhus County
- Aalborg University, Northern Jutland County and Aalborg Municipality
- University of Southern Denmark, Odense Municipality and Funen County
- The Danish Institute of Agricultural Sciences, Viborg Municipality and Viborg County

On top of this come the various departments of University of Southern Denmark, Aalborg University and DIAS, which are connected to regional development networks in those areas in which they are based.

- University of Southern Denmark, Sønderborg: Southern Jutland County and Sønderborg Municipality
- University of Southern Denmark & Aalborg University, Esbjerg: Ribe County and Esbjerg Municipality
- University of Southern Denmark, Kolding: Vejle County
- The Danish Institute of Agricultural Sciences, Bygholm; Horsens Municipality, Vejle County
- The Danish Institute of Agricultural Sciences, Aarslev: Odense Municipality and Funen County

The universities are also involved in looser network relations with development networks in the other county areas but loose networks are exactly what they are, involving co-operation around restricted tasks/projects of joint interest.

The universities' engagement with the Jutland-Funen Co-operation of Business Development is mediated via the Science and Enterprise Network and IT initiatives, which have two specific action areas, both of which aim to promote development and co-operation of two areas respectively:

- Development and usage of IT which, for the universities, also has capacity-building elements
- Intermediation of knowledge to companies and training/educational institutions that exclusively support the Intermediation process.

## **6.2 The universities' operational framework**

The new Universities' Act places requirements to the effect that universities must declare their objectives and make visible the social benefit of those objectives, as well as giving support to these activities with dedicated pooled grants. The universities see their primary social function as being the production of new knowledge and university graduates of professional international standing, for which reason they view networking and co-operation as a means to promote these aims. This means that, for universities, a network is not a question of geographical distance, but rather, a question of access to knowledge and information of importance to their various research and teaching activities.

This also means that the universities, to a great extent, view themselves as pivot points linking networks and co-operation projects together, regardless of geographical dimensions. For universities, it is of central importance to couple together the global and the local:

- The global is necessary so that universities can produce knowledge and competencies that, over a longer timeframe, can maintain the universities as interesting co-operation partners
- The local is necessary because the local is a prerequisite for the university's ability to retain and develop competencies that makes it possible to be attractive in the global knowledge process

## **6.3 Building up competencies**

Interaction between universities and regional interest groups has developed apace in recent years; from more general and formal relations to becoming, increasingly, strategic and operational networks which have great importance for the ability of universities and regional interest groups to react to the challenges posed to regions and universities given the ever speedier pace of globalisation, technology and innovation.

### **6.3.1. Regional innovation fora**

North Jutland Innovation Forum was established in 2002 on the initiative of Northern Jutland County, Aalborg Municipality and Aalborg University as a forum for the development of innovation in Northern Jutland. The background to this was a need to establish a forum in which the central political players within innovation had the opportunity to develop a strategic discussion around future strategies for Northern Jutland. The development of a forum had the aim of creating a space for dialogue and exchange of knowledge which created the possibility, of developing a common language and frame of reference, and thereby make it possible to overcome institutional barriers which restrict knowledge sharing and exchange between players from companies, the public sector and research and knowledge institutions.

The results of this experiment were very positive, as the innovation forum succeeded in formulating visions and initiatives relating to a strategy for the future of Northern Jutland based on a series of new growth-creating

measures based on the university's key competencies. And also the development of existing industries with a starting point in companies that were directly amenable to change.

The basic reason why it was possible to disseminate a county-based business policy was the very positive experiences obtained by using the university's key competencies as a launch point of the development of a competency cluster within wireless communications, as well as the positive experiences gained in co-operation with the university on the development of a series of politico-commercial measures in relation to change and development of Northern Jutland industry.

The innovation forum's philosophy forms a starting point for the new structure reform's growth fora, which have been established as institutions having the formal competency to develop industry and competency strategies for the new regions in Denmark.

### ***6.3.2. Networks within new areas of growth***

The IT sector is a prominent growth powerhouse in Aarhus, Odense and Aalborg, which creates many new companies and jobs. In Aalborg, for example, there has been a growth in employment of 60% within the last ten years, and there seems to be a continued potential for growth within the area. In Aarhus, the IT City Katrinebjerg has, in a similar way, brought a substantial increase in employment within the IT sector. The percentage of IT jobs in Aarhus is 13.2%, which is the highest percentage in the Jutland-Funen region.

In order to utilize this potential the central players – companies, counties, municipalities and universities – have come together to establish an IT forum that can form a resource from which local industries, organisations, research projects and training/educational institutions can exploit the potential that is contained in this type of synergy via network co-operation.

As a particular example, can be cited the IT City of Katrinebjerg, where the development of an area for the IT-industry was planned and received support via the fact that the university located its IT-research and teaching competencies in the area – a co-location which has created a dynamic environment and which functions as catalyst for the development of the IT-industry. In Aalborg, inspired by events in Aarhus and Odense, an ICT forum has been formed with the aim of creating a framework around the ICT industry in Northern Jutland and making this agenda visible so as to create opportunities for increased co-operation and growth.

Within the health sector, research competencies are shared amongst hospitals and the university, which offers the basis for the development of new co-operation projects between the county and the university, given that counties are responsible for the operation of hospitals whilst universities administer research and development.

Co-operation between counties and universities is of great importance to regional welfare services, but has also important implications for the business sector. In Aarhus, the strong competencies within the health sector have been used to develop new commercial strategies which combine health and nutrition competency with foodstuff industry competencies to develop new health food goods. Research competency, furthermore, has formed a launch pad for the development of incubators for new projects within the health sector. Beyond increasing the quality of services to people in the region, this type of co-operation also forms a starting point of growth strategy within the area of health technology, partly through the development of new projects and companies. Thus in Aarhus and Aalborg, incubator environments have been developed in connection with hospitals under the Aarhus University Hospital

In Odense and Aalborg, we can see the development of industry development networks within the health technology area, where the universities are a central driving force in an initial build up of competency clusters, in co-operation with the industry promotion system. And in Aarhus and Odense, we can see how co-operation forms the basis of new networks in a link-up between foodstuffs and health, where the Danish Institute of Agricultural Sciences is also a participant.

### **6.3.3. *Research centres as catalysts for co-operation between university and local industry***

With regards to, amongst other things the IT sector, a series of different types of research centres have been developed which have the aim of improving interaction between research and innovation. The establishing of the Alexandra Institute in the IT City in Aarhus is an example of a hub construction which aims to improve the interaction between research and innovation. The Alexandra Institute has thus developed a substantial expertise in matchmaking, which makes it possible to achieve better results in bringing researchers and industry together. Another new construction in the Alexandra concept is a project hotel, where it is possible for companies to have close physical proximity to the researchers with whom they are working.

### **6.3.4. *Building capacity in the training and educational system.***

In the area of education, an expansion of capacity is taking place via an expanded co-operation between universities and the medium term and short term higher education courses which themselves are helping to increase the system's ability to promote development

In the first instance, this co-operation means that a lifting process taking place in the training and education system as they gain access to research-based knowledge in close dialogue with the universities on both the professional and pedagogic areas. Secondly this co-operation means that there is also a raising of the bar in terms of the training/educational institutions' ability to support and service small to medium-sized businesses. And then thirdly, this means that users of the education system receive far better options when combining the various elements of the system, being now able to cut across existing institutional demarcations.

A strong network exists between the university and upper secondary schools, which has partly helped to assess needs regarding particular courses. In Aalborg and Aarhus, a range of specific networks have been developed within selected upper secondary school subjects which retain joint arrangements in order to promote a professional and pedagogic dialogue.

### **6.3.5. *Co-operation between research institutes.***

Research

- Research co-operation between research institutes improves the university system's ability to operate in an interdisciplinary and multidisciplinary fashion, something which contributes to improving knowledge development and knowledge intermediation.
- A sector research institution such as the Danish Institute of Agricultural Sciences seems especially to function as a mediator in a range of different research projects, by way of examples together with University of Southern Denmark concerning plant medicine and robots in the foodstuff industry, concerning molecular biology and the pig-genome-project with the University of Aarhus, and nanotechnology with the University of Aarhus and Aalborg University.

#### Training/Education

- IT-West is an example of how universities can work together to develop a series of interdisciplinary and multidisciplinary IT courses for the business community. One of the exciting initiatives within training courses is that co-operation makes possible the assembly of a course where one can exploit the fact that the research areas at the different universities have different key competencies that can be assembled for a course schedule; something that an individual institution would not be able to offer.

#### **6.3.6. Co-operation between companies and students**

A series of initiatives have been developed which will strengthen co-operation between students and companies, which gives, small companies especially, the opportunity to obtain or create a competent labour force (student work) and/or obtain competent project results, at the same time that students gain a better understanding of company practises.

