

The European ICT clusters

- an overview of selected
ICT clusters in Europe

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EUROPEISKA UNIONEN
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- an overview of selected ICT clusters in Europe

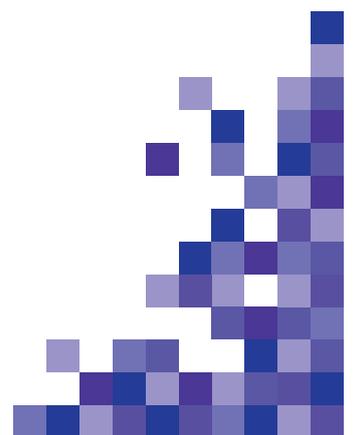
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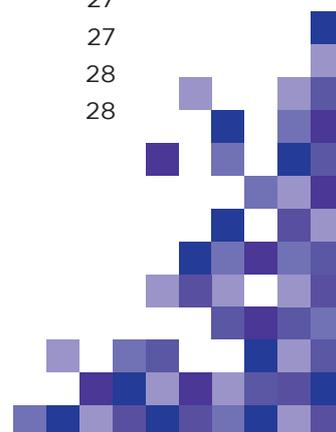
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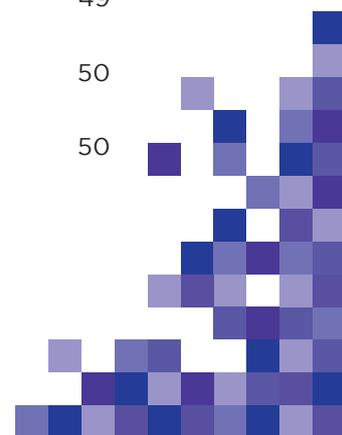
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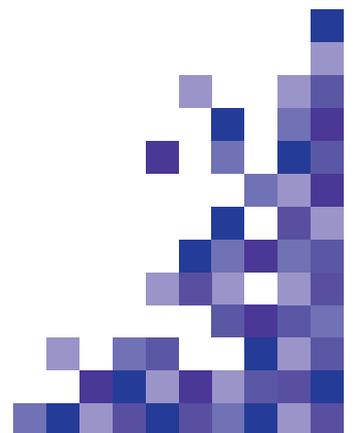


Preface

This report is prepared as part of the project BrandIT. The project is funded by Interreg IV A Øresund and the individual participating institutions. The statistical material in this report is based on statistical extracts from the Eurostat database. The analysis and results of the data have been subject to the authors' own interpretation.

The statistical material on foreign investments has been prepared by Espen Gregersen, Business Development Manager at Copenhagen Capacity. Again, the analysis and results of the data have been subject to the authors' own interpretation. We would like to say thank you for the positive and constructive views put forward by the participants involved in the Brand IT project.

This report will be followed by a structural report, which includes the development of employment, foreign establishments, new firms and turnover in the ICT sector in the Øresund Region. In an additional report we will focus on research and education resources related to ICT in the Øresund Region, including both public and private research. In a last report the positions of strength of the Øresund ICT sector will be analyzed.



Introduction

The purpose of this study is to provide an overview of ICT clusters and agglomerations in Europe. It is not the purpose to create an actual SWOT analysis or a comparison between competitive profiles of different ICT clusters. This will be done in special studies. This study, however, provides an overview of the largest clusters from an employment point of view and, to a certain extent, an overview of the ICT clusters, which are located close to the Øresund Region. Here, it has been taken into account that the clusters in proximity to the region, by tradition, have competed with the ICT cluster in the Øresund Region in terms of location and investment needs.

Looking at the general level of employment in the OECD countries, the ICT sector employs 5.5% of the total employment of the business sector. In 2008, this constituted approximately 15 million people. In relation to other business sectors, the increase in employment has been more or less the same compared to other business sectors. The percentage of the total employment varies a great deal among OECD countries. For instance, Finland, Sweden and Ireland have the largest share of ICT employment among OECD countries of the total business employment in 2009. The share of ICT employment in these countries is more than 8% of the total employment, and it has increased significantly in the last years. This has also been the case in Hungary, the Czech Republic and in Denmark. However, the share of employment in ICT has also declined in some countries¹.

1. OECD (2009): The impact of the crisis on ICT and ICT-related employment October.

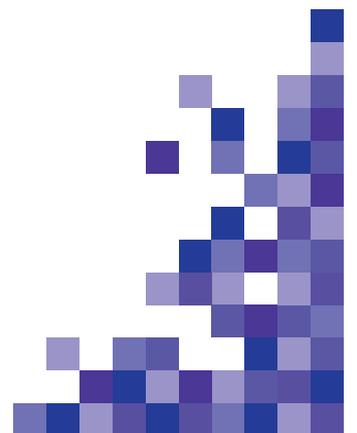
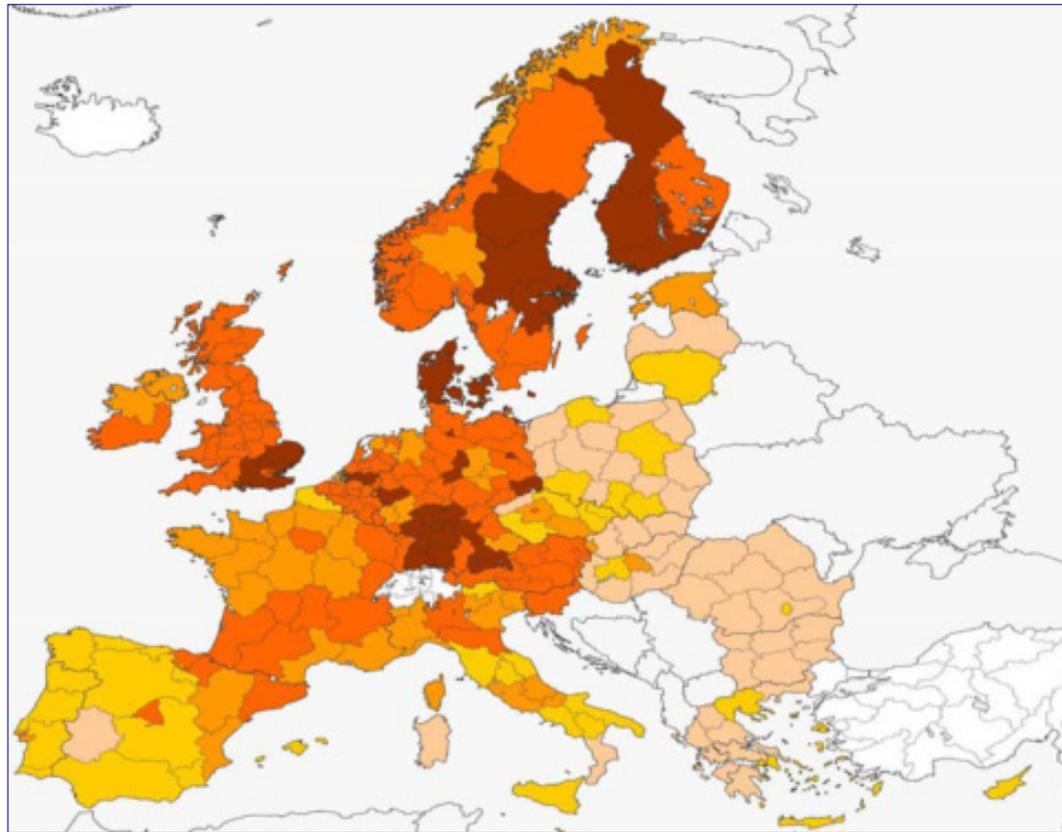


Figure 1: Regional performance groups for all regions (2006)²



- High innovators
- Medium-high innovators
- Average innovators
- Medium-low innovators
- Low innovators

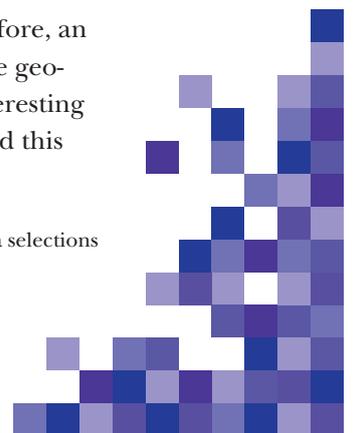
Source: European Regional Innovation Scoreboard (RIS)

The map is made by the European Regional Innovation Scoreboard (RIS), in order to rank and compare the innovation performance of the regions in Europe by using 16 indicators for innovative performance.

As the map shows, there is a “high-innovation belt” from north-west and south of Finland over central Sweden and Denmark and continuing to southern England and southern Germany. It is here the high-tech industry and services play a more prominent role in business development. The ICT industry is part of this trend. In the “belt” there will often be a high level of high-tech services in the industrial structure.

We do not distinguish between clusters and agglomerations in this study. Therefore, an evaluation has not been made, if there is a cluster or only an agglomeration in the geographic areas which are under discussion in this report. Though relevant and interesting in another context, that would be a lengthy and scholarly discussion that is beyond this report’s goal.

2. For a more detailed description of the database and weightings of the assessment in relation to data selections see: European Regional Innovation Scoreboard (RIS) 2009 Annex 1



First, there will be a presentation in the form of a general overview of the major ICT clusters in Europe. In addition, there will be a review of selected agglomerations and clusters with the aim of creating a basis for a more detailed analysis of the clusters, which the Øresund Region competes against. Because the information of the individual clusters is very heterogenic, both quantitative and qualitative data will be used in the review, as well as information on different levels. This implies that some of the information will not always be found in some of the clusters or agglomerations.

1. Cross-border clusters specific development conditions

The Øresund Region is a cross-border region. There are specific conditions for the development of regional cross-border collaborations, and the Øresund Region is not the only cross-border cluster in Europe. An analysis by the European Commission shows that there is a glass cross-border cluster in Upper Austria and in Bohemia (Czech Republic) and a textile cross-border cluster in Lower Austria and Bohemia. Another textile cross-border cluster is established between the region of Styria and Slovenia. A 'bioValley' is located in a trio of regions between northwest Switzerland, southern Baden and Alsace. There are also other cross-border clusters in Europe³.

Barriers for further integration across borders have been studied in relation to clusters in Alsace in France and Baden in Germany. The study showed that none of the companies in Baden had contact with research institutes in Alsace. On the other side of the border, only 7% of companies in Alsace were in contact with research institutes in Baden. This is a low percentage, especially in the light of the fact that 40% of companies collaborate with research institutes. The study also showed that firms primarily collaborate with research institutes from their own country. Various barriers for cross-border development are identified, but the primary barriers are institutional, linguistic and legal issues.

Although cross-border clusters exist, conditions for their development are tough compared to nationally based clusters. Primarily legislative and institutional barriers limit the exploitation of the benefits and advantages of agglomeration. Apart from the above-mentioned barriers, hurdles also exist in form of traditional national ways of thinking⁴.

2. ICT clusters and agglomerations

For several years, there have been discussions about the importance and relevance of agglomerations and clusters of firms within a geographical area. These discussions have been related to corporate competitive conditions, growth and employment and generally they can be divided into two groups of issues; firstly, external framework conditions for cluster development and secondly the relationship amongst businesses inside the cluster – their perception of collaboration and competition situations. For the ICT sector, these external conditions have been defined as:

3. Se: European Commission: Regional Clusters in Europe, Observatory of European SMEs 2002 no. 2

4. European Commission: Regional Clusters in Europe, Observatory of European SMEs 2002 no. 2 p. 26



- A highly developed infrastructure; accessible roads, central airports, dependable public means of transportation etc.
- A well developed technical infrastructure; speedy and reliable internet- and telephone connections.
- An excellent educational infrastructure. Universities play a role here, but good schools are also important to create skilled workers.
- Local availability of financial engineering skills. There is need for people nearby who are willing to finance risky projects and who understand the different forms of financing relevant to establishing a high-tech company. Financial engineering is about more than having enough money at the right time – you also need access to sophisticated specialists who can find the appropriate financing for the project.
- A society that places a high value on creativity, imagination and entrepreneurship and provides role models, for instance successful people or people who tried and failed but tried again.
- A good legal infrastructure allowing you to enforce contracts and protect intellectual property rights, as well as stable tax laws. Ever changing tax regulations scare businesses and investors off as it makes planning impossible.
- A strong network to access markets⁵.

Although these conditions relate to the external environment, the relationships between enterprises play an important role for the development of a cluster. This includes an environment characterised by a generally high level of innovation, which is echoed in the quality of the manpower. It may also be the general competitive situation, as pointed out by Michael Porter, who stresses the companies' need for a high level of innovation as well as access to innovative subcontractors. And last, but not least, the ability to establish collaboration for innovation between firms inside the cluster is important.

This study is not a comprehensive report on the development of ICT clusters in Europe. It is only a preliminary analysis providing an overview, which may form the basis for a more thorough SWOT analysis of the European ICT clusters, which the Øresund Regions' ICT sector competes against. During the past decade, the international economy has undergone a major shift, where innovations, and especially the innovation environment, play an extremely important role in the development of firms' competitiveness.

5. Stated by: Arnoud De Meyer, professor of management studies at Cambridge University and director of the Judge Business School: Quarterly innovation Issue 13 Spring 2008.

6. Terstriep, Judith 2006: NICE – Networking ICT Clusters in Europe Innovation through Collaboration, paper, International RESER, Conference Lisbon 2006.