#### **6.4 Building inter regional capacity**

The universities are primarily co-operation partners in those cities and regions in which they are located, which poses a range of challenges to universities, companies and the authorities in the other parts of the Jutland-Funen region.

A development which the Jutland-Funen Co-operation of Business Development supports with a series of initiatives which come under the Science and Enterprise Network and IT initiatives. These projects have as their aim the promotion of options for companies and training/educational institutions in terms of access to research based knowledge, and also give research based knowledge institutions access to knowledge in companies. Here there is a difference between two types of organising methods:

- to build up regional competency centres which can coordinate interaction between companies and knowledge institutions within selected areas
- to build up networks between companies, educational and research institutions which can help to bring research based knowledge out to companies

The projects are relatively new and there is therefore only a limited knowledge about their activities, but for the moment it is estimated that they are having a positive effect.

#### **6.4.1. The west Danish IT initiative.**

The aim of the IT initiatives is to strengthen the particular key competencies found in the different areas and to make the use of IT technology widespread throughout the Jutland-Funen region, with special emphasis here on those areas which are not in close geographical proximity to an IT environment. The IT initiative works in close co-operation with the public sector, training courses, and private businesses. Half has gone to the four centres, and the other, via the IT corridor, is helping to support smaller co-operation projects in practical ways.

### **The Centre for Embedded Software Systems**

The Centre for Embedded Software Systems is one of four Jutland-Funen IT competency centres, which are a part of the Jutland-Funen IT initiatives. The centre was established by Aalborg University and focuses on getting electronics and software to function together at an optimal level. The aim of the centre is to set in train as many co-operation projects as possible between research and the private business community. Partly with a view to quicker intermediation of research findings and effective turnover of new knowledge in new products. And partly with a view to exposing the research area at the centre to new research related challenges, which have as their starting point the concrete issues facing companies.

### **Centre for Software Innovation**

Centre for Software Innovation is a competency centre in southern Jutland which specialises in innovation, development and improvement of embedded software in mechatronic products, as well as general processing improvements in software development. The aim of the centre is to build bridges between researchers and industry so that research findings and key competencies can quickly find a practical use within company product ranges and competency development.

### **ISIS Katrinebjerg**

ISIS Katrinebjerg has the aim of strengthening research and development co-operation between the business community and the Aarhus region's IT knowledge environments. ISIS has three initiative areas, namely, Interactive, Space, Pervasive Healthcare – Health and Software development. Those projects in which ISIS is involved are arranged so that they present great potential both for new research findings and new and attractive business ideas.

### **Knowledge Lab**

Knowledge Lab is based at University of Southern Denmark. It is the Knowledge Lab's primary task to strengthen interaction between the university and the business community. The Knowledge Lab embraces a large range of projects within the areas of knowledge management, digital competency development and the theory of knowledge.

## **6.4.2 Competency areas**

The development of areas of competency in the region as a whole plays a substantial role in the national programmes for the exchange and dissemination of knowledge, as well as for a series of initiatives under the Jutland-Funen Co-operation of Business Development.

Universities and state-sector research institutions have a central position in these environments by virtue of their research-based competencies, which are then brought into interaction with non-research-based knowledge institutions and companies.

A knowledge environment is characterized by the bringing together of all the relevant players from across the whole Jutland-Funen region. These growth environments promote a competency lift via intense and binding interaction between companies and knowledge institutions. The companies gain a usable competency lift and the knowledge institutions are provided with useful input for research and teaching.

The centres are established with a starting point in existing competency clusters and seek to bind research, training and companies together in order to strengthen interaction between research knowledge in areas located outside of the traditional university regions.

The focus is on the transfer to existing clusters and companies and can thus be seen as a means to give these areas access to existing research the subject fields.

#### **6.4.3. Networks**

Networks are a looser form of co-operation established to promote the development of industry via exchange of knowledge between companies and researchers in the Jutland-Funen region.

An explosive growth in the development of network relations between universities and regions has taken place, where there is now an increasing trend for universities to be included in binding network co-operation, which is of importance to development and renewal in the region – co-operation which comes on top of traditional tasks in relation to research and education.

#### **6.4.4 Development possibilities**

Denmark's first science park was established at the University of Aarhus in the 1980s, and since then, collaboration between the university, private companies and regional/local authorities has increased, especially in the fields of science and health science. Interdisciplinary collaboration and joint projects with the business community have since become more acceptable in terms of both legislation and content. The view among university researchers is that collaboration between the university and the region is still in its infancy in many areas and will develop over time. The business community also carries a responsibility in this context to ensure it is open to using new knowledge and commercializing research results. Research collaboration is highly dependent on personal relations in the form of participation in various networks or contact with former students. In some areas, this collaboration is the result of a conscious effort by the university.

In Aarhus it is primarily the Faculty of Science and the Faculty of Health Sciences that cooperate directly with private companies and public authorities. The Faculty of Humanities does not have the same opportunities and traditions, but has nevertheless recently started collaborating with a consultancy firm about disseminating knowledge to companies via short tailor-made courses. The County of Aarhus finances the scheme, so there is hope that with time, the humanities disciplines will also take part increasingly in a dialogue with the business community and public authorities in the region.

In the field of social sciences, the opportunities for dialogue will increase as a result of the government's decision to establish a municipal evaluation institute under the auspices of the University of Aarhus in connection with the forthcoming amalgamation of local government in Denmark.

Initiatives such as the Centre for Entrepreneurship and Business Contact are often subsidised by the municipality or the county and reflect the way in which public authorities mainly allocate funds. Funding is typically allocated for a number of years at a time and often in support of sustainable new projects to help them survive until they can function independently. The problems arise when this support runs out, and the projects must either become self-supporting or be integrated into the organisation.

It can be difficult to distinguish many of the projects from each other, including those initiated by the Jutland-Fyn Business Co-operation Scheme. Many parties have expressed the wish that projects with similar content should instead be combined to enable a concentration of funds.

An interdisciplinary approach is one of the key terms in the university's development contract with the ministry for 2005. New degree programmes will be established in the coming years, including a Bachelor of Modern Arabic and Business Communication, which will be a joint effort by the university and the Aarhus School of Business. In some areas, financial issues and organisational structure are barriers to an interdisciplinary

approach. This approach is nevertheless becoming increasingly common and has resulted in several new degree programmes.

The division of the education system into Bachelor's and Master's degree levels gives the university new opportunities and challenges. The university can work with the business community to increase the demand for graduates with a Bachelor's degree who go back to university after working for several years to complete a Master's degree targeting labour market needs. This will result in an exchange of knowledge between the university and the business community. There is a general awareness that students who complete a Bachelor's degree at the University of Aarhus often go to Copenhagen or abroad to complete their Master's degree if other universities offer better conditions.

It is the interplay between the university and society at large that fosters renewal and innovation. It is important to bridge the gap between the university and society to ensure an increased mutual exchange of knowledge. This can be done in many ways, such as work experience for students, increased employment opportunities for graduates with Bachelor's degrees and Master's degrees who think of becoming entrepreneurs rather than employees. It is important in this context that companies become less hesitant to employ highly educated people with an unusual profile. With a labour market in which creativity, flexibility and collaboration are becoming increasingly important, strong professional skills need to be matched by strong personal skills.

The Katrinebjerg IT City is one example of the many initiatives that resulted from collaboration between the Municipality of Aarhus and the County of Aarhus about a development strategy for the region. As a result of the amalgamation of local government, the University of Aarhus will in future cover a larger geographical area, which will more clearly regard the university as its own, and thus become more involved in its work. The amalgamation of local government may also result in county finance being spread over a larger area and regional development being concentrated in outlying areas.

The future Central Jutland Region will thus present a number of new challenges and opportunities for the university, especially due to the education and business structures of the new region, characterised by a high level of education at HEIs available mainly in the eastern part of the region. On the other hand, the western part has many entrepreneurial SMEs. The university and other regional bodies will be responsible for regional coherence. Some of the future roles of the university may involve supplying qualified labour, determining the development agenda, defining the region's image and contributing to collaboration between the private and public sectors about innovation. It is very important that the university continues to be active internationally to ensure a high standard of research and education, also in the future. This international perspective will also have a knock-on effect within the region.

The dialogue between the university and society at large must be extended and made more distinctive via mutual openness, branding of the university environments and storytelling – using good case studies as examples. This could help the university make better use of its strengths and niches in the future.

The Danish Institute of Agricultural Sciences has a broad range of national and international cooperating partners, among these institutions, organisations, and companies, and the Danish Institute of Agricultural Sciences can therefore serve as a bridge builder when it comes to research, education, and innovation within the agricultural area, and the areas of food and environment.