To be embedded in an innovative environment requires that framework conditions in terms of fostering innovation in the form of knowledge exchange between producers, users, universities and research institutions and regional authorities are present. This strengthened by networking between businesses and not least, building of staff skills, is central for the creation of an innovative and competitive environment. Clusters and agglomerations in a limited geographical area are the basis for the creation of these environments in various fields of the ICT sector⁶.

There are a variety of studies presenting the ICT clusters in Europe. There is a big difference between what factors and what statistics these reports use to define a cluster. One of the major common conditions for the establishment of ICT firms is, however, the existence of a technological infrastructure in terms of a telecom infrastructure, a skilled labor force and the use of ICT in other firms as well as a public demand for ICT. These factors are important for attracting foreign investments to an ICT cluster or an ICT agglomeration⁷.

Studies clearly show that high-tech companies locate to urban areas and often near other high-tech firms and institutions. There is often more than one high-tech cluster or agglomeration within a defined urban area. These areas are often supported by a strong public infrastructure in terms of research and education institutions.

“Many capital and core metropolitan regions in Europe already have very high rates of knowledge-intensive service employment. Stockholm, London, Brussels, Helsinki, Berlin and the Île-de-France (Paris) all have rates of employment in knowledge-intensive services that approach or exceed 50 %⁸.“

Although it is possible to locate elsewhere, it is clear that the ICT sector locate to specific areas, which is close to urban areas and places of higher education, but also to areas where there are other high-tech sectors. These framework conditions are crucial conditions for the development of localization for ICT companies.

3. The ICT clusters in Europe

The following chapters aim to give an overall picture of the ICT clusters and agglomerations which are either large or of great significance in Europe. There are those that have such an international structure or geographic proximity that they play an important role for the Øresund Region’s ICT sector’s competitive situation – a competition that in turn requires developing advanced framework conditions for attracting investments to the region.

A benchmarking tool has been developed to measure the competitiveness of the ICT sector based on 26 indicators grouped into: Overall business environment, IT infrastructure, human capital, legal environment, R&D environment and support for IT industry development, placing most weight on infrastructure and human capital.

7. Barrios, Salvador, Mass, Hatilde, Navajas, Ellena and Quesada, Javier (2008): Mapping the ICT in EU Regions: Location, Employment, Factors of Attractiveness and Economic Impact, MPRA Report January 2008.

8. OECD (2007): Globalisation and Regional Economies: Can OECD Regions Compete in Global Industries?, OECD 2007.

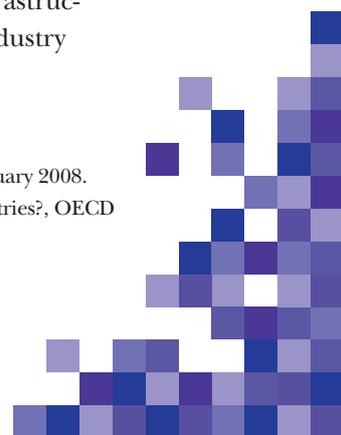


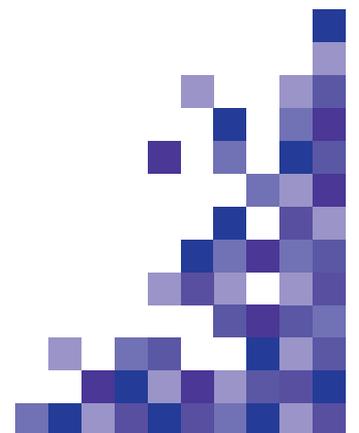
Table: 3.1. ICT industry competitiveness 2009

Country	Overall scores	Ranks 2009	Ranks 2008
United States	78.9	1	1
Finland	73.6	2	13
Sweden	71.5	3	4
Canada	71.3	4	6
The Netherlands	70.7	5	10
United Kingdom	70.2	6	3
Australia	68.7	7	7
Denmark	68.6	8	5
Singapore	68.2	9	9
Norway	67.1	10	14

Source: European Regional Innovation Scoreboard (RIS)

This form of ranking can always be questioned, but either way, it will say something about the framework conditions under which ICT companies operate their business. As table 3.1 shows, the Nordic countries are ranked in the top, although the United States is a safe number one. Central ICT cluster countries as France and Spain are ranked 17 and 25 respectively. The only Asian country in top 10 is Singapore. Although this type of ranking should be taken with a pinch of salt, the study clearly shows that the Nordic countries are considered having a good business environment for the ICT industry.

Every year, The World Economic Forum, an international independent research institution, publishes a report on the framework conditions for ICT businesses: The Global Information Technology Report for network readiness. In this report, Sweden and Denmark together with Singapore lead the ranking for 2009-2010. The USA is ranked fifth. These countries have thus confirmed their pre-eminence in networked readiness in the current times of economic down turn. Switzerland (4) and the other Nordic countries complete the top 10 with the Netherlands, Canada, Hong Kong and Taiwan.



**Table: 3.2. The ICT Networked Readiness Index 2009–2010 rankings
2009–2010 rank Country/Economy Score**

Country	Score
1. Sweden	5.65
2. Singapore	5.64
3. Denmark	5.54
4. Switzerland	5.48
5. United States	5.46
6. Finland	5.44
7. Canada	5.36
8. Hong Kong SAR	5.33
9. Netherlands	5.32
10. Norway	5.22
11. Taiwan, China	5.20
12. Iceland	5.20
13. United Kingdom	5.17
14. Germany	5.16
15. Korea, Rep	5.14

Source: World Economic Forum: The Global Information Technology Report 2009–2010

133 countries are evaluated in the report, and Sweden and Denmark are in the top. As table 3.2 shows, Sweden, Singapore and Denmark continue to be assessed as the world's most networked economies. The three countries ICT pre-eminence rests on a similar base. The top rankings are a result of continuous focus on education and innovation as well as a prominent place is given to ICT penetration and diffusion on the national agenda as an enabler of general competitiveness. In the rankings of 2009-2010; "Sweden displays the best and second-best infrastructure and regulatory environments in the world, with comprehensive and efficient hard infrastructure, top-class human resources and education infrastructure, and an extremely friendly regulatory framework ensuring full protection of intellectual property"⁹. On the other side, the other of the Øresund cross-border region country is also in the front. "After topping the rankings for three consecutive years, Denmark loses its networked readiness primacy, sliding to 3rd position, with what remains nonetheless one of the most solid performances within the 133 economies covered. Denmark ranks second for the quality of its environment and readiness, but scores lower in terms of ICT usage (11th). The country features among the top 10 in all pillars but one (17th in business usage)"¹⁰.

Particularly, in regards to supporting the ICT environment, the Nordic countries are in the top. Sweden is ranked no. 1, Denmark no. 2 and Norway no. 3 out of 133 countries included in the study. There is no doubt that the framework conditions are central to the ICT business development conditions.

9. World Economic Forum: The Global Information Technology Report 2009–2010 p. 8

10. Ibid. p.8



4. The large European clusters

The ICT industries are localized in central Europe close to or in capital regions or in strongly urbanized areas. The ICT sector in Europe is concentrated in an area from the south of UK, through the Benelux countries and to the north of Italy, south and west of Germany and around Île-de-France, Madrid in Spain and Scandinavia.

The most primary and most comprehensive statistic report of the ICT sector's location in Europe is made by the European Commission in 2008¹¹.

Table: 4.1. The largest ICT clusters in Europe by employment 2004

Region	Rank	Share of EU ICT Employment	Cumulated Shares
Île-de-France (FR)	1	9.40 %	9.40 %
Lazio (IT)	2	3.64 %	13.04%
Comunidad de Madrid (ES)	3	3.62 %	16.65%
Lombardy (IT)	4	2.74 %	19.39%
Denmark (DK)	5	1.76 %	21.16%
Inner London (UK)	6	1.75 %	22.91 %
Berkshire, Buck. & Oxf. (UK)	7	1.66 %	24.57%
Darmstadt (DE)	8	1.58 %	26.15 %
Oberbayern (DE)	9	1.49 %	27.64 %
Stockholm (SE)	10	1.41 %	29.05 %

Source: Barrios et.al 2008

As the table shows, almost one third of all people employed in the ICT sector in Europe, are employed in one of the 10 highest concentrations of ICT. The study shows that the dominant location for ICT companies is Île-de-France, which is the area around Paris. There are two areas in Italy, two in Germany, the area around Madrid and the whole country of Denmark, which the study has defined as one geographical area. Stockholm is placed as number 10.

If we look at the position of the different branches within the ICT sector in the different clusters, it shows that the geographical profile of the ICT sector differs between the clusters. It is clear that the production and service branches of the sector are spread quite differently.

11. Barrios, et al. *ibid.*



NACE 30:

Office machinery and computers: Ireland, Scotland, Southern Germany, Czech Republic, Hungary, France (Nice area)

NACE 32

Manufacture of radio, television and communication equipment and apparatus: Finland, Stockholm, Czech Republic and parts of Hungary

NACE 33:

Manufacture of medical equipment and optical products: Ireland and Southern Germany, Northern Italy.

NACE 64:

Telecommunications: Stockholm, Île-de-France, Madrid, Rome and London

NACE 72:

Computer and related activities: London, Île-de-France, Madrid, Stockholm

Source: Barrios et.al 2008

It is not only cooperation within the clusters themselves and their framework conditions, which are important to the firms. The development of technology, and hereby the competition, has also been driven by demand in the area. Cross-cluster cooperation with other firms within a region is therefore also important.

We have created our own statistic extract based on special extracts from Eurostat, in order to get a more consistent picture of the cluster size. We have used the same method for all areas in order to obtain a joint standard of reference.

The only problem with these extracts is that a large part of the ICT sector in the form of wholesale is not included in Eurostat's ICT statistics, while it is included by the OECD definition. Eurostat does not divide wholesale into various sectors and therefore there is no specific ICT wholesale sector. In the following statistics, the clusters will therefore be too small. They will approximately be 20 to 30 % too small, taking into account that ICT wholesale is not part of the statistics. The error ratio will almost be the same in the different clusters. However, the whole of NACE 64 is included in the Eurostat statistics. It has not been possible to separate the post sector from the telecom sector, which is the case in the OECD definition. This will more than compensate for the lack of the wholesale sector. As such, the figures for ICT clusters in Europe on employment will be between 10-15% larger, varying between individual ICT clusters. With these restrictions in mind, this is the closest we can get in comparing the ICT clusters in Europe. It should be noted that the EU's own investigation "Mapping the ICT in EU regions" has the same form of statistical "error"¹².

12. See European Commission Joint Research Centre: Barrios et. al. Mapping the ICT in EU regions: Location, Employment, Factors of Attractiveness and Economic Impact, 2008.



Table: 4.2. ICT employment in NUTS region 2007

Region 2 level	NUTS	Population 2007	Employment total	ICT sector 2007 (employment)	ICT % of total employment
France					
1. Île-de-France (Paris)	FR10	11,616,500	5,180,900	629,280	12.1
Germany					
2. Cologne	DEA2	4,386,271	1,979,100	360,201	18.2
Spain					
3. Comunidad de Madrid	ES30	6,052,583	3,052,600	276,149	7.9
England					
4. Great London (UKI1+UKI2)	UKI1+UKI2	7,534,600	3,920,700	222,848	6.1
4.A. Inner London (West and East)	UKI1	2,986,600	1,447,500	134,445	9.3
4.B. Outer London (North East North West)	UKI2	4,548,000	2,209,500	88,403	4.0
Italy					
5. Lombardy (Milano)	ITC4	9,545,441	4,458,200	206,364	4.8
6. Lazio (Roma)	ITE4	5,493,308	2,215,100	173,974	7.9
England					
7. Berkshire, Buckinghamshire and Oxfordshire	UKJ1	2,170,100	1,140,700	115,040	10.1
Germany					
8. Oberbayern (München)	DE21	4,279,112	2,177,300	110,472	5.1
9. Darmstadt	DE71	3,772,906	1,795,300	109,218	6.0
Sweden					
10. Stockholm County	SE11	1,949,516	1,035,338	102,089	9.8
Hungary					
11. Közép-Magyarország (Budapest)	HU10	2,872,678	1,249,100	93,789	7.5

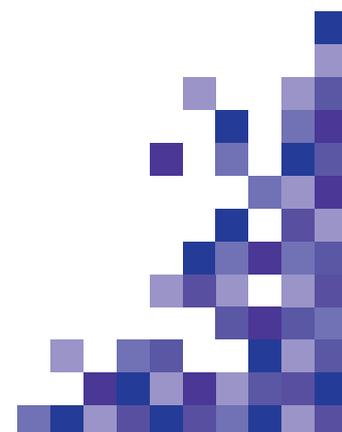


Region 2 level	NUTS	Population 2007	Employment total	ICT sector 2007 (employment)	ICT % of total employment
Øresund Region¹³					
12. Øresund Region	-	3,652,224	1,806,585	91,302	5.0
12.A. Zealand	DK01+02	2,452,867	1,271,000	68,490	5.4
12.B. Scania County	SE224	1,199,357	535,585	22,812	4.3
Finland					
13. Etelä-Suomi (Helsinki)	FI18	2,613,925	1,312,100	78,909	6.0
Spain					
14. Catalonia (Barcelona)	ES51	7,085,000	3,510,600	72,803	2.1
Germany					
15. Karlsruhe	DE12	2,734,260	1,331,400	69,510	5.2
The Netherlands					
16. Noord - Holland	NL32	2,613,070	1,393,800	50,415	3.6
17. Noord - Brabant	NL41	2,419,042	1,257,900	46,710	3.7
Norway					
18. Oslo and Akershus	NO01	1,057,794	588,400	44,473	7.5
England					
19. East Anglia (Cambridgeshire)	UKH1	2,299,000	1,134,500	42,044	3.7
Germany					
20. Berlin	DE30	3,404,037	1,502,400	14,141*	NA
21. Hamburg	DE60	1,754,182	849,900	NA	NA

* Limited reports from key industries of the ICT sector to Eurostat. Therefore the figures should be taken with great reservation.