The Danish Institute of Agricultural Sciences is pro-active with regards to the formation of the new regions and the new Danish structural reform, including the regional fora of growth. It is expected that the Danish Institute of Agricultural Sciences will play a central role when it comes to bringing the potentials of the agricultural sciences into the dialogue on the regional business and social development. In local areas, the Danish Institute of

Agricultural Sciences finds great political support, and the Danish Institute of Agricultural Sciences is included in many local development strategies on increased innovation and knowledge transfer. On several fronts, mutual dialogue and marketing exist, and coordinated activities are planned. In the regional development strategies, the food sector plays a central role, and there is a great interest for increased bridge building in relation to the public research institutions. The set-up of regional research foundations and/or an increase in local venture capital will be an obvious possibility for promoting the regional commitment and carry out the ideas that arise through for instance centres of excellence, the formation of networks, and the establishment of spin-off companies. The set-up of a foundation or similar will allow for research to be focused on the regional business development with the objective of exploiting regional potentials and important distinctive features.

The new Danish act on Public Sector Research gives a high priority to the role of the Danish Institute of Agricultural Sciences with regards to teaching, and a clearer framework and incentives for the educational activities are expected. This evaluation indicates that in the Jutland-Funen region there is a profound desire of keeping and further developing courses of education related to agriculture at a university level, localised in the region.

The Danish government has decided to intensify the efforts of developing the rural districts, and as part of this make living in the countryside more appealing. Some of the elements of this strategy are knowledge-based business development within the areas of, for instance, food production as well as an improved nature management. The Danish Institute of Agricultural Sciences has good possibilities of entering into co-operation on joint projects in which companies, municipalities, and citizens benefit from research-based knowledge, for instance with regards to niche productions and the development of rural districts. In connection to the Danish Institute of Agricultural Science's regulatory expert advisory tasks there is a focus on the balance between agricultural production and safeguarding the environment. From a societal point of view, there is much focus on this area of research and in relation to, for instance, the development of rural districts it is much suited for future regional co-operation.

Insofar as biomass, the rural districts problems, and the business development, there is a profound synergy between the objectives of Viborg county and the Danish Institute of Agricultural Sciences. There is also a profound synergy between the objectives of the Danish Institute of Agricultural Sciences and the Funen county with regards to the gardening business sector and "Plants for health" ("Planter til sundhed").

The Danish Institute of Agricultural Sciences has a national and professional research commitment that primarily needs to be taking into account, but simultaneously the Institute has a solid regional involvement and an obligation to participate in regional business and social development. If the regional interested parties and the regional institutions can cooperate well, the regional aspect will have good prospects of becoming more wide-ranging in years to come.

## 7. CONCLUSION

This conclusion summarizes the conclusions drawn in the previous chapters.

Danish universities and state-sector research institutions are state institutions whose activities are directed by government; hence the interaction between universities is to a great extent defined within the framework of the state's research policies. Research resources are distributed partly via base grants in relation to individual institutions and partly via prioritised means of research. The trend is towards a reduction in base grants at the same as the prioritised means of research are increased. This is a trend which implies changes in the interaction, both within institutions and between institutions and the government department, and thereby offers an opportunity for redistribution in relation to existing grants.

There appears, however, to be an increasing degree of co-operation between universities around joint interests, where precisely that geographical imbalance in state research policy has helped to create the establishment of a series of joint initiatives. Both within and between research areas, and between the universities, there is a formal and informal interaction which shifts between competition and co-operation. This has its roots in the fact that researchers within the individual fields of research are working to develop definite areas of knowledge and competency where they then must (concurrent with the co-operation and comradeship) also compete for scant resources in the form of research grants.

The Danish Institute of Agricultural Sciences' function as a state-sector research institution takes in many types of co-operation with the west Danish universities, as Institute's approach is complementary to the more base-research orientated activities at these universities. A policy which, on the one hand, promotes competition between areas of research with a view to creating international key competencies, while on the other also moves in the direction of promoting co-operation by supporting areas of research and research initiatives between the various research institutes.

Research-based co-operation with non university and research institutes is growing steadily; initiated, not least, by changes in state-research policy which aim at developing the research competencies of these institutions. A co-operation arrangement which is partly based on the advantages of regional co-location and on the advantages in sector specialisation.

Regionally speaking, there is therefore strong co-operation between the various BA/MA and professions based training/educational institutions and the regional university, where universities will go in and support the research related anchoring of these institutions, e.g. in the absorption of the Herning Institute of Business Administration and Technology into the University of Aarhus.

The sectors show co-operation taking place between research-based institutions and the non-research-based institutions with a view to supporting the development of research and development. This can be seen within engineering and the health sector.

On the inter-regional level, these activities are supported via the building of competency clusters and networking via institutions under the umbrella of the Jutland-Funen research project.

Co-operation with other regional interest groups takes place at many levels. Thus a strong co-operation ethos exists within the development orientated companies, the development-orientated company clusters as well as with counties and municipalities around the development of dedicated initiatives.

It appears from the evaluation that education and learning are important elements in the Jutland-Funen efforts to create a balanced Denmark with regards to growth and development. Seen in the light of the growing international competition and technological development, which makes it possible to outsource production to countries with lower costs as to pay and welfare, education and learning are central elements in maintaining growth and welfare.

This strategy is made difficult by the relatively low educational level and qualification level in the labour force and in companies. Consequently, there is a need to improve the competencies of both the current and the future labour force. The prerequisites for such a strategy are that a higher percentage of the youth cohorts takes research-based further education, and that members of the existing labour force are given an opportunity to develop and improve their qualifications and competencies through research-based continuing and further education

Consequently, it is essential that universities and regions go together regarding the development of educational and learning possibilities that can contribute to an improvement of the labour force. There is an increasing focus on the development of degree programmes and learning sequences that contribute to developing competence levels of strategic importance for regional development.

A number of new degree programmes have been established based on special regional requirements, but they also have a broader aim as the regional labour markets are too small to form a basis for research-based education. A number of these new degree programmes are offered in co-operation with non-research based further-education educational institutions – the so-called research bachelor degree programmes, for instance at engineering colleges – and they are implemented in competition with existing degree programmes at other institutions. As something new, local authorities and companies play an active role in coordinating and developing these initiatives.

A rising prioritization is also seen in the degree of practice orientation in the degree programmes with an emphasis on the students' ability to work with problem formulations in companies and organizations as an essential element in their competence profile. At the same time, it makes it possible to develop the labour markets, which are currently characterized by a limited demand for labour with research-based education.

To an increasing extent, the continuing education field is subject to a strategic prioritization from the universities which are developing a number of new educational initiatives within the more traditional fields of education. However, an increasing orientation is also seen in the direction of areas that have not traditionally been prioritized and which demand new forms of competence levels across existing professional standards. In the continuing educational area, a higher degree of co-operation is seen between the different universities, and IT-West is an example of the strategic prioritizing of the development of IT competence levels in the western part of Denmark.

Entrepreneurship is another field subject to strategic prioritization where the west Danish universities have gone together to develop a national consortium to promote entrepreneurship activities as an integrated part of the degree programmes at all levels in the educational system. This regional perspective is promoted through the development of regional centres at the University of Southern Denmark in Kolding, the Aarhus School of Business and Aalborg University, and its purpose is to coordinate the regional initiatives in the entire educational system.

In terms of organizational aspects, there is an increasing tendency to involve external stakeholders in the planning and development of the educational portfolio and degree programmes through user panels where regional users are also represented.

Two fundamental conditions characterize the regional partners' co-operation on education and training for regional development:

- The co-operation between the regional partners' regarding the contributions of further and higher education to the labour market and qualifications are within the framework of the Universities' Act, which determines the conditions for development and offers existing and new forms of education that are to be approved by the Danish Ministry of Sciences, Technology and Innovation. The co-operation is also characterized by small, local labour markets which is why the production of people with a Master's degree is aimed at national and international labour markets.
- The co-operation between universities has its starting point in the existing division of work between the institutions that are decided and based upon national education policy.

As the regional labour markets and the surrounding areas have a limited size and limited basis for recruitment, most of the academic courses of education compete for the recruitment of students and for the allocation of people with a Master's degree to the labour market. Within certain areas of education the competition is however limited. This is due to the fact that for some educations, the government has decided on a specific distribution of educations on some institutions.

The increasing demand on the labour market for academic competences within all areas has increased the requirements for the development and adjustment of current and new Master's degrees. This requirement has intensified the co-operation across faculties and universities. IT-West is an example of an area in which the universities have cooperated on offering inter-disciplinary educations that correspond to the needs of the trade and industry.

Within the area of supplementary education, the co-operation between universities seems to be closer. The close co-operation is due to the fact that several of the supplementary educations are based on a combination of the universities' core competencies and specific regional requirements for qualifications. Institutions cooperate on offering complementary educations within all areas in which the institutions themselves do not possess the required core competencies.

In recent years, the co-operation between universities and non-university colleges of higher education has been highly prioritized. This is partly in response to the education policy's requirements of the upgrading of skills within the medium-length educations, and partly in response to an increased demand for a development of new competencies within these educations and/or in continuation of these.

Through the establishment of regional co-operation, not least within the areas of health and engineering, the co-operation has been particularly wide-ranging. Within the area of engineering, regional co-operation has resulted in a development of new engineering degrees at graduate level at the universities.

The location at campus in Esbjerg – University of Southern Denmark, as well as Aalborg University – has served as the basis for a developed co-operation within existing educations, as well as the establishment of new educations to meet local needs.

The co-operation across sectors has also been wide-ranging. The co-operation across sectors has played a part in the upgrading and the development of the supply of competencies at the medium-length engineering degrees, as well as giving those with a medium-length engineering degree the possibility of continuing their studies within the area of engineering. As a governmental research institution, the Danish Institute of Agricultural Sciences, has an obligation to contribute to the area of higher education. The Danish Institute of Agricultural Sciences is

actively and increasingly involved in connection with the supply of student activities within the education areas of farming, food, and the environment.

Interested parties in the region have increasingly been involved in the co-operation on the educations' contributions to the labour market and qualifications. A number of the above-mentioned initiatives have been introduced based on initiatives from regional interested parties. This development is being supported by the establishment of institutions in which the regional interested parties play an active role. A development that has been particularly successful in connection with the establishment of the Centre for Technical Educations (Centre for Tekniske Uddannelser) in Aarhus, as well as in connection with the creation of the various educations' advisory boards.

Up until the new Universities' Act, the universities have been in charge of developing knowledge through research and research-related degree programmes at a high international level. The regional obligations had not been part of the universities' tasks, and consequently, there have been no mechanisms to promote a local and/or regional commitment. Nevertheless, the universities of the western part of Denmark have had different degrees of regional commitment and obligations, and the reason for this is that they have all been established on the basis of regional initiatives and support. The extent and substance of the regional commitment is determined by the particular institutional conditions such as research and educational cultures, the subject area and the special regional issues, and the stakeholders.

Historically, the interplay between universities and regions has been the most wide-spread at the new universities that have based research and educational concepts on an interdisciplinary dimension and project-oriented problem-based education with its starting points in problem formulations from the everyday life of companies, organizations, and local society.

As a consequence of societal development, the universities' importance has increased and there is an increasing tendency that the universities are in charge of societal tasks and take an active part as organizations in strategic development initiatives in the form of the development of creative and knowledge-based trades, the development of town's physical and social space, and the development of the environment.

## **APPENDICES**

Appendix 1: Regional Educational Level

Appendix 2: GNP per Capita (In 1 000 DDK)

Appendix 3: Facts and Figures concerning the Universities

Appendix 4: The University Act

## Appendix 1: Regional Educational Level

### A. Regional level of education – 2003 in %

	UNSKILLED	YOUTH EDUCATION	VOCATIONAL TRAINING	SHORT CYCLE EDUCATION	MEDIUM CYCLED EDUCATION	LONG CYCLED EDUCATION	TOTAL
Ringkøbing County	35.1	6.5	40.2	3.9	11.6	2.6	100
Ribe County	33.9	6.0	40.4	4.3	12.7	2.7	100
South Jutland County	32.9	5.3	42.0	4.2	12.4	2.9	100
Viborg County	34.7	5.9	40.8	3.9	11.5	3.2	100
Vejle County	32.3	6.6	39.7	4.7	13.4	3.3	100
North Jutland County	32.0	7.2	39.6	3.9	13.2	4.2	100
Funen County	28.9	7.6	39.2	4.4	14.8	4.2	100
Aarhus County	25.6	10.7	36.0	4.8	16.1	6.9	100
Denmark	28.9	8.8	37.3	4.5	14.3	6.2	100

Source: Arbejderbevægelsens erhvervsråd – Economic Council of the Labour Movement

### B. Regional level of education – Change 1983-2003 in % point

	UNSKILLED	YOUTH EDUCATION	VOCATIONAL TRAINING	SHORT CYCLE EDUCATION	MEDIUM CYCLED EDUCATION	LONG CYCLED EDUCATION
Ringkøbing County	-22.7	3.7	11.4	2.1	4.4	1.1
Ribe County	-20.9	3.3	10.3	1.9	4.5	0.9
South Jutland County	-21.5	2.8	11.4	1.7	4.2	1.3
Viborg County	-23.0	3.2	12.3	2.0	4.1	1.4
Vejle County	-20.6	3.6	8.4	2.2	4.9	1.5
North Jutland County	-22.2	3.8	9.5	1.8	4.9	2.2
Funen County	-21.3	3.5	8.2	2.0	5.5	2.1
Aarhus County	-20.7	4.1	5.1	2.1	5.9	3.5
Denmark	-20.6	3.9	6.3	1.9	5.3	3.2

Source: Arbejderbevægelsens Erhvervsråd – Economic Council of the Labour Movement

**Appendix 2: GNP per Capita (In 1 000 DDK)**

	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>
<b>Denmark</b>	211,2	217,9	227,0	239,6	247,4	253,1	259,1
<b>Eastern Denmark</b>	199,4	206,7	213,9	221,3	228,9	234,9	241,2
<b>Funen County</b>	179,0	182,4	186,9	193,2	200,0	204,4	209,4
<b>Southern Jutland County</b>	193,8	197,8	206,8	211,8	223,1	226,9	231,1
<b>Ribe County</b>	207,5	213,5	219,7	225,2	230,1	238,1	243,3
<b>Vejle County</b>	191,5	202,7	211,5	223,4	230,6	235,4	240,4
<b>Ringkøbing County</b>	205,6	219,2	224,1	231,2	243,9	249,6	253,2
<b>Aarhus County</b>	186,3	192,2	199,6	206,7	216,0	221,7	227,3
<b>Viborg County</b>	193,3	201,0	204,0	219,2	227,0	230,4	235,1
<b>Northern Jutland County</b>	183,3	189,9	195,4	203,1	209,2	213,4	218,8

Source: Statistic Denmark

### Appendix 3: Facts and Figures concerning the Universities

**Table A:** Key Figures

<b>Key Figures 2003</b>					
	<b>AU</b>	<b>SDU</b>	<b>AAU</b>	<b>ASB</b>	<b>Total</b>
<b>1. Total Income</b>	2.248,0	1.376,7	mgl.	307,3	<b>3.932,1</b>
Faculty of Theology	45,7	ir	ir	ir	<b>45,7</b>
Faculty of Social Sciences	206,2	158,8	mgl.	165,9	<b>530,9</b>
Faculty of Health Sciences	587,0	251,2	ir	ir	<b>838,2</b>
Faculty of Humanities	264,7	194,4	mgl.	53,0	<b>512,0</b>
Faculty of Sciences	560,0	269,0	mgl.	ir	<b>829,0</b>
Central Administration	584,5	503,3	mgl.	46,3	<b>1.134,1</b>
Distributional range	0,0	ir	mgl.	42,2	<b>42,2</b>
<b>2. Basic Research</b>	<b>AU</b>	<b>SDU</b>	<b>AAU</b>	<b>ASB</b>	<b>Total</b>
<b>2a. Basic Research Grants (income)</b>	572,4	365,5	mgl.	70,9	<b>1.008,7</b>
Faculty of Theology	15,8	ir	ir	ir	<b>15,8</b>
Faculty of Social Sciences	63,1	52,7	mgl.	45,2	<b>161,0</b>
Faculty of Health Sciences	162,4	61,5	ir	ir	<b>223,9</b>
Faculty of Humanities	76,7	71,0	mgl.	14,5	<b>162,2</b>
Faculty of Sciences	166,8	76,4	mgl.	ir	<b>243,2</b>
Central Administration	87,6	103,9	mgl.	8,8	<b>200,3</b>
Distributional range	0,0	0,0	mgl.	2,4	<b>2,4</b>
<b>3. External Research Grants</b>	<b>AU</b>	<b>SDU</b>	<b>AAU</b>	<b>ASB</b>	<b>Total</b>
<b>3a. External Research Grants (Income)</b>	453,0	214,7	mgl.	22,9	<b>690,6</b>
Faculty of Theology	8,8	ir	ir	ir	<b>8,8</b>
Faculty of Social Sciences	35,0	19,7	mgl.	21,9	<b>76,6</b>
Faculty of Health Sciences	150,0	59,8	ir	ir	<b>209,8</b>
Faculty of Humanities	29,6	20,4	mgl.	1,0	<b>51,0</b>
Faculty of Sciences	226,9	109,1	mgl.	ir	<b>336,0</b>
Central Administration	2,7	5,7	mgl.	0,0	<b>8,4</b>