Source: Eurostat, Regional Structural Business Statistics, Regional data (NUTS 06). Regional Labour Market Statistics.

13. The employment on both Zealand and in Scania and therefore the Øresund Region is based on a combination of national labour force surveys and register based statistics.



There are clear similarities between the two tables. Both studies identify Île-de-France as number one. In our study, however, Cologne comes in as number 2. This cluster does not exist in the study made by the European Commission. In both studies then follow Madrid, Lombardy and London as the largest ICT agglomerations/clusters. To these, the three clusters in the southern part of Germany may be added. In Scandinavia, it is Stockholm and the Øresund Region, which are the major ICT centers positioned as number 10 and 12 respectively¹⁴. From the above figure we can conclude that both the Øresund Region and Stockholm are far behind the leading ICT clusters in Europe in size, like Île-de-France, Cologne, Madrid, London and Lombardy measured in employment. However, the ICT cluster in the Øresund Region is larger than its neighboring clusters in Hamburg, Berlin, Oslo and Helsinki.

As we have mentioned, there are huge differences in the sizes of the clusters, which the ICT sector in the Øresund Region competes against to attract firms. Firstly, the competition is based on framework conditions in the region and secondly on the structure of the individual clusters.

In the following sections we will look at some of the large clusters/agglomerations in Europe, or clusters/agglomerations that have a structure, which makes them interesting in a competitive perspective regarding the development conditions of the ICT sector in the Øresund Region.

5. A review of selected ICT clusters in Europe

The purpose of this part of the study is to provide an overview and an analysis of the specific structures of the most important clusters in Europe. This overview is based both on cluster size measured by employment and by geographical proximity to the Øresund ICT sector. This outline is based on a very diverse material. The material varies in perceptions and definitions of the ICT sector. There is also diversity in the substance of the qualitative material which is considered in the different clusters. Despite these limitations, it still provides a better overview of the various cluster structures than an overview based purely on a statistical analysis. Therefore, we have also included descriptions of clusters related to other materials beside the statistical information.

6. The Nordic ICT clusters

The Nordic countries have, as our previous analysis showed, a strong position within the ICT sector. This is due to both strong and important framework conditions and to a large ICT sector, measured as a share of total employment. In the following chapter, we will look at some of the ICT clusters in the Nordic countries. The Øresund Region is to be reviewed and analyzed in other special reports. Therefore, there will only be made a limited discussion of the Øresund ICT sector here.

14. A more precise comparison of the Stockholm and the Øresund Region ICT clusters will be made in another report using national statistics as for example register based statistics and using NACE codes on more than a two digit level, which will enable a much more precise comparison. To make a European cluster comparison, however, the analysis had to be based on a weaker statistical material in form of two digit NACE codes and surveys instead of a register based analysis.



6.1. The Stockholm ICT cluster

Table: 6.1.1. Stockholm County 2007

Population	1,949,516
Number of employed	1,035,338
Employed in ICT	102,089
Number of universities	8
Number of students at university level	79,273*
Number of PhD students	6,503*
R&D staff at university	12,486
R&D staff at public sector research	2,732
R&D staff at business sector	21,417

*2006.

Source: Eurostat and Universities Worldwide¹⁵

Table: 6.1.2. Structure of the ICT sector in Stockholm County

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	720*	93
32. Manufacture of radio, television and communication equipment and apparatus	11,515*	303
33. Manufacture of medical, precision and optical instruments, watches and clocks	6,956	818
64. Post and telecommunications	27,041	
72. Computer and related activity	55,857	14,185

* Register based employment statistics

Source: Eurostat: Regional Structural Business Statistics

15. We have used the University Worldwide database to get a common reference for all the ICT clusters. To be classified as a university the institution must at least offer a bachelor education.



In the greater Stockholm area the ICT sector is partly located in the town of Kista 10 km from the city center. The ICT cluster is part of Sollentuna, Järfälla and Sundbyberg municipalities. The town is a research city built after 1970. The idea was to build a city where both work, housing and commercial town centers were close to each other¹⁶. There are 450 high-tech ICT companies located in the city of Kista with 1,100 researchers in an extremely restricted geographic area north of the Swedish capital Stockholm.

The ability to attract foreign investments is an important factor for the development of the ICT sector in a cluster, these investments often include both new technological knowledge and new jobs and are often an important complement to the already established industries. There has been a study, not only on the number of foreign investments in Stockholm's ICT sector, but also on the country of origin and in which part of the ICT sector the investments were made.

Table: 6.1.3. Number of foreign investment in the ICT sector in Stockholm County by country

1. Investments	2007	2008	2009	Total
Overall Total	5	8	7	20
2. Investments by country	2007	2008	2009	Total
USA	1	3	4	8
Norway		2		2
Finland	1		1	2
UK	1	1		2
China	1		1	2
Denmark		1		1
Germany			1	1
Russia	1			1
Ireland		1		1
Overall Total	5	8	7	20

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

As the figures clearly show, investments from the USA dominate in all years. The USA is followed by Norway, Finland, and the UK. Also China has invested in the ICT sector in Stockholm.

Equally interesting, as the number of foreign investments and their breakdown by country of origin, is in what sectors of the ICT industry the investments are made.

16. See: Sandberg, Åke, Augustsson, Frederik and Lintala, Anne: IT and telecom companies in Kista Science city, Northern Stockholm, MPRA paper no. 10743 2008.

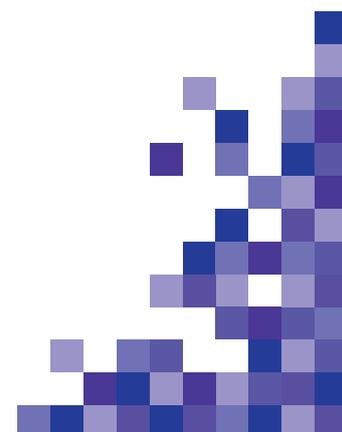


Table: 6.1.4. Number of foreign investments in ICT by sector in Stockholm County

Investments by ICT sector	2007	2008	2009	Total
Software & IT services	1	6	4	11
Communications	3	1	2	6
Business Machines & Equipment	1			1
Electronic Components		1		1
Transportation			1	1
Overall Total	5	8	7	20

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

The study gives a good picture of the distribution of investments in the ICT sector, although the sector division does not quite follow the NACE codes, which we use in this report. It has not been possible to make such an investigation based on NACE codes. We have, nevertheless, chosen to include it, because it gives a picture of the investment pattern and thus shows which parts of the ICT sector that are attractive for investors. Here, we can see that the main part of the investments go to Software & IT services followed by Communications. This is also in accordance with the ICT structure of Stockholm showed in table 6.1.2, where, in particular, Computer & Related activities, such as IT services & Consultancy, are ranked highly, followed by telecommunication.

ICT Firms in Kista and Stockholm County

- L.M.Ericsson, Telefonaktiebolaget
International employment: 78,989, of these in Sweden: 24 % 19,675 in 2008 and in Kista: 8,000.
- TeliaSonera AB
International employment: 30,037, of these in Sweden: 10,152
- Tele2 AB
Employed at group level: 5812, of these in Sweden: 1,219
- Atea Sverige AB
Employed group: 4,400 of these in Sweden: 1,400.
- Enea AB
Employed 690 in Kista.
- Tieto Sweden AB
Employed in Sweden 3,086.
- Other firms are Hewlett-Packard, IBM, Philips, ÅF and Oracle



It is evident that Stockholm is strong in the telecom field. Since 1970 Stockholm has managed to build up a strong ICT centre with close relationships between businesses, institutions of higher education and research within a limited geographic area and with proximity to airport and international communications.

6.2. The Etelä-Suomi (Helsinki) ICT cluster

Table: 6.2.1. The Etelä-Suomi (Helsinki) 2007

Population	2,613,925
Number of employed	1,312,100
Employed in ICT	78,909
Number of universities	9
Number of students at university level	143,107*
Number of PhD students	12,575*
R&D staff at university	14,192
R&D staff at public sector research	7,429
R&D staff at business sector	23,333

*2006, Source: Eurostat and Universities Worldwide

Table: 6.2.2. Structure of the ICT sector in Etelä-Suomi (Helsinki)

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	143	32
32. Manufacture of radio, television and communication equipment and apparatus	20,176	167
33. Manufacture of medical, precision and optical instruments, watches and clocks	6,376	459
64. Post and telecommunications	21,845	769
72. Computer and related activities	30,369	3,903

* Register based employment statistics

Source: Eurostat: Regional Structural Business Statistics



Helsinki is the political capital, but also the financial and trade centre in Finland. It is also the largest city in Finland, with a population of 555,000. The Greater Helsinki Region (GHR) has 1.8 million inhabitants and the county 2,613,925 out of a national population of 5.2 million in 2008. The city region has grown faster than the rest of Finland since 1990, both in terms of population and employment¹⁷. The development of Finland's ICT sector during the 1990s was largely an urban phenomenon, like other ICT regions. The development took place close to large population centers and increases in jobs took place only in a handful of urban regions. It was, first and foremost, a commercial development focused on Helsinki¹⁸. But through Nokia's activities it was also a development which spread to other regions in Finland. The ICT sector is located particularly in northern Espoo and Vantaa in the Helsinki region. In Espoo the sector has grown in proximity to Helsinki University of Technology. In Ruoholahti, however, the concentration is a result of city planning policies¹⁹.

The dominating ICT player is clearly Nokia, the mobile telephone company. Nokia's headquarter is situated in Espoo in the Helsinki area. Nokia is not only a regional and national player, but also a strong global player. It has around 18 production facilities in 10 countries. In Finland, Nokia have production facilities in four Finnish cities – Helsinki, Tampere, Oulu, and Turku. In 2005 Nokia merged their network facilities with Siemens. In 2009, Nokia employed 23,320 people in Finland, and in total Nokia Inc employed 125,829 people. Nokia Siemens Networks employed 60,295 people in 2009. The cooperation with the German firm Siemens includes the following occupational areas of business: Utilities, Transportation, Public Sector and Enterprises.

17. Tukiainen, Janne (2003): ICT Cluster Study Helsinki region, Helsinki City Urban Facts offices, 2003:2

18. Susiluoto, I. and Loikkanen H. (2006): The Economic Efficiency of Finnish Regions 1988-1999, Paper prepared for the 41st Congress of the European Regional Science Association, Zagreb, Croatia, 29.8-1.9.2001.

19. Van den Berg, L. & Van Winden, W. (2002): Information and Communications Technology as a Potential Catalyst for Sustainable Development: Experiences in Eindhoven, Helsinki, Manchester, Marseilles and The Hague' Aldershot: Ashgate.

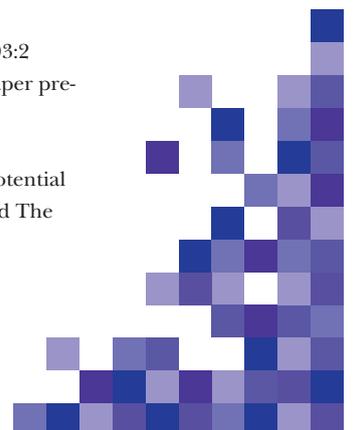


Table: 6.2.3. Number of foreign investments in Helsinki by country

1. Investments	2007	2008	2009	Total
Overall Total	6	1	3	10
2. Investments by country	2007	2008	2009	Total
USA	2		1	3
Denmark	1			1
Estonia			1	1
Germany	1			1
Sweden	1			1
UK	1			1
Switzerland		1		1
France			1	1
Overall Total	6	1	3	10

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

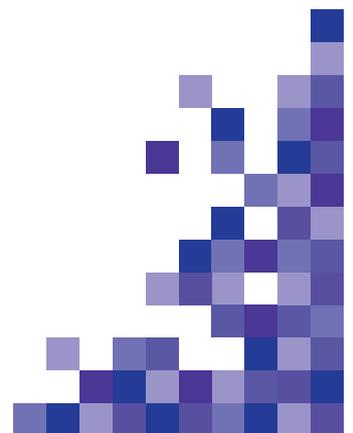
Similar to Stockholm, the USA is also the largest foreign investor in Finland. We can also see that Estonia is an investor together with Denmark and Germany. While there in Stockholm were 20 foreign investments over the last three years, the number in Helsinki was only 10.

Table: 6.2.4. Number of foreign investments in ICT by sector in Helsinki

Investments by ICT sector	2007	2008	2009	Total
Software & IT services	4		3	7
Semiconductors	2			2
Electronic Components		1		1
Overall Total	6	1	3	10

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

It is obvious that Nokia is a very significant player in Finland and a dominant force in the ICT sector. There are also other significant players who have relationships with the mobile sector. Accounting for 6% of the employment in the Helsinki area, the ICT sector is an important part of business development in the region.