<b>6. Enrolment</b>	<b>AU</b>	<b>SDU</b>	<b>AAU</b>	<b>HHÅ</b>	<b>I alt</b>
<i>6b. Median Age for Enrolled Students</i>	21,7	23,6	mgl.	21,0	
Faculty of Theology	22,3	ir	ir	ir	
Faculty of Social Sciences	21,6	23,2	mgl.	21,0	
Faculty of Health Sciences	21,6	23,0	ir	ir	
Faculty of Humanities	22,0	24,9	mgl.	21,0	
Faculty of Sciences	21,4	23,3	mgl.	ir	
<b>8. Full-year equivalent - Total</b>	3.409,1	1.124,7	mgl.	527,2	5.061,0
<b>12. Number of Students</b>	<b>AU</b>	<b>SDU</b>	<b>AAU</b>	<b>HHÅ</b>	<b>I alt</b>
12a. Number of Students – total	21.826	12.324	mgl.	5.346	39.496
<b>17. Completion, Defection and time of Study</b>	<b>AU</b>	<b>SDU</b>	<b>AAU</b>	<b>HHÅ</b>	<b>I alt</b>
<b>Bachelor</b>					
17a. % Completion within the ordinary time					
Humanities	19	20	41	0	ir
Natural Sciences	15	3	34	ir	ir
Social Sciences	37	34	55	0	ir
Health Sciences	ir	25	ir	ir	ir
17b. % Completion within the ordinary time + 1 year					
Humanities	41	34	52	0	ir
Natural Sciences	38	16	42	ir	ir
Social Sciences	61	58	62	0	ir
Health Sciences	ir	50	ir	ir	ir
17d.%drop out					
Humanities	34	46	31	0	ir
Natural Sciences	38	48	31	ir	ir
Social Sciences	30	35	28	0	ir
Health Sciences	ir	24	ir	ir	ir
<b>Candidate</b>	<b>AU</b>	<b>SDU</b>	<b>AAU</b>	<b>HHÅ</b>	<b>I alt</b>
17e. % Completion within the ordinary time					
Humanities	6	5	8	0	ir
Natural Sciences	12	34	77	ir	ir
Social Sciences	22	15	23	0	ir
Health Sciences	ir	43	ir	ir	ir

17f. % Completion within the ordinary time + 1 year					
Humanities	31	29	29	0	ir
Natural Sciences	46	69	90	ir	ir
Social Sciences	54	48	51	0	ir
Health Sciences	ir	71	ir	ir	ir
17h. % drop out					
Humanities	10	22	19	0	ir
Natural Sciences	7	21	7	ir	ir
Social Sciences	6	18	16	0	ir
Health Sciences	ir	7	ir	ir	ir

Source: The Rectors Conference

**Table B:** The Residence of students enrolled through the coordinated enrolment system (2005) at the University of Aarhus (AU), The University of Southern Denmark (SDU), Aarhus School of Business (ASB) and Aalborg University (AAU)

	AU	SDU	ASB	AAU
Funen County	131	1058	33	28
Southern Jutland County	136	207	35	42
Ribe County	134	170	37	91
Vejle County	305	281	103	53
Ringkøbing County	224	50	71	87
Aarhus County	1846	86	601	195
Viborg County	198	14	64	135
Northern Jutland County	285	36	44	1093
Eastern Denmark	177	352	30	114

Source: the coordinated enrolment system

**Table C:** Industrial PhDs (PhD students employed in a company during their PhD study)

	Administered by the Universities					Administered by the Ministry of Sciences			
	1993	1998	1999	2000	2001	2002	2003	2004	2005
Aalborg University	6	6	7	6	8	4	3	11	7
University of Southern Denmark	1	2	2	2	4	4	11	7	5
The University of Aarhus	1	3	1	4	2	4	2	2	6
Aarhus School of Business	0	1	1	0	0	1	0	1	4

Source: The Ministry of Sciences, Technology and Innovation

**Table D:** Employment rate for newly graduated

	<b>UNIVERSITY</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>
<b>Humanistic Sciences</b>	The Aarhus School of Business	80	81	81	70	67
	University of Southern Denmark	73	71	76	71	65
	Aalborg University	75	81	77	72	65
	The University of Aarhus	71	73	73	71	67
<b>Natural Sciences</b>	University of Southern Denmark	76	78	75	86	78
	Aalborg University	100	100	92	94	85
	The University of Aarhus	78	79	84	73	75
<b>Social Sciences</b>	The Aarhus School of Business	92	92	90	85	88
	University of Southern Denmark	94	90	92	85	88
	Aalborg University	81	90	88	74	79
	The University of Aarhus	91	91	92	89	86
<b>Technical Sciences</b>	Aalborg University	83	95	95	91	83

Source: The Ministry of Sciences, Technology and Innovation

## Appendix 4: The University Act

Act no. 403 of 28 May 2003  
(Translation)

### Act on Universities (the University Act)

We, Margrethe the Second, by the Grace of God Queen of Denmark, hereby make known that the Danish Parliament has passed and we have given our Royal Assent to the following Act:

## Part 1

### Scope of the Act

1. –(1) This Act applies to universities under the Ministry of Science, Technology and Innovation.  
(2) The universities are independent institutions under the public-sector administration and supervised by the Minister of Science, Technology and Innovation.

### Purpose

2. –(1) The university shall conduct research and offer research-based education at the highest international level in the disciplines covered by the university. The university shall ensure a balanced relationship between research and education, on a regular basis screen for the relevancy of its research and educational disciplines, prioritise and develop them further, and disseminate knowledge of scientific methods and results.  
(2) The university has freedom of research and shall safeguard this freedom and ensure the ethics of science.  
(3) The university shall collaborate with society and contribute to the development of international collaboration. The university's scientific and educational findings should contribute to the further growth, welfare and development of society. As a central knowledge-based body and cultural repository, the university shall exchange knowledge and competencies with society and encourage its employees to take part in the public debate.  
(4) The university shall contribute to ensuring that the most recent knowledge within relevant disciplines is made available to non-research oriented higher education.

## Part 2

### Degree Programmes

3. –(1) The university is free to decide which research-based degree programmes it wants to offer within its academic scope. Pursuant to section 4 (1 (articles 1 and 2)) and section 5 (1) of this Act, the degree programmes offered by the university shall be subject to the approval of the Minister of Science, Technology and Innovation.

(2) The Minister may revoke the approval of a programme offered pursuant to subsection (1), if it is no longer necessary for the university to offer the programme concerned, or if the programme no longer lives up to the high standard of quality applicable at all times to research-based education.

(3) In special cases, the Minister can initiate an evaluation of one or more programmes.

4. –(1) The university may offer the following research-based full-time programmes as independent well-rounded educational programmes:

- 1) Bachelor programme for 180 ECTS points.
- 2) Master's programme (candidatus) for 120 ECTS points.
- 3) PhD programme for 180 ECTS points.

(2) 60 ECTS points are equivalent to 1 year of a full-time programme.

(3) In exceptional cases, the Minister may deviate from the points listed in subsection (1), when special circumstances require it.

(4) The Minister can determine thresholds limiting the student intake.

5. –(1) The university can offer the following research-based educational activities as part-time programmes:

- 1) Master's programme.
- 2) Other continuing and further education.
- 3) Supplementary educational activities in order to meet the admission requirements for a Master's programme (candidatus).

(2) A university's provision of part-time programmes can include all the courses that it is approved to offer on a full-time basis, single courses from these and domain-specific programmes.

6. –(1) Within its academic fields, a university can award the bachelor's degree, the master's (candidatus) degree, the PhD degree and the doctoral degree. In addition to the master's degree (candidatus), the university can also award the degree of master under a continuing education scheme.

(2) The Minister lays down the rules concerning the acquisition of the doctoral degree.

7. Subject to the approval of a second Minister, the university may offer programmes in accordance with rules laid down by the Minister concerned.

8. The Minister lays down general rules governing education, including grading and quality development, cf. sections 4 and 5, on the titles connected to education, and cf. section 6 on admission requirements.

9. During the study programme, the university shall offer guidance on education and subsequent job opportunities.

## Part 3

### Governance Regulations

#### The Board

10. –(1) The Board is the highest authority of the university. The Board shall safeguard the university's interests as an educational and research institution and determine guidelines for its organisation, long-term activities and development.

(2) To the greatest possible extent, the Board shall be open about its activities.

(3) The Board shall administer the university's funds to ensure that they serve the university's goals to the greatest extent possible.

(4) The Chairman of the Board shall administer the real estate together with a member of the Board.

(5) The Board shall approve the university's budget in accordance with the Rector's recommendation, including the distribution of the collective resources and the principles concerning the use of these resources, and it shall approve the accounts.

(6) The Board shall set up the university's charter and amendments. These shall be subject to the Minister's approval.

(7) The Board shall employ and dismiss the Rector and employ and dismiss the university's executive management on the recommendation of the Rector.

(8) The Board shall enter into a performance contract with the Minister.

(9) The Board has no authority over individual cases relative to other employees of the university, cf. subsection (7), or relative to students.

(10) The charter shall lay down further details concerning the openness of the Board's activities, cf. subsection (2). The charter shall also lay down details concerning the procedures for employment and dismissal, pursuant to (7) above. The employment procedure shall ensure that the Rector has academic and managerial legitimacy.

11. –(1) The Board shall answer to the Minister regarding the activities of the university, including the administration of the university's collective resources.

(2) If the Board disregards orders from the Minister concerning the rectification of unlawful matters, the Minister may order the Board to resign so that a new board can be appointed.

(3) If the Board's actions jeopardise the continued activities of the university, the Minister may order the Board to resign immediately, and in this connection install an interim governing board, until a new Board can be appointed.

(4) The Board or the Minister may decide to bring an action against members of the Board, the Rector, any auditors or others if the university has suffered any losses.

(5) The Board shall be authorised to take out a standard directors' liability insurance.

12. –(1) The Board shall be composed of external members and members representing the academic staff of the university, which includes PhD students with university contracts, the technical and administrative staff and the students. The Board shall comprise a majority of external members. The Board shall elect a chair from among its external members.

(2) Together the members of the Board shall use their experience and knowledge concerning education, research and the dissemination and exchange of knowledge to contribute to the promotion of the university's strategic work.

(3) The external members shall be selected on the merit of their personal qualifications and appointed for a period of four years. They may be re-appointed to serve an additional four-year period. In addition, the external members shall be experienced in management, organisation and economics, including the evaluation of budgets and accounts.

(4) The other members shall be elected by and from the academic staff of the university, which includes PhD students with university contracts, the technical and administrative staff and the students. The students shall be represented by a minimum of two members.

(5) The charter shall lay down further details concerning setting up the Board pursuant to subsections (1–4).

13. –(1) The university may set up a representative assembly to be composed of external members.

(2) The representative assembly shall conduct general discussions on the research, educational activities and other activities of the university and issue statements on these issues to the Board.

(3) The charter shall lay down further details concerning the representative assembly pursuant to subsections (1) and (2). The charter may also stipulate that the representative assembly appoints some or all of the external members of the Board.

Rector

14. –(1) The Rector shall undertake the day-to-day management of the university within the framework laid down by the Board. The other members of the university's executive management,

Deans, Heads of Department and Directors of Studies shall undertake their duties in a manner authorised by the Rector, cf. section 16(1) and (3–7), section 17(2) and (4) and section 18(5).

(2) The Rector shall be an acknowledged researcher within one of the university's academic fields and have knowledge of the educational sector. The Rector shall be an experienced manager and organiser of research environments and have knowledge of a university's activities and relationship with society.

(3) The Rector shall make recommendations to the Board regarding the employment and dismissal of the other members of the university's executive management, cf. section 10(7).

(4) The Rector shall employ and dismiss Deans if the university is split up into main academic areas.

(5) The Rector shall recommend the budget to the Board and approve the accounts.

(6) The Rector shall lay down the rules governing disciplinary actions regarding students.

(7) The Rector shall be authorised to sign on behalf of the university with the exception of real estate concerns, cf. section 10(4), and shall make decisions on all matters, with the exceptions of section 10(1) and (5-8), section 15(2) and section 18(4) and (6).

(8) The Rector shall approve all external collaborations with a binding effect on the university.

(9) Under special circumstances, the Rector may dissolve the Academy Council, cf. section 15(1). The Rector can also under special circumstances assume the tasks of the Academy Council, cf. 15(2).

(10) The charter shall lay down further details concerning the procedures of employment and dismissal pursuant to subsection (4). The employment procedure shall ensure that Deans possess academic and managerial legitimacy.

#### Academy Council

15. –(1) The university shall set up an Academy Council either for the entire university or for each of the main academic areas.

(2) The Academy Council shall have the following tasks:

- 1) Make statements to the Rector on the internal distribution of funds.
- 2) Make statements to the Rector on central strategic research questions and educational issues and plans for knowledge exchange.
- 3) Make recommendations to the Rector on the composition of academic committees to assess applicants for scientific positions.
- 4) Award PhD and doctoral degrees.

(3) The Academy Council may make statements on all scientific issues of substantial relevance to the activities of the university and has a duty to discuss scientific issues presented to them by the Rector.

(4) The Academy Council shall be composed of the Rector, ex officio chairman, except for conditions noted in subsection (5), and of members representing the academic staff, including PhD students with university contracts and the students. Representatives of the academic staff, including PhD students with university contracts, and of the students shall be elected by and from the academic staff, including PhD students with university contracts and the students.

(5) If several Academy Councils are set up, the Dean of each of the main academic areas shall be ex officio chairman of the Academy Council of that main academic area.

(6) The charter shall lay down further details concerning the set up of an Academy Council pursuant to subsections (1) and (4).

#### Dean

16. –(1) The Dean shall manage the main academic area, ensure the interaction between research and education and quality of education and teaching, as well as the cross-disciplinary development of the quality of the education and research of the main academic area.

(2) The Dean shall be an acknowledged researcher with experience and knowledge of teaching, management and the interaction of a university with society.

(3) The Dean shall employ and dismiss the Head(s) of Department.

(4) The Dean shall set up Study Boards and approve the Chairmen and Vice-Chairmen of the Study Boards.

(5) The Dean shall appoint and remove Directors of Studies subject to the recommendation of the Study Board set up pursuant to subsection (4).

(6) The Dean shall approve curricula, subject to proposals from the Study Board.

(7) In special cases, the Dean can dissolve a Study Board set up pursuant to subsection (4). Also in special cases, the Dean may take over the tasks of the Study Board, in such cases deviating from section 18 (4) and (6).

(8) If no dean is employed, the Rector or a person authorised by the Rector shall see to the Dean's tasks.

(9) The charter shall lay down further details concerning employment and dismissals pursuant to subsection (3). The employment procedure shall ensure that Heads of Department possess academic and managerial legitimacy. The charter shall also lay down further details concerning appointment and removal pursuant to subsection (5).

#### Departments and Heads of Department

17. –(1) Usually, research and educational activities are the responsibility of the departments.

(2) The Head of Department shall undertake the day-to-day management of the department, which includes planning and allocation of tasks. The Head of Department may allocate specific jobs to specific employees. Members of the academic staff are free to conduct research within the strategic framework laid down by the university for its research activities to the extent they are not requested to address jobs allocated to them by the Head of Department.

(3) The Head of Department shall be an acknowledged researcher and have teaching experience.

(4) The Head of Department shall ensure the quality and interaction between the research and education of the department, and in consultancy with the Study Board and the Director of Studies the Head of Department shall follow-up on evaluations of education and teaching.

(5) In the exceptional case, when a Head of Department is not employed, cf. subsection (1), the Dean shall see to the tasks of the Head of Department, cf. section 14(1).

#### Study Board and Director of Studies

18. –(1) To safeguard student influence on education and teaching, the Dean shall set up the necessary number of Study Boards, cf. section 16(4).

(2) Each Study Board shall comprise equal numbers of representatives of the academic staff and the students, selected by and from the academic staff and the students respectively.

(3) The Study Board shall select from among its members a chairman from the academic staff and a vice-chairman from the students.

(4) The Study Board shall recommend the Director of Studies to the Head of Department, cf. section 16(5).

(5) In co-operation with the Study Board, the Director of Studies shall undertake the practical organisation of teaching and assessments forming part of the exams.

(6) The Study Board shall ensure the organisation, realisation and development of educational and teaching activities, including aims to:

- 1) assure and develop the quality of education and teaching, and follow-up on evaluations of education and teaching;
- 2) produce proposals for curricula and changes thereof;
- 3) approve the organisation of teaching and assessments forming part of the exams;
- 4) handle applications concerning credit and exemptions; and
- 5) make statements on all matters of importance to education and teaching within his/her area and discuss issues related to education and teaching as presented by the Rector or the person authorised by the Rector to do so.