6.3. The Oslo and Akershus ICT cluster

Table: 6.3.1. Oslo and Akershus 2007

Population	1,057,794
Number of employed	588,500
Employed in ICT	44,473
Number of universities	9
Number of students at university level	7,006*
Number of PhD students	2,123*
R&D staff at university	10,190
R&D staff at public sector research	4,493
R&D staff at business sector	9,481

*2006, Source: Eurostat and Universities Worldwide

Table: 6.3.2. Structure of the ICT sector in Oslo and Akershus

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	91	5
32. Manufacture of radio, television and communication equipment and apparatus	1,218	42
33. Manufacture of medical, precision and optical instruments, watches and clocks	1,789	175
64. Post and telecommunications	17,028	802
72. Computer and related activities	24,347	4,348

Source: Eurostat: Regional Structural Business Statistics

Oslo is the primary region for ICT research in Norway, although valuable research is being conducted elsewhere in Norway. The majority of Norway's ICT policy initiatives are founded in the Oslo region. In fact, 60% of the Norwegian ICT positions are located around Oslo and Akershus County.

The ICT companies and research institutions are based in three clusters in Oslo and in Akershus County, namely Gaustadbekk Valley, the IT Center at Fornebu and the Kjeller Technology Park.

The Gaustadbekk Valley is the primary ICT research centre and houses the Oslo Innovation Centre. In the centre, there are about 100 high-tech companies, incubators, and research centers. The Kjeller Technology Park is located 20 km from Oslo. The park covers a wide array of research and development, higher education and consultancy in electronics, mathematics and ICT.



Table: 6.3.3. Number of foreign investments in Oslo by country

1. Investments	2007	2008	2009	Total
Overall Total	2	2	2	6
2. Investments by country	2007	2008	2009	Total
Denmark	1			1
USA		1		1
Spain		1		1
Estonia			1	1
Sweden			1	1
UK	1			1
Overall Total	2	2	2	6

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

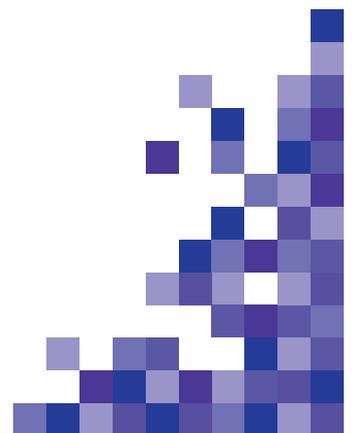
The number of foreign investments in the ICT sector Oslo/Akershus is somewhat smaller compared to Helsinki, although the sector is also slightly smaller. The foreign investments in the area are equally distributed between Denmark, Estonia, Spain, Sweden, USA and the UK.

Table: 6.3.4. Number of foreign investments in ICT by sector in Oslo

Investments by ICT sector	2007	2008	2009	Total
Software & IT services	2	1	1	4
Communications		1		1
Electronic Components			1	1
Overall Total	2	2	2	6

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

The innovation pattern follows that of the other Nordic regions, which implies a strong focus on Software & IT services, expressing the strong position of this sector in the region's ICT structure.



Large ICT firms in the Oslo region:

- Atea ASA: Wholesale of computers, software and telecommunications equipment, etc. NACE: 51840 Wholesale of computers and IT equipment, Wholesale of telecommunication equipment.
- ErgoGroup: This is a Nordic ICT company which is a total supplier of IT operations, solutions and consulting services. Jobs at group level: 2,116 in 2009.
- EDB Business Partner ASA: The telecommunication firm Telenor owns 51.3% of the company. The firm operates in IT services business. The number of employees was 6,175 in the concern in 2009.
- Ergo group: Total employed: 3,714 (2,255 in Norway 2009).

Oslo and Akershus is the smallest of the Nordic ICT clusters. Yet, a couple of major ICT companies are located here as well as a research park and a research centre,

6.4. The Øresund Region ICT cluster

Table: 6.4.1. The Øresund Region 2007

Population	3,652,224
Number of employed	1,806,585
Employed in ICT	91,302
Number of universities	19
Number of students at university level	164,976*
Number of PhD students	5,799*
R&D staff at university	12,000
R&D staff at public sector research	2,272**
R&D staff at business sector	40,697**

* 2006

** Also includes the county of Blekinge

Source: Eurostat and Swedish National Agency for Higher Education

Table: 6.4.2. Structure of the ICT sector in the Øresund Region

NACE code	Number of employed	Number of local units
30, 313, 32, 33 ICT manufacturing	12,500	425
64. Post and telecommunications	33,802	NA
72. Computer and related activity	45,000	6,584

Source: Labour Force Statistics from Statistics Denmark and Statistics Sweden and register based statistics from Statistics Denmark and Statistics Sweden



The number of university students shows that the Øresund Region holds a strong position compared to the neighbouring regions, although the region cannot compete with the largest regions in Europe in our study. The Øresund Region has a larger number of university students than the other Nordic Regions, but also compared to Hamburg and Berlin. Regarding research students, the Øresund Region's position is somewhat weaker. With 6,009 research students, the region is far behind Helsinki, and also slightly behind Stockholm.

If we look at R&D personnel and researchers in private business we find that the Øresund Region, with its approximately 40,000 employees (including Blekinge) is far ahead of the before mentioned neighbouring regions. We can therefore conclude that the region has a strong education and research infrastructure.

Table: 6.4.3. Number of foreign investments in the ICT sector in the Øresund Region by country

1. Investments	2007	2008	2009	Total
Overall Total	11	8	12	31
2. Investments by country	2007	2008	2009	Total
USA	4	2	2	8
Sweden*	2		2	4
China	1	1	1	3
Germany	1		2	3
The Netherlands			2	2
Finland	1	1		2
UK	2			2
Norway			1	1
South Korea			1	1
Taiwan		1		1
Australia		1		1
Japan			1	1
Philippines		1		1
Denmark**		1		1
Overall Total	11	8	12	31

* Investment from Sweden in Zealand in the Danish part. It is not possible to exclude eventual investments from Scania in Zealand.

** Investment from Denmark in Scania in the Swedish part. It is not possible to exclude eventual investments from Zealand in Scania.

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

As the table shows, there are quite a lot of foreign investments in the Øresund ICT cluster compared to neighbouring clusters in the Nordic countries and those in Berlin and Hamburg. Similar to the other European clusters, the USA leads the table. There is a spread of investor countries and especially noteworthy are the many Asian countries.

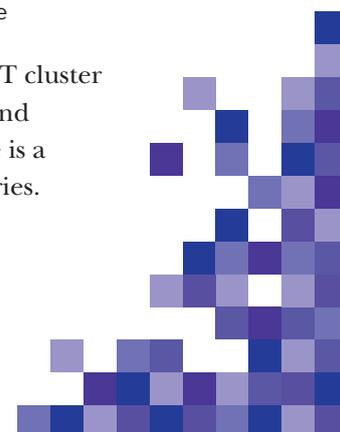


Table: 6.4.4. Number of foreign investments in ICT by sector in the Øresund Region

Investments by ICT sector	2007	2008	2009	Total
Software & IT services	8	5	6	19
Communications	1	2	2	5
Components	1	2	1	4
Semiconductors	0	0	2	2
Transportation	0	0	1	1
Overall Total	10	9	12	31

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

The foreign investments by sector show the traditional investment pattern with Software & IT services clearly at the top. This is followed far behind by Communications. This pattern is also in accordance with the structure of the ICT sector in the Øresund Region.

7. The French ICT clusters

7.1. The Île-de-France (Paris) ICT cluster²⁰

Table: 7.1.1. Île-de-France (Paris) 2007

Population	11,616,500
Number of employed	5,180,900
Employed in ICT	629,280
Number of universities	44
Number of students at university level	443,287*
Number of Ph.d. students	26,443*
R&D staff at university	:
R&D staff at public sector research	:
R&D staff at business sector	:

* 2006 Source: Eurostat and Universities Worldwide

20. It is in: NUTS 2 Level (Nomenclature des unités territoriales statistiques)



Table: 7.1.2. Structure of the ICT sector in Île-de-France

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	5,015	179
32. Manufacture of radio, television and communication equipment and apparatus	25,372	831
33. Manufacture of medical, precision and optical instruments, watches and clocks	40,119	2,674
64. Post and telecommunications	332,266	5,864
72. Computer and related activities'	226,509	26,484

Source: Eurostat: Regional structural business statistics

Île-de-France is the largest ICT cluster in Europe and France's leading region in terms of population with more than 11.6 million inhabitants and it has the highest population density in France. The very large population concentration obviously plays an important role for the size and structure of the ICT sector. In Île-de-France the Post & telecommunications are especially large. The fact that we cannot, in the Eurostat statistics, separate the telecommunication sector from the post sector becomes clear here. Located in the centre-north of France by the river Seine, Île-de-France is the commercial and industrial centre of the country, but also a cultural and intellectual centre of international significance²¹. Île-de-France has Europe's highest concentration of R&D, with 134,550 researchers and technicians (7.5% of R&D in the EU 25 in 2004)²².

Supply of a well-educated labor force is one of the factors often mentioned among factors supporting a cluster. Île-de-France has a large population and a large number of students at university level. With its 443,287 university students, available statistics show that Île-de-France is rated the great number one among ICT clusters. Also in regards to research students is Île-de-France number one.

The ICT sector in Île-de-France is especially located in the City of Paris, Hauts-de-Seine, Yvelines and Essonne, which are the most central areas for ICT enterprises. The ICT sector employs nearly 10 % of the private sector workforce²³. The region Île-de-France focuses on strengthening the relations between public laboratories and private enterprises.

Île-de-France has 36,036 local units engaged in the ICT sector. It comprises three main categories: telecommunication activities, IT services and R&D.

Île-de-France is especially known for its concentration of players in the field of optic fiber in a small area, which is organized in the Optics Valley Association²⁴.

21. BISER: Benchmarking the Information Society: e-Europe Indicators for European Regions, Regional Portrait of Île de France 2003

22. Econovista: econovista.com/en/overview.asp

23. Biser p.9 2003

24. Cordis (2009): Ile-de-France Research and Innovation.



Table: 7.1.3. Number of foreign investments in Île-de-France by country

1. Investments	2007	2008	2009	Total
Overall Total	54	53	23	130
2. Investments by country	2007	2008	2009	Total
USA	21	20	9	50
Germany	8	9	4	21
UK	11	3	2	16
Japan	2	3	1	6
China	2		3	5
The Netherlands	2	1	1	4
Switzerland		4		4
India		3		3
Sweden	2	1		3
Spain	1	1		2
Finland	1	1		2
Belgium		1	1	2
Canada	1		1	2
Denmark		1		1
Norway		1		1
Hong Kong		1		1
Czech Republic	1			1
Tunisia			1	1
Australia		1		1
Italy		1		1
Russia	1			1
South Africa	1			1
Vietnam		1		1
Overall Total	54	53	23	130

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

Île-de-France is the region, after London, with the largest number of foreign investments among the investigated ICT regions, which is in line with the fact that the region holds the superior position in Europe. There were 130 foreign investments in the three-year period. As in several other clusters, the USA was the absolute largest foreign investor, with 50 investments, followed by Germany with 21 and the UK with 16. These three countries clearly dominated the foreign investments. It is also interesting to note that the major ICT countries invested in Europe's largest ICT region.

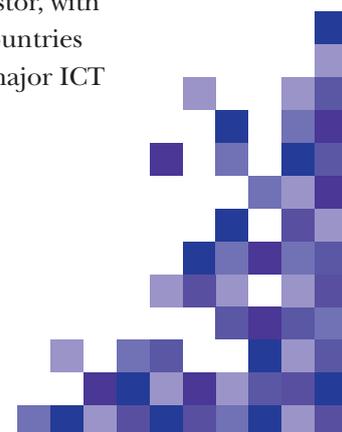


Table: 7.1.4. Number of foreign investments in ICT by sector in Île-de-France

Investments by ICT sector	2007	2008	2009	Total
Software & IT services	37	31	14	82
Communications	11	10	4	25
Electronic Components	2	5	3	10
Business Machines & Equipment		5	1	6
Transportation	4			4
Semiconductors		2	1	3
Overall Total	54	53	23	130

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

Île-de-France follows the same foreign investment pattern as the before mentioned ICT clusters. There is a strong concentration of investments in Software & IT services, which in turn mirrors this sector's strong position in the Île-de-France ICT structure. A clear number two was Communications, which is also natural considering this sectors importance in the region.

Large Firms in different ICT sectors in Île-de-France 2009

- Software: Dassault systems, Business Objects.
- Telecommunication: Orange, Alcatel-Lucent, Siemens, Montorola, Huawei, ZTE, Digital Content: Thomson, Vivendi, Ubisoft
- Defence and Security: Thales, Safran, Gemalto,
- Optics: EADS, GE, Healthcare
- Source: Paris Region: Information and communication technology

The main strength of the Île-de-France region and its ICT cluster is clearly the strong localization position near a large urban area. Moreover, the area is also dominated by a number of other high-tech firms and industries, and strong educational institutions. Especially aerospace industries have a strong position, but also a lot of research laboratories are located in the area.