(7) The charter shall lay down further details concerning setting up a Study Board, including election of Chairman and Vice-Chairman and recommendation for Director of Studies, pursuant to subsections (1-4), and tasks, pursuant to subsections (5) and (6).

(8) In the charter, the Board may decide to set up Study Boards at different levels of the organisation.

(9) In the charter, the Board may lay down special rules to govern master's programmes and can deviate from the governance regulations as specified in this Part, when necessary to achieve the ends.

## Part 4

### Economic Matters

19. –(1) The Minister shall subsidise the university's educational, research and dissemination activities and other tasks allocated to the university. Subsidies to educational activities shall be awarded based on rates, as specified in the annual Budgets, and the number of full-time equivalent students and any completed studies. The annual Budgets specify the framework governing subsidies to research and dissemination activities and other activities allocated to the university.

(2) Subsidies to university tasks as specified in subsection (1) shall also comprise contributions to cover indirect university expenses, this includes management, administration, buildings etc.

(3) Subject to negotiations with the Minister of Finance, the Minister may specify rules governing subsidies to the universities' activities, pursuant to subsections (1) and (2), payment of subsidies to the universities, this includes payment in advance, and aspects concerning budgets and appropriations relative to the universities.

(4) The Minister may lay down rules governing which students will produce subsidies pursuant to subsection (1), and how to estimate the number of full-time equivalent students.

(5) The Minister may request information from the university for budgetary and statistical purposes and lay down requirements to the programme administration systems.

20. –(1) Other ministers can subsidise the university.

(2) The university may accept subsidies and donations from third parties, in addition to those provided by the State through appropriation acts.

(3) The university may make money on activities they offer and run subsidised activities.

21. –(1) Within its scope, the university has at its free disposal subsidies, income and capital as a whole. It is a condition that the university should comply with the conditions for the subsidies and the rules of management and should undertake the tasks subsidised pursuant to sections 19 and 20.

(2) The university may accumulate subsidies to be spent in accordance with the university's purpose in the following financial year.

(3) The university shall deposit its cash funds in compliance with the order on the depositing of the money of foundations and board fees etc.<sup>1</sup>

22. –(1) To a reasonable extent, the university shall pay for and make facilities available to activities related to students' union activities.

(2) To a limited extent, the university may pay for and make facilities available to other student activities.

(3) The university may pay for accident insurance for students enrolled at the university.

23. The Minister shall reimburse, on a quarterly basis and against due documentation, the university's expenses for payment of duties under the VAT act that pursuant to the VAT act are not deductible from the statement of tax liabilities (non-deductible input VAT) of an enterprise and that the university incurs to procure goods and services subsidised pursuant to sections 19 and 20.

24. –(1) The Minister may retain subsidies, cancel subsidies fully or in part or request full or part repayment if the university does not comply with the conditions for the subsidies and the rules of management.

(2) The Minister may retain subsidies, cancel subsidies fully or in part or request full or part repayment if a petition in bankruptcy is filed against the university, if the university suspends its payments, or if there is a risk that the university may stop its activities due to other factors.

(3) The Minister may request repayment of subsidies if the calculation of the subsidies rests on an incorrect basis or if the calculation of the subsidies as such was incorrect.

(4) The Minister has the same powers on behalf of other ministers, cf. subsections (1–3).

(5) Claims for repayment pursuant to subsections (1–4) and expenses paid for the university pursuant to section 31(2) and section 42(1) can be set off against future subsidies.

25. The Minister may grant loans for various institutional purposes, this includes purchase of equipment. The Minister may specify the terms and conditions of such loans.

<sup>1</sup> In Danish: Bekendtgørelse om anbringelse af fondes midler og bestyrelsesvederlag m.v.

#### Student Fees

26. –(1) The university shall request part payment for participation in educational activities and assessments forming part of the exam for part-time programmes partially subsidised pursuant to section 19(1) and section 20(1).

(2) The university may request full payment for participation in educational activities and tests and other assessments forming part of the exams for full-time and part-time programmes not subsidised pursuant to section 19(1) and (4) and section 20(1).

(3) The university shall request full payment from external students<sup>2</sup> for their participation in assessments forming part of the exam.

(4) The university shall set up a basis for calculating student fees. Together with any subsidies, the student fees may not exceed the costs incurred. The Minister may specify further details on how to set up the basis for determining student fees.

27. The university may request that Ph.D. students, whose education is funded by external sources, pay in full for their participation in educational activities and assessments forming part of the exam.

#### Accounts and Audits

28. –(1) The university shall comply with the legislation governing the accounting of the State, etc.

(2) The accounts shall be prepared as specified by the Minister.

(3) The university accounting year is the financial year. At the conclusion of the accounting year, the university shall prepare annual accounts comprising a profit and loss account, balance and a list of capital equipment. The Board and the Rector shall sign the accounts, cf. section 10(5) and section 14(5).

(4) The university accounts shall be audited by an Auditor General as provided by the legislation governing audits of the accounts of the State etc.

(5) The Auditor General and the Minister may arrange that audits pursuant to subsection (4) are undertaken jointly by the Auditor General and an accountant as agreed upon. A state-authorized or registered accountant shall conduct such audits.

#### Staff

29. –(1) The university shall follow the rules on wage and employment conditions, including pensions, as laid down by or agreed with the Minister of Finance for staff employed by the university. The university shall also follow the rules on special remunerations as laid down by or agreed upon with the Minister of Finance.

(2) The duty to give evidence as laid down in the act on public servants shall apply to members of the Board.

<sup>2</sup> In Danish: "selvstuderende", i.e., a registered student permitted to study for a specific exam and sit at this exam without attending lectures, etc.

(3) The Minister may lay down rules on employment of academic staff and teachers.

(4) Powers that the Minister of Finance pursuant to subsection (1) has delegated to the Minister may be delegated to the universities by the latter.

Building Matters etc.

30. –(1) Universities that change into independent universities under this Act shall comply with the scheme laid down for the administration of the buildings of the State.

(2) The Minister shall be authorised to transfer state-owned buildings, furniture and other movables to the university upon the university's request.

(3) The conditions that are specified for transfers pursuant to subsection (2) shall be subject to the approval of the authorities empowered to perform such transfers.

(4) After negotiations with the Minister of Finance and the Minister of Economic and Business Affairs, the Minister may lay down rules concerning the university's construction activities and building matters as such concerning buildings that the university possesses or has taken over.

(5) The university may take out a general insurance covering the buildings that the university possesses or has taken over.

## Part 5

Changes in the Status of the University

31. –(1) For collaboration activities between universities or between universities and other educational or research institutions, the Minister may approve exceptions from applicable legislation and lay down special rules governing such collaboration as recommended by the institutions involved. For institutions that are not under the Minister of Science, Technology and Innovation, such approval shall take place after negotiations with the minister concerned. The same shall apply to mergers between universities or mergers between universities and other research institutions.

(2) For approval of collaboration activities pursuant to subsection (1), the Minister may decide – as regards collaboration between universities and state-run research institutions – that money paid by the State to a third party on behalf of the university, pursuant to section 24(5), shall be set off against the university's subsidies, pursuant to section 19(1) and section 20(1).

32. –(1) Should the Board abolish the university, the net assets of the university shall be transferred to the State, apart from section 38(8). A decision to abolish shall be approved by the Minister.

(2) Donations granted to the university shall be transferred to the State, unless otherwise provided by generally applicable Danish legislation, cf. section 38(8) however.

33. The Minister may lay down special rules governing universities or parts thereof that assume special tasks or where special circumstances speak in favour of it.

## Part 6

### Miscellaneous Provisions

34. –(1) Legal questions relating to the university's decisions on student matters may be brought before the Minister in accordance with the rules laid down by said Minister.

(2) The Minister may determine that others may submit complaints to the Minister on legal questions relating to the decisions of the university.

35. Upon the university's application, the Minister may approve that foundations and associations contribute to the university's research-based degree programmes if the employment procedures of these foundations and associations are not contrary to the employment procedures of the State.

36. In exceptional cases and to a limited extent, the Minister may approve deviations from the governance regulations of the law, cf. Part 3, as proposed by the university.

## Part 7

### Interim Provisions and Entry into Force

37. –(1) This Act enters into force on 1 July 2003.

(2) The Senate shall assume the tasks that are the responsibility of the Board until a Board has been set up; section 10 also applies to the work of the Senate in the same way as it does to the work of the Board. During this period, the Rector and the University Director shall be empowered to make the necessary arrangements concerning real estate, cf. section 10(4). However, only the Senate may make the decisions necessary to continue the activities of the university.