8. The UK ICT clusters

8.1. Inner and outer London

Table 8.1.1. Inner and Outer London 2007

Population	7,534,600
Number of employed	3,920,700
Employed in ICT	222,848
Number of universities	72
(Major universities)	22*
Number of students at university level	:
Number of PhD. students	:
R&D staff at university	59,907
R&D staff at public sector research	2,700
R&D staff at business sector	9,786

* Some of them part of University of London

Source: Eurostat and Universities Worldwide

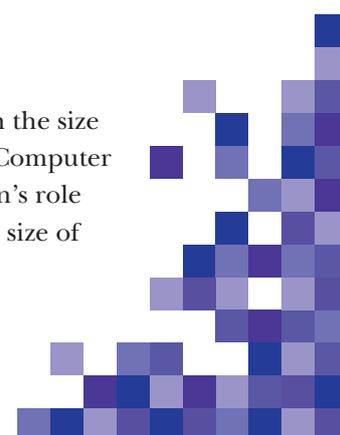
We have decided to merge the two NUTS regions Inner and Outer London. That is UKI1 and UKI2. This is due to the fact that they constitute one region in the same way as Île-de-France. In spite of this merger the regions' population does not reach that of Île-de-France.

Table: 8.1.2. Structure of the ICT-sector in London (Inner and outer)

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	1,723	282
32. Manufacture of radio, television and communication equipment and apparatus	2,508	318
33. Manufacture of medical, precision and optical instruments, watches and clocks	4,789	619
64. Post and telecommunications	90,405	3067
72. Computer and related activities	123,423	24,200

Source: Eurostat: Regional Structural Business Statistics

As was the case of Île-de-France, the size of the city has an important influence on the size of the Post & Telecommunication sector in London. It should be noted that the Computer & Related activities (IT service and consultancy) are big in London. Here London's role as a major financial centre must be stressed. It has an important influence on the size of ICT service activities.



The framework conditions are enhanced by the fact that London is a global city and has at least three main strengths: it is a global financial service centre, it is an attractive place to live with its media, arts and leisure industries and it is a global centre for education, with international universities and a host of supporting facilities. Among the researched ICT clusters London was ranked no. 5 measured on number of university students with a total of 237,025 students, after Île-de-France, Rome, Lombardiy and Madrid, in the available statistics. But if we look at R&D personnel and researchers at higher education institutions, London is ranked no. 1 with nearly 60.000 employed. It is an international city and foreign ownership of London's business sector amounts to approximately 20 %²⁵. The ICT sector is mainly located in Islington²⁶.

Table: 8.1.3. Number of foreign investments in ICT in London (Inner and outer) by country

1. Investments	2007	2008	2009	Total
Overall Total numbers	48	52	34	134
2. Investments by country	2007	2008	2009	Total
USA	28	29	18	75
France	6	6	2	14
Germany	3	1	2	6
Spain	2	3		5
India		1	3	4
Japan	2		2	4
The Netherlands	1		2	3
Canada	2		1	3
China	1	2		3
Australia	1	1		2
Bermuda		2		2
Switzerland	1	1		2
Ireland		1	1	2
Norway		1		1
Hong Kong		1		1
Russia			1	1
South Africa		1		1
Belgium		1		1
New Zealand		1		1
Israel			1	1
Mexico	1			1
The United Arab Emirates			1	1
Overall Total	48	52	34	134

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

25. London School of Economics: London's Place in the UK Economy, 2008-09 London 2008

26. *ibid.* p. 78



Like in Île-de-France the number of investments in London is large (slightly larger than in Île-de-France), which mirrors that both are large city regions. USA is by far the largest investor, followed by France and Spain far behind. Like in Île-de-France, there is a large spread of investing countries including India.

Table: 8.1.4. Number of foreign investments in ICT by sector in London (inner and outer)

Investments by ICT sector	2007	2008	2009	Total
Software & IT services	38	36	23	97
Communications	7	12	9	28
Business Machines & Equipment		1	1	2
Business Services		2		2
Electronic Components	1	1		2
Semiconductors	1		1	2
Space & Defence	1			1
Overall Total	48	52	34	134

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

The foreign investment pattern follows that of Île-de-France with Software & IT services as an undisputed number one followed by Communications. The other sectors have only minor foreign investments. Again, we can see this as a result of the ICT structure in the London region.

Large firms in London

- London is the home of leading mobile operators like Vodafone, Telefonica (O2), British Telecom France Telecom's Orange, Deutsche Telekom's T-Mobile and Hutchison's 3.

The main strength of the London ICT sector, like Île-de-France, is the size of the city and the fact that it is a major international centre, especially for the financial sector, but also in regards to education and leisure. This gives a good framework for ICT services and consultancy. Interesting to note is also, that London is the ICT region with the largest number of foreign ICT investments, even more than the larger Île-de-France region.



8.2. The Cambridge ICT cluster - East Anglia (Cambridgeshire)

Table: 8.2.1. Cambridge, East Anglia, Cambridgeshire 2007

Population	2,299,000
Number of employed	1,134,500
Employed in ICT	42,044
Number of universities	4
Number of students at university level	:
Number of PhD students	:
R&D staff at university	16,419
R&D staff at public sector research	2,536
R&D staff at business sector	14,212

Source: Eurostat and Universities Worldwide

Table: 8.2.2. Structure of the ICT sector in Cambridge, East Anglia (Cambridgeshire)

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	1,274	77
32. Manufacture of radio, television and communication equipment and apparatus	3,407	318
33. Manufacture of medical, precision and optical instruments, watches and clocks	4,892	324
64. Post and telecommunications	15,579	1,110
72. Computer and related activities'	16,891	4,218

Source: Eurostat: Regional Structural Business Statistics

Cambridge is not a particularly large ICT region in a European perspective. However, it is known for its wireless communication. But as our statistics show, there is also a relatively strong ICT manufacturer sector in the region in the form of manufacturing of telecommunication equipment and medical equipment. It is also worth noticing that computer and related activities is relatively weak in this region compared to the above-mentioned regions.



Table: 8.2.3. Number of foreign investments in the ICT sector in East Anglia by country

1. Investments	2007	2008	2009	Total
Overall Total	4	3	2	9
2. Investments by country	2007	2008	2009	Total
USA		1	2	3
Taiwan	1	1		2
The Netherlands		1		1
Finland	1			1
Australia	1			1
Sweden	1			1
Overall Total	4	3	2	9

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

The number of foreign investments in the region are rather small (on level with Helsinki) compared to the large European ICT clusters. Besides the USA, which is always the biggest investor in the European ICT clusters, Taiwan has also invested in the Cambridge ICT Region.

Table 8.2.4. Number of foreign investments in ICT by sector in Cambridge East Anglia

Investments by ICT sector	2007	2008	2009	Total
Electronic Components	3	1		4
Software & IT services	1	1	2	4
Communications		1		1
Overall Total	4	3	2	9

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

If we look at the foreign investment pattern in the region, this stands out from the rest of the mentioned regions, because Software & IT services are not dominant here. Instead, the Electronic Components sector received the same number of foreign investments as Software & IT services, which is an expression of the relatively strong position of ICT manufactures in the region.

Large ICT firms in the Cambridge area

- ARM Holdings plc, founded 1990, is the world's leading semiconductor intellectual property (IP) supplier with 1700 employees in 2009. Office in Lund in Scania. RedGate: Developers of software tools for database administrators and developers. Employed 95 in 2009. Jagex: Developers and publishers of online computer games, including RuneScape and FunOrb. Owlstone: Developers of button-sized programmable chemical sensors.



The Cambridge ICT cluster is a relatively small cluster in European terms. Compared to the other ICT clusters, Computer & related services is relative weak; that is ICT service and consultancy, while the cluster is relatively strong in ICT manufacturing and wireless.

8.3. Berkshire, Buckinghamshire and Oxfordshire

Table: 8.3.1. Berkshire, Buckinghamshire and Oxfordshire 2007

Population	2,170,000
Number of employed	1,140,700
Employed in ICT	115,040
Number of universities	5
Number of students at university level	:
Number of PhD students	:
R&D staff at university	19,415
R&D staff at public sector research	2,271
R&D staff at business sector	14,470

Source: Eurostat and Universities Worldwide

Table: 8.3.2. Structure of the ICT sector in Berkshire, Buckinghamshire and Oxfordshire

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	2,130	121
32. Manufacture of radio, television and communication equipment and apparatus	3,914	211
33. Manufacture of medical, precision and optical instruments, watches and clocks	7,820	355
64. Post and telecommunications	34,598	1,217
72. Computer and related activities	66,578	9,554

Source: Eurostat: Regional Structural Business Statistics

The Berkshire, Buckinghamshire and Oxfordshire regions have undergone major transformation from being old rural economies based on brewing, agriculture, textiles, motor vehicles and education to a mixed economy, in which the high-tech sector plays an important and growing role.

The Thames Valley area has been successful in attracting key industries within the knowledge-intensive sectors such as computing, R&D and business services, but also within financial services and telecommunications. Outside the ICT sector there are pharmaceutical and automobile industries in the area. Berkshire, Buckinghamshire and Oxfordshire's high-tech economies are the largest and fastest growing in the UK. The county of Oxfordshire is the main high-tech location in the region.



Table: 8.3.3. Number of foreign investments in Berkshire, Buckinghamshire and Oxfordshire

1. Investments	2007	2008	2009	Total
NA	NA	NA	NA	NA

Large ICT firms in the Berkshire, Buckinghamshire and Oxfordshire

- BT, Microsoft, Oracle, Cisco, Vodafone, Siemens, and many others have branches in the region as well as smaller firms that expand their activities internationally²⁷.

Compared to the ICT cluster in Cambridge, the ICT cluster in Berkshire, Buckinghamshire and Oxfordshire has a structure that is in accordance with the other presented ICT clusters in Europe, which implies a dominant Computer & related activities sector followed by Post & Telecommunications. The ICT cluster also has the advantage of the presence of other high-tech industries in the region.

9. The Italian ICT Clusters

9.1. The Lazio (Rome) ICT cluster

Table: 9.1.1. Lazio (Rome) 2007

Population	5,493,308
Number of employed	2,215,100
Employed in ICT	173,974
Number of universities	13 (5 public universities)
Number of students at university level	286,765*
Number of PhD students	4,871*
R&D staff at university	:
R&D staff at public sector research	:
R&D staff at business sector	:

*2006, Source: Eurostat and Universities Worldwide

27. BISER – Work package 6: Regional Portrait of Berkshire, Buckinghamshire and Oxfordshire. 2003.



Table: 9.1.2. Structure of the ICT sector in Lazio (Rome)

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	1,100	174
32. Manufacture of radio, television and communication equipment and apparatus	8,402	669
33. Manufacture of medical, precision and optical instruments, watches and clocks	10,141	1,702
64. Post and telecommunications	92,777	762
72. Computer and related activities'	61,554	11,525

Source: Eurostat: Regional Structural Business Statistics

Lazio belongs together with Île-de-France, Cologne and Darmstadt to the clusters where Post & Telecommunication is the largest sector in the ICT sector. Another characteristic of the Lazio ICT sector is that the Manufacturing of tele- and medical equipment is relatively strong. Just as Île-de-France, Lazio has also a large aerospace industry. As Lombardy and Piemonte represent the technological heart of Italian industry, Lazio accounts for a large share of the Italian public R&D infrastructures and activities.

More than 25% of the total public R&D in Italy is located in the region of Lazio.

In contrast, the strongest concentration of R&D carried out by the private sector is located in Piemonte and Lombardy (more than 50% of the total national output). As such, Lazio is characterised by public activities, which is evident by the large Post & Telecom sector.

Along with their strong public sector, Lazio is also very strongly positioned in regards to students at university level. It is ranked number two among the researched ICT clusters, after Île-de-France, with 286,765 university students.

Table: 9.1.3. Number of foreign investments in the ICT sector in Lazio (Rome) by country

1. Investments	2007	2008	2009	Total
Overall Total	5	4	2	11
2. Investments by country	2007	2008	2009	Total
USA	2	1	2	5
UK	2			2
Germany		1		1
Russia		1		1
Canada	1			1
Egypt		1		1
Overall Total	5	4	2	11

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database



Compared to the large size of the ICT sector in Lazio, the number of foreign investments is very low. This confirms other indications; that the ICT sector in Lazio (Rome) is characterised by the public sector. Again, as in other clusters, the USA dominates the number of foreign investments, though there are also investments from other major European countries like the UK and Germany.

Table: 9.1.4. Number of foreign investments in ICT by sector in Lazio (Rome)

Investments by ICT sector	2007	2008	2009	Total
Software & IT services	4	3	1	8
Communications	1	1		2
Business Machines & Equipment			1	1
Overall Total	5	4	2	11

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

Lazio follows the traditional pattern, where most foreign investments are made in Software & IT services. The strong position of Post & Telecommunication in the ICT structure is not expressed in the pattern of foreign investments.

9.2. The Lombardy ICT cluster

Table: 9.2.1. Lombardy (Milan) 2007

Population	9,545,441
Number of employed	4,458,200
Employed in ICT	206,364
Number of universities	11
Number of students at university level	254,573*
Number of PhD students	5,110*
R&D staff at university	:
R&D staff at public sector research	:
R&D staff at business sector	:

*2006 Source: Eurostat and Universities Worldwide.