(3) At the time when this Act enters into force, the people elected as Rector, Deans and Heads of Department may continue in their positions, with the powers vested in them according to the law, for the duration of this election period, unless the charter specifies a different election period, and after that until the Board has employed a Rector, as specified in the charter, and the Rector has employed Deans, as specified in the charter, and the Deans have employed Heads of Department, as specified in the charter and as authorised by the Rector.

(4) At the time when this Act enters into force, the people elected as Chairmen and Vice-Chairmen of the Study Boards may continue in their positions for the duration of this election period, unless the charter specifies a different election period, and after that until new Study Boards have been set up, and Chairmen and Vice-Chairmen of the Study Boards have been elected and approved by the Deans as laid down in the charter.

(5) The rules on removal of elected leaders (Rector, Deans and Heads of Department) applicable until now shall apply during the period until new leaders have been employed or appointed in accordance with the charter.

(6) The present members elected to collegiate bodies shall continue for the duration of this election period unless the charter specifies a different election period, and after that until new bodies have been set up in accordance with the charter and new members have been elected. The collegiate bodies, cf. subsection (2) however, maintain the powers that have been vested in them until now to the extent these powers have not been transferred to others according to this Act.

(7) The Senate shall lay down in a special clause of the charter, subject to the Minister's approval, the procedure to follow when setting up the first Board. This clause shall also specify replacement of both leaders (Rector, Deans and Heads of Department) and members elected to the collegiate bodies that resign during the interim period. This special clause shall be submitted for the Minister's approval not later than 1 January 2004.

(8) The Board shall be set up by 1 January 2005 at the latest. The Minister shall approve the composition of the first Board.

(9) The university charter shall be submitted for the Minister's approval by 1 May 2005 at the latest.

38. –(1) The Advisory Councils and the Senates of Copenhagen Business School and the Aarhus School of Business will be abolished simultaneously with setting up a Board, although not later than 1 January 2005. Simultaneously with the abolishment of the Advisory Council of Copenhagen Business School, the charter of 18 November 1995 for Copenhagen Business School will be revoked.

(2) The Advisory Council of Copenhagen Business School undertakes the tasks that are specified in Order no. 340 of 21 June 1974 issued by the Ministry of Education on the administration of Copenhagen Business School, and the Advisory Council of the Aarhus School of Business undertakes the tasks as specified in the charter of 8 March 2000 for the Aarhus School of Business and that are allocated to the Boards in this Act until the Boards have been set up.

(3) Until 1 January 2005, the Minister may cancel the appointment of the Advisory Councils if these bodies do not comply with injunctions to set unlawful matters right, or if these bodies jeopardise the continued existence of the university through their arrangements, cf. section 11 (2) and (3).

(4) Upon enquiry with the involved Senates, the Advisory Councils of Copenhagen Business School and the Aarhus School of Business shall lay down a special clause on the procedure for setting up the first Boards, whose composition shall be approved by the Minister. This clause shall also specify replacement of both leaders (Rector, Deans and Heads of Department) and members elected to the collegiate bodies that resign during the interim period.

(5) The provisions laid down in section 37 (3-6) and (9) shall also apply to the business schools.

(6) Existing governmental loans granted to the business schools to erect, reconstruct or procure buildings and subsidies to furnish rented premises shall continue on the same terms.

(7) Also in future, only Copenhagen Business School and the Aarhus School of Business may use the Danish term for “business school” (in Danish: “handelshøjskole”).

(8) If either Copenhagen Business School or the Aarhus School of Business is abolished, and if the remaining assets are sufficient, the net assets of the business school as computed on 31 December 1990 and any donations made from 1 January 1991 to 30 June 2003 in the form of movables, real estate and grants for the construction of real estate, shall be used for the purposes specified in the charter applicable at all times. If there are any additional remaining assets, the net assets of the business school as computed on 30 June 2003 shall be used for teaching and educational aims as specified by the Minister. The charter may lay down rules to compute the net assets.

39. –(1) After consultations with the Boards of the Danish University of Education and the Technical University of Denmark, the Minister shall lay down the procedure to follow for the change-over of each university to this Act.

(2) After consultation with the Board of the Danish University of Education, the Minister may abolish fully or in part Act no. 483 of 31 May 2000 on the Danish University of Education, and after consultation with the Board of the Technical University of Denmark, the Minister may abolish fully or in part Act no. 1265 of 20 December 2000 on the change-over to a self-governing institution by the Technical University of Denmark.

(3) The Danish University of Education adheres to the provisions set out in the act on the Danish University of Education until these provisions are abolished and replaced by the provisions of this Act. The Technical University of Denmark adheres to the provisions set out in the act on the Technical University of Denmark until these provisions are abolished and replaced by the provisions of this Act.

40. After negotiations with the Minister of Education, the Minister of Science, Technology and Innovation may approve the merger of the Danish Forestry College and the Royal Veterinary and Agricultural University, Denmark.

41. –(1) When this Act enters into force, the IT-højskolen i København changes status from being a free faculty under Copenhagen Business School to a self-governing university, IT University of Copenhagen.

(2) After consultation with the Board of the IT University, the Minister shall set up an interim arrangement.

42. –(1) Universities that pursuant to this Act change to subsidised funding shall take over the debts and obligations concluded with the State as debtor. However, the State places surety to guarantee the obligations that the universities have assumed up until the time of take-over.

(2) Universities under subsection (1) enter into the incorporeal rights of the universities at the entry into force of this Act.

(3) The Minister shall publish the date of taking over, pursuant to subsections (1) and (2) in the Statstidende.

43. –(1) For universities that pursuant to this Act shall change over to subsidised funding, the intra-state/university accounts shall be computed.

(2) The university shall produce a final annual account in connection with the change-over to subsidised funding.

(3) The rules of appropriation applicable to Government institutions in force at the time when this Act enters into force shall apply to the university until the Minister issues more specific rules for subsidies pursuant to section 19(3).

(4) The rules of accounting applicable to universities in force at the time when this Act enters into force shall apply to the university until the Minister issues more specific rules for the university's accounting practices pursuant to section 28(2).

(5) The Minister shall determine the time of changing over to subsidised funding.

44. To universities that pursuant to this Act have changed over to a self-governing institution, the Minister may assign donations granted the former governmental institution.

45. –(1) Public servants employed at universities that pursuant to this Act change over to a self-governing body may choose to uphold their employment status as public servants for work performed at the university. Public servants are not entitled to receive compensation during temporary unemployment, allowance pay or pension as a result of the university's change-over to a self-governing body and are under an obligation to submit to the changes to the extent and form of their services resulting from this change-over.

(2) The university shall pay the wages and pension contributions to the Treasury for such public servants, this includes any expenses for compensation during temporary unemployment, allowance pay and money payable after death. Expenses for current pensions shall be borne by the State. If the university is abolished, any expenses for compensation during temporary unemployment or allowance pay and money payable after the death of a public servant of the university shall be paid by the Treasury if the abolished university does not have sufficient funds to cover these expenses.

(3) The Rector shall make any decisions regarding suspensions, initiation of an official examination of the work of a public servant, appointment of a leader of an examination, impose disciplinary punishment and bring actions for slander pursuant to the rules laid down in the act on public servants.

(4) The Minister shall make any decisions pursuant to subsection (3) as regards the Rector and the executive management of the university until the Board has been set up, following that the Board shall assume these rights.

46. –(1) Subject to consultations with the Board of the Danish Science Park at Hørsholm, the Minister may abolish the independent institution the Danish Science Park at Hørsholm and rescind the act on the Danish Science Park at Hørsholm, cf. consolidated act no. 736 of 7 August 2001.

(2) Upon the abolishment of the Danish Science Park at Hørsholm, the current Government loan of DKK 52.5m granted to the Science Park shall be discontinued.

(3) The Minister shall have the powers to include the assets and liabilities of the Science Park by way of non-cash contributions in a dedicated public limited company founded by the Government under the name of SCION\*DTU A/S, with the Government as the sole shareholder.

(4) The Minister shall have the powers to transfer the shares of SCION\*DTU A/S to the Technical University of Denmark.

47. Arrangements concluded by the university, pursuant to section 10(2) of the University Act applicable so far, may continue until 1 July 2005, pursuant to section 48(1) article 1.

48. –(1) The following acts and regulations are hereby repealed:

1. Act on universities etc. (the University Act), cf. consolidated act no. 1177 of 22 December 1999.

2. Act on business schools and business school departments, cf. consolidated act no. 864 of 27 September 1996.

(2) Rules laid down under the provisions of acts referred to in subsection (1) and section 39(2) shall remain in force until repealed or replaced by rules laid down under the provisions of this Act.

Given at Christiansborg Castle, 28 May 2003

Under Our Royal Hand and Seal

Margrethe R.

/Helge Sander