Table: 9.2.2. Structure of the ICT sector in Lombardy

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	3,663	400
32. Manufacture of radio, television and communication equipment and apparatus	29,955	1,801
33. Manufacture of medical, precision and optical instruments, watches and clocks	31,483	4,980
64. Post and telecommunications	41,492	1,300
72. Computer and related activities	99,771	26,652

Source: Eurostat: Regional Structural Business Statistics

The biggest city of the region is Milan with 3,707,210 inhabitants. The city of Milan is an important economic, financial, social and political hub, both at a national and international level. In Milan, like other regions with ICT clusters, there are also concentrations of other high-tech firms. Lombardy is a biotech district, with approx. 50% of the national companies, including research centers. Milan is also a large centre for fashion. Milan also has a large health sector including 1,897 firms and more than 30,000 employees.

Like Rome, Lombardy also holds a strong position in regards to students at university level. With its 254,573 students it ranks number three after Île-de-France and Lazio (Rome).

Table: 9.2.3. Number of foreign investments in ICT in Lombardy by country

1. Investments	2007	2008	2009	Total
Overall Total	14	14	8	36
2. Investments by country	2007	2008	2009	Total
USA	3	5	4	12
UK	2	1	2	5
France	3	2		5
Germany	1	2		3
Japan		2		2
Switzerland	2			2
China			2	2
Australia	1			1
Sweden	1			1
Bermuda		1		1
Canada	1			1
Ireland		1		1
Overall Total	14	14	8	36

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database



Compared to Lazio, the number of foreign investments is much larger in Lombardy. This may be due to the larger private ICT sector in Lombardy. The US dominates, but there are also investments from a series of other countries, among them strong ICT countries like the UK, France and Germany.

Table: 9.2.4. Number of foreign investments in ICT by sector in Lombardy

Investments by ICT sector	2007	2008	2009	Total
Software & IT services	10	5	4	19
Communications	2	3	3	8
Electronic Components	1	3		4
Semiconductors		3		3
Business Machines & Equipment	1		1	2
Overall Total	14	14	8	36

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

Lombardy follows the traditional pattern of foreign investments with a concentration in the Software & IT services sector. There are also several foreign investments in Communications. These investments also mirror the ICT structure of the region. Noteworthy is also relatively many foreign investments in ICT manufacturing.

10. The Spanish ICT clusters

10.1. The Madrid ICT cluster

Table: 10.1.1. Madrid 2007

Population	6,052,583
Number of employed	3,052,600
Employed in ICT	276,149
Number of universities	16
Number of students at university level	237,368*
Number of PhD students	21,033*
R&D staff at university	33,171
R&D staff at public sector research	16,608
R&D staff at business sector	29,783

* 2006.

Source: Eurostat and Universities Worldwide



Table: 10.1.2. Structure of the ICT sector in Madrid

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	925
32. Manufacture of radio, television and communication equipment and apparatus	6,242
33. Manufacture of medical, precision and optical instruments, watches and clocks	7,627
64. Post and telecommunications	132,001	9,894
72. Computer and related activities	129,354	11,177

Source: Eurostat: Regional Structural Business Statistics

The ICT cluster in Madrid houses 41% of the ICT firms in Spain, and it accounts for 47% of the Spanish ICT market. The region is home to 23% of ICT's foreign trade of Spain²⁸. Compared to the other clusters, the share of Computer & related activities in the ICT structure is small. This is compensated by a large telecommunications sector. There is also a biopharmaceutical cluster located in the region.

Madrid has a competitive advantage in the form of a generally strong supply of a well educated labour force. The region is number four after Île-de-France- and the two Italian regions in regards to number of university students and number two concerning students at research level, where the number of students exceeds 20,000. Madrid's strong position at the research level is accentuated by the fact that the region ranks number two after London in R&D personnel and researchers at higher education institutions and number four in private business R&D personnel and researchers.

28. Felix Bellido: Comunidad de Madrid Technological Innovation policy PPP inside clusters and competitiveness poles, October 4th 2007 Comunidad de Madrid Spain



Table: 10.1.3. Number of foreign investments in the ICT sector in Madrid by country

1. Investments	2007	2008	2009	Total
Overall Total	22	19	8	49
2. Investments by country	2007	2008	2009	Total
USA	4	5	1	10
UK	5	3		8
France	4	2		6
Germany	1	3		4
The Netherlands	1		2	3
Japan	1	1	1	3
Finland		1	1	2
Bermuda	1	1		2
Taiwan	1			1
Italy	1			1
Russia		1		1
Sweden			1	1
Austria			1	1
Argentina	1			1
Belgium		1		1
Switzerland	1			1
Canada		1		1
Portugal	1			1
Mexico			1	1
Overall Total	22	19	8	49

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

If we look at the number of foreign investments, there are fewer compared to London and Île-de-France but more than in Lazio and Lombardy. The traditional strong ICT countries top the list with the USA at the top followed by the UK, France and Germany. Otherwise, there is an even distribution of foreign investments by a series of countries.



Table: 10.1.4. Number of foreign investments in ICT by sectors in Madrid

Investments by ICT sector	2007	2008	2009	Total
Software & IT services	10	11	2	23
Communications	7	7	4	18
Business Machines & Equipment	2		1	3
Electronic Components	2	1		3
Semiconductors	1			1
Space & Defence			1	1
Overall Total	22	19	8	49

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

If we look at the sectors in which foreign investments have been made, we can again observe the traditional picture of Software & IT services at the top. The difference to number second Communications is however not large, compared to other clusters. This indicates that Madrid's telecommunication sector is rather large. This sector is also, together with Post, the largest sector in Madrid's ICT cluster.

ICT firms in Madrid:

- AETIC, INDRA, GMV, AMPER, TELEFÓNICA (Telefónica de España,) I+D, SECUREWARE, IMADE

10.2. The Catalonia (Barcelona) ICT cluster

Table: 10.2.1. Catalonia (Barcelona) 2007

Population	7,161,700
Number of employed	3,510,600
Employed in ICT	72,803
Number of universities	10
Number of students at university level	188,029*
Number of Ph.d students	11,650*
R&D staff at university	26,138
R&D staff at public sector research	7,469
R&D staff at business sector	30,474

* 2006

Source: Eurostat and Universities Worldwide



Table: 10.2.2. Structure of the ICT sector in Catalonia (Barcelona)

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	792	234
32. Manufacture of radio, television and communication equipment and apparatus	8,016	319
33. Manufacture of medical, precision and optical instruments, watches and clocks	10,735	1,209
64. Post and telecommunications	11,903	1,023
72. Computer and related activities	41,357	8,286

Source: Eurostat: Regional Structural Business Statistics

The city centre has slightly more than 1.5 million inhabitants in an area of almost 100 square kilometers. When including the 26 municipalities, which surround Barcelona and are located in the neighbourhood of the ICT cluster, the total number of inhabitants is more than 7 million. The largest sectors in the Barcelona ICT clusters are, besides Computer & related activities, Telecommunication and Medical equipment.

Although the Barcelona ICT cluster is rather small in a European context, it has succeeded in effectively branding itself and has become quite well known. The city of Barcelona's own statistical research shows a larger ICT sector than our analysis based on Eurostat statistics. They reach a share of 4.8% of the employment while our analysis shows a share of 1.1% in Catalonia. There are also other high-tech industries in Barcelona, for example a biopharmaceutical cluster with about 25,000 employees (European Cluster Observatory).

If we look at the research level it is interesting to note that the general number of R&D personnel and researchers in the higher education institutions is high. With its 26,138 persons employed in this sector, the number is higher than in for example the German regions and in the Cambridge and Oxford regions. Also when it comes to number of R&D personnel and researchers generally in private business research, the region stands strong, where only Oberbayern, The Øresund Region and Darmstadt is stronger among the investigated clusters.



Table: 10.2.3. Number of foreign investments in the ICT sector in Catalonia (Barcelona) by country

1. Investments	2007	2008	2009	Total
Overall Total	13	12	4	29
2. Investments by country	2007	2008	2009	Total
USA	5	1	2	8
Germany	4	3		7
France	2	4		6
UK	2		1	3
The Netherlands		1		1
Denmark			1	1
South Korea		1		1
Japan		1		1
Argentina		1		1
Overall Total	13	12	4	29

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

The foreign investments in Barcelona are only about 60% of those in the Madrid region. The investments are dominated again by the USA, although, the domination is not as great as in other clusters. Two traditionally strong ICT countries; Germany and France follow the USA. There is also an investment from Denmark in the Barcelona cluster.

Table: 10.2.4. Number of foreign investments in ICT by sector in Catalonia (Barcelona)

Investments by ICT sector	2007	2008	2009	Total
Software & IT services	9	6	1	16
Electronic Components	2	3		5
Communications	1	1	1	3
Business Machines & Equipment		1	1	2
Semiconductors	1	1		2
Business Services			1	1
Overall Total	13	12	4	29

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

Again, as in other clusters, we can see a strong domination of foreign investments in Software & IT services, expressing the domination of Computer & related activities in the ICT structure. Noteworthy is also the relatively small number of investments in telecommunications, despite this sector's relative important status in the ICT structure.

The ICT sector in Barcelona is dominated by small and medium sized firms, mainly operating in software. One of these is GTD, Ingenieria de Sistemas y de Software, which provides information and control systems for different sectors such as space, defence, aeronautics, industry and science.



Another software firm is Adhoc Synectic Systems SA, which focuses on software engineering oriented towards projects. In the Telecom sector, after the liberalization of the market, private firms have been established, for instance Auna and Retevision, but also foreign firms such as T-systems – a German telecom company. But the public Telefónica is still the dominant telecom company in Barcelona. Some foreign companies also have production plants in the Barcelona region, like Hewlett Packard, Sony, Samsung and CISCO²⁹.

11. The German ICT clusters

Germany is still the largest ICT market in the EU. The European ICT market is a fragmented market where national interests dominate. There is a need for a real single internal market, both in the sectors of production and in research³⁰.

11.1. The Berlin ICT cluster

Table: 11.1.1. Berlin 2007

Population	3,404,037
Number of employed	1,502,400
Employed in ICT	14,141*
Number of universities	15
Number of students at university level	134,547**
Number of PhD students	:
R&D staff at university	17,406
R&D staff at public sector research	11,073
R&D staff at business sector	11,228

* Limited report for some of the ICT sub sectors,

** 2006

Source: Eurostat and Universities Worldwide

Table: 11.1.2. Structure of the ICT sector in Berlin

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	255	9
32. Manufacture of radio, television and communication equipment and apparatus	5,307	48
33. Manufacture of medical, precision and optical instruments, watches and clocks	8,579	88
64. Post and telecommunications	NA	NA
72. Computer and related activities	NA	NA

Source: Eurostat: Regional Structural Business Statistics

29. Bosch, Júlia and Capel, Laura: The Barcelona ICT cluster study (2004)

30. Heidi Wiig Aslesen Prospective Innovation Challenges in the ICT Sector, Europe Innova report 2008



It is difficult to get a clear overview of the size of the ICT cluster in Berlin, because two of the traditionally large sectors of the ICT structure have been subject to discretion, which are Telecommunications and Computer & related activities. But it is nevertheless obvious that the Berlin ICT cluster does not belong among the large ICT clusters in Europe and not even in Germany, where this position is held by Cologne followed by Munich. Besides the ICT cluster, there is also a biopharmaceutical cluster and an analytical instruments cluster in Berlin (European Cluster Observatory). This is also mirrored in the structure of ICT manufacturing in Berlin, where Manufacturing of medical, precision and optical instruments constitutes the largest sector.

Table: 11.1.3. Number of foreign investments in ICT in Berlin by country

1. Investments	2007	2008	2009	Total
Overall Total	7	8	5	20
2. Investments by country	2007	2008	2009	Total
USA	1	4	3	8
UK	2	2	1	5
Macedonia			1	1
The Netherlands		1		1
Ukraine		1		1
Japan	1			1
Bermuda	1			1
Switzerland	1			1
Liechtenstein	1			1
Overall Total	7	8	5	20

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

There were 20 foreign investments in Berlin during the three-year period, which is the same amount as in Stockholm. There are only two countries that distinguished themselves with many investments in the Berlin ICT sector, namely the USA at the top followed by the UK. The other countries have only made a single investment.

Table: 11.1.4. Number of foreign investments in ICT by sector in Berlin

Investments by ICT sector	2007	2008	2009	Total
Software & IT services	5	4	3	12
Communications	1	3	1	5
Electronic Components	1	1	1	3
Overall Total	7	8	5	20

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database



If we look at the sectors of foreign investments, Software & IT services is once again a clear number one followed by Communications. This investment structure could indicate that the Berlin ICT cluster follows a traditional structure with a strong Computer & related activities sector followed by Telecommunications.

11.2. The Hamburg ICT cluster

Table: 11.2.1. Hamburg 2007

Population	1,754,182
Number of employed	849,900
Employed in ICT	NA
Number of universities	6
Number of students at university level	69,166*
Number of PhD students	:
R&D staff at university	8,243
R&D staff at public sector research	2,995
R&D staff at business sector	7,496

* 2006.

Source: Eurostat and Universities Worldwide

Table: 11.2.2. Structure of the ICT sector in Hamburg

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	NA	2
32. Manufacture of radio, television and communication equipment and apparatus	NA	9
33. Manufacture of medical, precision and optical instruments, watches and clocks	5,289	45
64. Post and telecommunications	NA	NA
72. Computer and related activities	NA	NA

Source: Eurostat: Regional Structural Statistics Business



The city of Hamburg states that the number of employed in the ICT sector in Hamburg is 70,000. But here it is important to note that a large proportion of this employment are in the magazine and newspaper sector; industries that in Hamburg has been placed in the ICT sector, although it is media subsumed under “multimedia”. Traditional media (press, radio, TV, film) have always formed a major part of the private sector in Hamburg, independent of the development of the ICT in recent years. But the multimedia sector is big. There are more than 1,300 companies in the field of cinema and a large part of the 2,780 multimedia companies in Hamburg hold significant positions in the sector of digital moving images as is also the case with Web TV, video-on-demand, mobile TV or IP-TV, which are revitalising economic factors in the form of “new television”. From our research, we can also observe that Hamburg has several clusters in other sectors than ICT, for example logistics, aerospace vehicles, defence and the medical sector³¹.

Table: 11.2.3. Number of foreign investments in ICT in Hamburg by country

1. Investments	2007	2008	2009	Total
Overall Total	0	3	5	8
2. Investments by country	2007	2008	2009	Total
USA			3	3
UK			2	2
The Netherlands		1		1
Spain		1		1
Luxembourg		1		1
Overall Total	0	3	5	8

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

There are rather few foreign investments made in the Hamburg ICT sector – less than half of that in Berlin. Noticeable is also that there is no American domination in foreign investments, contrary to the general European trend. The USA has only made one investment more than the UK, which comes in second.

Table: 11.2.4. Number of foreign investments in ICT by sector in Hamburg

Investments by ICT sector	2007	2008	2009	Total
Software & IT services		2	3	5
Business Machines & Equipment			1	1
Communications		1		1
Semiconductors			1	1
Overall Total	0	3	5	8

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

More than half of the foreign investments are made in Software & IT services, which indicates a strong Computer & related activities sector, also in line with a strong multi-media sector.

31. Regional Research & Innovation Service, Hamburg



11.3. The Munich (Oberbayern) ICT cluster

Table: 11.3.1. Munich (Oberbayern) 2007

Population	4,279,112
Number of employed	2,177,300
Employed in ICT	110,472
Number of universities	8
Number of students at university level	:
Number of PhD students	:
R&D staff at university	18,451
R&D staff at public sector research	10,302
R&D staff at business sector	48,371

Source: Eurostat and Universities Worldwide

Table: 11.3.2. Structure of the ICT sector in Munich (Oberbayern)

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	4,656	21
32. Manufacture of radio, television and communication equipment and apparatus	29,905	55
33. Manufacture of medical, precision and optical instruments, watches and clocks	18,197	143
64. Post and telecommunications	16,235	487
72. Computer and related activities	41,479	6,372

Source: Eurostat: Regional Structural Business Statistics

The Munich area was very quick to start up production of ICT equipment. This happened in 1954 when Siemens started up production of computers in Munich.

Today, some of the world's largest ICT firms are located in the area. Also, some of the European ICT headquarters are located in the Munich region. Some of them are Microsoft, Compaq, Hewlett-Packard, NEC, Silicon Graphics, Seagate and Oracle.

As we have seen in other clusters, there are also other high-tech clusters in the region. Munich is also the home of a considerable biotechnology cluster with 12,000 employees working in Life Sciences³². But there are also clusters within sectors like medical devices, analytical instruments, automotive industry and business services³³. Munich also has several business incubators, e.g. the Munich Technology Centre located in the town of Garching in the Northern Munich region. In order to strengthen knowledge development and

³². The European Commission, Enterprise & Industry Directorate General, launched *e-Business W@tch p*

³³. European Cluster Observatory



knowledge transfer, organisations for supporting ICT development have been established. In relation to knowledge transfer, organisations such as the Corporation for Innovation and Knowledge Transfer and Bayern Patent³⁴ support the innovation process in the region. But also to support finance and venture capital, there are organisations and firms in the area specialised in different stages of company development, like suppliers of corporate venture capital and private investors in the Munich Business Angel Network.

As is the case for most clusters and national initiatives, the innovation processes in the region are publicly supported. The state of Bavaria seeks to support ICT and e-business companies, including the Software Offensive Bavaria³⁵ and Invest in Bavaria³⁶. The City of Munich Department of Labour and Economic Development (as well as the semi-public Chamber of Commerce and Industry for Munich and Upper Bavaria) are also considerably involved in providing support to start-ups.

There is also a strong, general, private business research sector in Oberbayern. Oberbayern was the clear number one in the statistics available from Eurostat, with 48,371 employed R&D personnel and researchers followed by the Øresund Region.

Table: 11.3.3. Number of foreign investments in ICT in Munich by country

1. Investments	2007	2008	2009	Total
Overall Total	20	14	13	47
2. Investments by country	2007	2008	2009	Total
USA	10	7	8	25
Japan	3	1	1	5
France	2	1	1	4
Russia	1	1		2
UK	2			2
The Netherlands			1	1
Spain			1	1
Italy		1		1
Sweden		1		1
Austria	1			1
Cyprus			1	1
Switzerland		1		1
Canada	1			1
China		1		1
Overall Total	20	14	13	47

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

34. Se: <http://www.bayernpatent.de>

35. Se: <http://www.software-offensive-bayern.de>

36. www.invest-in-bavaris.de



There are rather many foreign investments in the Munich ICT cluster taking its size into account. The number of investments matches that of the much larger Madrid ICT cluster. The number of foreign investments is also much larger than for the other German ICT clusters. There is a very strong American domination, which accounts for more than half of the number of foreign investments. Far behind, we find Japan as number two. This is the European ICT cluster in our study with the most Japanese investments. Russia is also present as an investor.

Table: 11.3.4. Number of foreign investments in ICT by sector in Munich (Oberbayern)

Investments by ICT sector	2007	2008	2009	Total
Software & IT services	11	9	10	30
Semiconductors	3	2	1	6
Communications	2	1	2	5
Electronic Components	2	1		3
Business Machines & Equipment	1			1
Industrial Machinery, Equipment & Tools		1		1
Space & Defence	1			1
Overall Total	20	14	13	47

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

We see a very strong domination of foreign investments in Software & IT services, with nearly two thirds of the foreign investments in this sector. Computer & related activities, that is IT services and consultancy, is also the largest sector in the Munich ICT structure. Noticeable is also the low level of foreign investments in communication – the same amount as in the much smaller Berlin cluster.

11.4. The Darmstadt (Hessen) ICT cluster

Table: 11.4.1. Darmstadt 2007

Population	3,772,906
Number of employed	1,795,300
Employed in ICT	109,218
Number of universities	4
Number of students at university level	:
Number of PhD students	:
R&D staff at university	9,542
R&D staff at public sector research	3,903
R&D staff at business sector	31,253

Source: Eurostat and Universities Worldwide

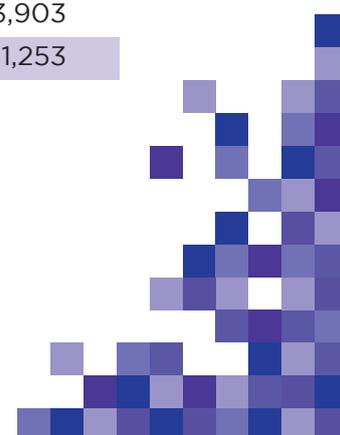


Table: 11.4.2. Structure of the ICT sector in Darmstadt (Hessen)

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	381	6
32. Manufacture of radio, television and communication equipment and apparatus	4,558	24
33. Manufacture of medical, precision and optical instruments, watches and clocks	13,859	106
64. Post and telecommunications	46,355	1,420
72. Computer and related activities	44,065	4,661

Source: Eurostat: Regional structural business statistics

Hessen with Frankfurt and not least Darmstadt is one of Germany's industrial centers. In this region a large part of Germany's manufacturing industries is located, for example chemicals and pharmaceuticals, motor vehicles, electrical engineering and machinery. In addition, Frankfurt is one of Europe's financial centers and there are collaborations on material technology, called Materials Valley Competence Network for Materials Research.

The Networking organisation CAST e.V. offers a range of services within secure modern information technology. The organisation also establishes collaborations between firms in the IT security industry. The purpose of this network is to develop knowledge about IT security and technology education at all levels. If we look at the ICT structure in the Darmstadt cluster, it is interesting to note that this cluster is one of the few clusters in our study where Post and telecommunication constitutes the largest sector.

As Oberbayern, the Darmstadt region holds a strong position in private business research – in our study it is ranked number three with more than 30,000 R&D personnel and researchers employed. There are also a number of ICT researchers in the region, with more than 350 professors active in the field of ICT, more than 150 of them in Darmstadt and more than 50 in Frankfurt.



Table: 11.4.3. Number of foreign investments in ICT in Darmstadt (Hessen) by country

1. Investments	2007	2008	2009	Total
Overall Total	16	7	9	32
2. Investments by country	2007	2008	2009	Total
USA	9	3	4	16
The Netherlands	3	1	1	5
Switzerland	1	1	1	3
China	1	1		2
Norway			1	1
Finland			1	1
Japan	1			1
Bermuda		1		1
UK			1	1
France	1			1
Overall Total	16	7	9	32

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

Following the general trend in our investigation, USA is the dominant foreign investor with half of the foreign investments in the Darmstadt ICT cluster. Interesting, however, is that it is not the traditional ICT countries which we have seen in the other clusters that follows but the Netherlands, Switzerland and China.

Table: 11.4.4. Number of foreign investments in ICT by sector in Darmstadt (Hessen)

Investments by ICT sector	2007	2008	2009	Total
Software & IT services	11	3	5	19
Communications	3	4	3	10
Consumer Electronics			1	1
Electronic Components	1			1
Textiles	1			1
Overall Total	16	7	9	32

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

Software & IT services are the dominant sectors for foreign investments. Nearly 60% of the foreign investments go into this sector. Particular for Darmstadt is the large number of foreign investments in Communications. Nearly one third of the investments went into this sector. Only Madrid has a larger share of foreign investments in Communications. One explanation of this foreign investment pattern can be that telecommunications constitute the largest sector in the cluster.



11.5. The Karlsruhe ICT cluster

Table: 11.5.1. Karlsruhe

Population	2,734,260
Number of employed	1,331,400
Employed in ICT	69,510
Number of universities	4
Number of students at university level	:
Number of PhD students	:
R&D staff at university	12,675
R&D staff at public sector research	8,667
R&D staff at business sector	18,511

Source: Eurostat and Universities Worldwide

Table: 11.5.2. Structure of the ICT sector in Karlsruhe

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	453	7
32. Manufacture of radio, television and communication equipment and apparatus	8,218	38
33. Manufacture of medical, precision and optical instruments, watches and clocks	17,846	132
64. Post and telecommunications	6,012	362
72. Computer and related activities	36,971	2,565

Source: Eurostat: Regional Structural Business Statistics

The ICT employment in Karlsruhe constitutes about two thirds of that in Darmstadt. As the figure shows, ICT manufacturing in Karlsruhe is focused on medical, precision and optical instruments. Here, Karlsruhe is in line with the ICT manufacturing structure of Darmstadt. Southern Germany has a strong position in this kind of manufacturing industry. A big difference between Karlsruhe and Darmstadt however, is the weak position of the Post & telecommunications sector in the former. Contrary, this sector is the strongest of the Darmstadt's ICT cluster.

In the Karlsruhe region, an analytical instruments cluster is also located³⁷. Electro-technology and fine mechanics is a large sector within manufacturing, and only the automobile industry with Daimler Chrysler is larger. Also, the chemical industry and the machine industry are strongly positioned.

Among the ICT firms in the region are Internet providers and service firms such as 1&1 Internet AG and Schlund + Partner AG, where the latter is a provider of Internet services for SMEs. Germany's second largest web-portal has its headquarter in Karlsruhe.

37. European Cluster Observatory



Karlsruhe Informatik Cooperation (KIK) is cooperation between the business and science sectors, which specializes in Informatics at Karlsruhe University³⁸.

Table: 11.5.3. Number of foreign investments in ICT in Karlsruhe by country

1. Investments	2007	2008	2009	Total
Overall Total	5	10	4	19
2. Investments by country	2007	2008	2009	Total
USA	2	3	2	7
France	1	2		3
Switzerland	1		1	2
The Netherlands		1		1
Denmark		1		1
Italy	1			1
Japan		1		1
Brazil			1	1
Austria		1		1
Canada		1		1
Overall Total	5	10	4	19

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

The level of foreign investments in Karlsruhe is about the size of that in Stockholm. The country pattern is the traditional of European ICT clusters with the USA leading the table by far followed by a traditionally strong ICT country; France. Just like in Darmstadt, Switzerland is ranked number three. Denmark has also made an investment during the three year period.

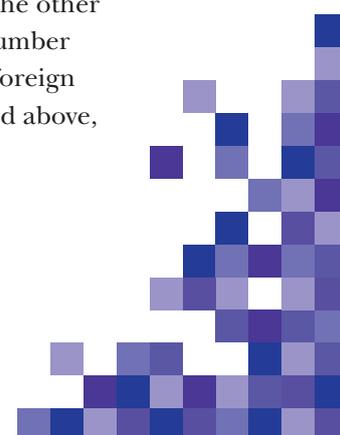
Table: 11.5.4. Number of foreign investments in ICT by sector in Karlsruhe

Investments by ICT sector	2007	2008	2009	Total
Software & IT services	4	6	4	14
Electronic Components		3		3
Business Services	1			1
Communications		1		1
Overall Total	5	10	4	19

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

Also in regards to foreign investments by sector Karlsruhe follows the pattern of the other researched European ICT clusters, with Software & IT services dominating the number of foreign investments. Contrary to Darmstadt, there have not been made many foreign investments in Communications. The Telecommunications sector is, as mentioned above, also much smaller in Karlsruhe.

38. www.technologieregion-karlsruhe.de



11.6. The Cologne/Bonn ICT cluster

Table: 11.6.1. Cologne/Bonn 2007

Population	4,386,271
Number of employed	1,979,100
Employed in ICT	360,201
Number of universities	11
Number of students at university level	107,802*
Number of PhD students	NA
R&D staff at university	19,609
R&D staff at public sector research	11,784
R&D staff at business sector	14,083

*

Source: Eurostat and Universities Worldwide and German Academic Exchange Service

There are 3 large universities: One in Cologne, one in Bonn and one in Aachen. These are also the largest cities in the county together with Leverkusen.

Table: 11.6.2. Structure of the ICT sector in Cologne County

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	1,141	11
32. Manufacture of radio, television and communication equipment and apparatus	1,679	16
33. Manufacture of medical, precision and optical instruments, watches and clocks	6,860	100
64. Post and telecommunications	317,404	2,979
72. Computer and related activity	33,117	4,740

Source: Eurostat: Regional Structural Business Statistics

Cologne is the second largest ICT cluster in Europe, surpassed only by Île-de-France. The ICT sector in Cologne is strongly dominated by the Post & telecommunications sector, which is stronger than in other large ICT clusters in Europe, except for Île-de-France. The main reason for the large ICT sector in the county of Cologne is that Deutsche Telekom, Deutsche Post and the courier company DHL, all have their headquarters in Bonn. If we leave out the Post & telecommunication sector and only look at Computer & related activities, Cologne goes significantly further down the list of clusters in Europe. In this case the Cologne ICT cluster only comes in as number 13 in Europe.



Table: 11.6.3. Number of foreign investments in the ICT sector in Cologne by country

1. Investments	2007	2008	2009	Total
Overall Total	NA*	NA	NA	NA
2. Investments by country	2007	2008	2009	Total
Overall Total	NA	NA	NA	NA

Table: 11.6.4. Number of foreign investments in ICT by sector Cologne

Investments by ICT sector	2007	2008	2009	Total
Overall Total	NA	NA	NA	NA

* It has not been possible to get investment information from Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database for Cologne.

Cologne's ICT sector is quite special. Although it is clearly no 2 in Europe at the total level, it is only no 13 in Europe in Computer & related activities, where it is considerably weaker and in line with the surrounding German ICT clusters like Karlsruhe.

12. The Netherlands

12.1. The Noord-Holland ICT Cluster

Table: 12.1.1. Noord-Holland 2007

Population	2,613,070
Number of employed	1,393,800
Employed in ICT	50,415
Number of universities	4
Number of students at university level	79,485*
Number of PhD students	1,054*
R&D staff at university	:
R&D staff at public sector research	3,969
R&D staff at business sector	7,664

* 2006 Source: Eurostat and Universities Worldwide



Table: 12.1.2. Structure of the ICT sector in Noord-Holland

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	116	NA
32. Manufacture of radio, television and communication equipment and apparatus	426	NA
33. Manufacture of medical, precision and optical instruments, watches and clocks	3,017	NA
64. Post and telecommunications	20,408	1140
72. Computer and related activities	26,448	4,460

Source: Eurostat: Regional Structural Business Statistics

Table: 12.1.3. Number of foreign investments in ICT in Noord-Holland by country

1. Investments	2007	2008	2009	Total
Overall Total	15	21	7	43
2. Investments by country	2007	2008	2009	Total
NA	15	21	7	43
Overall Total	15	21	7	43

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

Table: 12.1.4. Number of foreign investments in ICT by sector in Noord-Holland

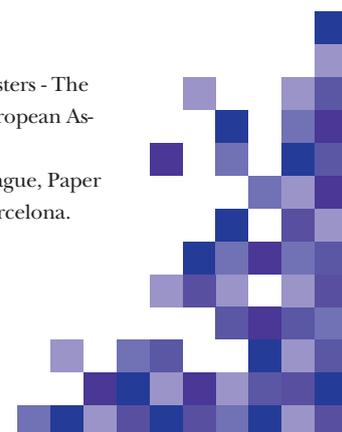
Investments by ICT sector	2007	2008	2009	Total
NA				
Overall Total	15	21	7	43

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database

The cluster in Noord-Holland is located around the capital of Amsterdam. The cluster is closely related to the media sector, which has an ICT media cluster cooperation between 7,500 companies³⁹. Not only the media sector, but also the finance sector has been an important driving force for the Amsterdam ICT cluster growth. The presence of many publishers, advertisement agencies and other segments of the media industry has provided for a rich and demanding client base for the ICT sector in Amsterdam⁴⁰.

39. van Winden, Willem and Woets, Paulus: Local Strategic Networks and Policies in European ICT Clusters - The cases of Amsterdam, Bari, Dublin and Oulu, Paper prepared for the 15th Annual Conference of the European Association for Evolutionary Political Economy, Maastricht, The Netherlands, 7th – 10th November 2003

40. van Winden, Willem: ICT clusters in European cities: The cases of Helsinki, Manchester and The Hague, Paper for the 40th congress of the European Regional Science Association, August 29 – September 1 2000, Barcelona.



12.2. North-Brabant

Table: 12.2.1. North-Brabant 2007

Population	2,419,042
Number of employed	1,257,900
Employed in ICT	46,710
Number of universities	4
Number of students at university level	79,318*
Number of PhD students	814*
R&D staff at university	..
R&D staff at public sector research	592
R&D staff at business sector	19,681

*2006 Source: Eurostat and Universities Worldwide

Table: 12.2.2. Structure of the ICT sector in North-Brabant

NACE code	Number of employed	Number of local units
30. Manufacture of office machinery and computers	260	..
32. Manufacture of radio, television and communication equipment and apparatus	6,684	..
33. Manufacture of medical, precision and optical instruments, watches and clocks	8,818	...
64. Post and telecommunications	13,192	825
72. Computer and related activities'	17,756	3,095

Source: Eurostat: Regional Structural Business Statistics

Table: 12.2.3. Number of foreign investments in ICT in North-Brabant by country

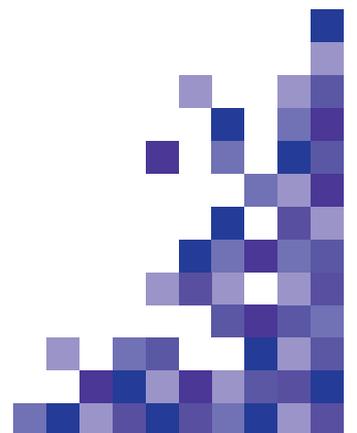
1. Investments	2007	2008	2009	Total
Overall Total	3	4	5	12
2. Investments by country	2007	2008	2009	Total
NA	3	4	5	12
Overall Total	3	4	5	12

Source: Copenhagen Capacity/ fDi Markets-Cross-border Investment Monitor database



Along with the Limburg region, the North Brabant County is the manufacturing industry centre of the Netherlands. Apart from the ICT industry, other groups of companies also dominate the region, for example Automotive (DAF), Mechatronics, Medical Technology (Life Tech), Design and Food groups. Eindhoven is the home to the large firm Philips, which is also active in the ICT industries. The large number of people employed in the NACE 32 has an impact on this location. Today, Philips' headquarter is based in Amsterdam. Key areas of ICT in the Eindhoven region involve the design of software-intensive systems, the design of software components, modules and architectures for such systems and special techniques for development in the area of architecture, quality maintenance, testing and integration, system evaluation, configuration, and so forth⁴¹.

41. Cross works, transnational, cooperation of Cross-border innovations network.



Summary

The purpose of this report has been to give an overview of the most important ICT clusters in Europe, but also to identify and present ICT clusters, which the Øresund ICT cluster through geographical proximity is in closer competition with. The purpose has therefore not been to make a SWOT analysis of the different ICT clusters, which would require a much deeper analysis.

The report has identified a “high-technology belt” which ICT clusters also are a part of. The belt stretches from southern Finland, over southern Sweden, Denmark, southern England and southern and western Germany, Île-de-France to northern Italy. However, outside of these points there are also strong ICT clusters in Madrid and Rome.

The conditions for establishing an ICT cluster are dependent on a well-developed framework in the form of:

- Technical and educational infrastructure;
- Financial institutions;
- A functioning legal structure.

Furthermore, it is of utmost importance to be part of international communication structures. A creative social environment should be present so that it is possible to establish contact to other firms in the form of networking and innovation development. These conditions are best satisfied in the large urban areas of Europe and in societies with a well-developed public infrastructure.

This report has identified the ICT cluster of Île-de-France as a superior number one measured on employment followed by Cologne, Lazio, Madrid, Lombardy and London. This fact points to the importance of being part of a densely populated region and the resources this enables.

The Øresund Region is ranked 12 among the researched regions in Europe. The ICT cluster in the Øresund Region is larger than the better known clusters in Barcelona and Cambridge as well than the neighboring clusters in Helsinki, Oslo, Hamburg and Berlin.

One way of measuring the appeal of an ICT cluster is to measure the number of foreign investments made in the cluster. Here, we can see that the largest clusters are also those that receive the largest number of foreign investments. London and Île-de-France are in a league of their own outnumbering the other clusters in terms of numbers of foreign investments, which again supports the assumption that large urban environments have the necessary framework conditions to attract investors, although Rome is characterised by a low number of foreign investments. Cambridge for example is at the bottom of the list. In all the clusters, USA is the most dominant foreign investor. Other important foreign investors in the various European clusters are strong ICT countries like the UK, France and Germany.

Also concerning the allocation of foreign investments on ICT sectors, we can identify a common pattern for the ICT clusters in Europe. In all countries investments are primarily made in the category of Software & IT services.



This is in accordance with the ICT structure, because Computer & related activities, which covers consultancy and IT services, dominate in nearly all clusters. The general structure in order is thus as follows:

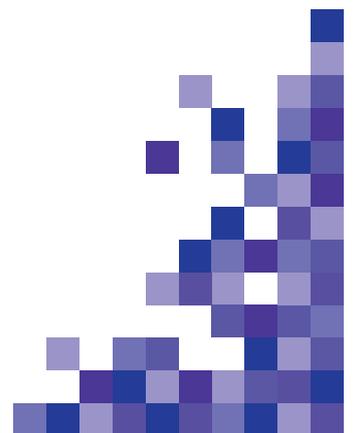
1. Computer & related activities
2. Post & telecommunications
3. Manufacture of medical, precision and optical instruments, watches and clocks
4. Manufacture of radio, television and communication equipment and apparatus
5. Manufacture of machinery and computers

Only a few clusters break this pattern, namely Paris, Madrid, Cologne, Rome and Darmstadt. They all have a strong Post & telecommunication sector, which is the largest in their ICT structure. Oberbayern, and partially Helsinki, also break the pattern. Their largest industry within ICT manufacturing is manufacture of radio, television, communication equipment and apparatus. Oberbayern is special in general by being strong in ICT manufacturing.

The importance of being embedded in a strong innovative environment has been emphasized in cluster theory, which has not only pointed at the necessity of an intense competition within the cluster, but also at the existence of strong framework conditions to support the innovative activities of the firm. Here, access to a highly educated labour force is decisive for competition based on a constant upgrade of products and processes. This report also shows that many of the large ICT clusters have the advantage of a large supply of university students, for example Île-de-France, Lazio, Madrid, Lombardy and London. Île-de-France and Madrid furthermore hold the two top positions in regards to number of research students, whereas the large clusters in Madrid and London also have a large supply of university researchers.

According to studies, a common feature of ICT clusters is that most of them are located in regions that also include other high-tech industries. This fact is supported by this study, which have showed a similar trend among the researched clusters. This is of course conditioned by the fact that these industries require an advanced infrastructure, for example supply of a highly educated labour force, but also that other high-tech industries often demand advanced ICT solutions, which require close interaction and cross-cluster cooperation within a region.

It is therefore no coincidence that we find the largest ICT concentrations in the large urban centers of Europe. These places offer advanced infrastructures in the form of research and educational capabilities, but also potential for cross-cluster interaction where ICT to an increasing extent can be embedded in other high-tech industries' innovation processes.



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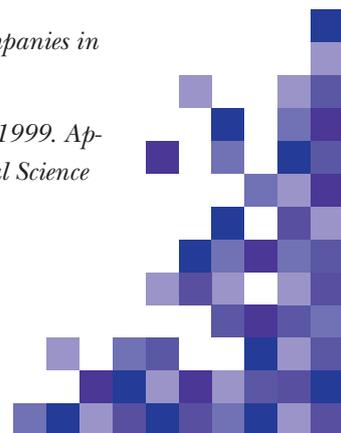
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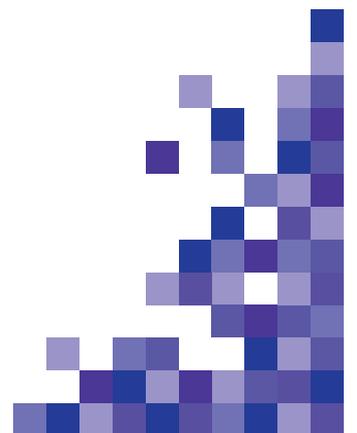
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Appendix I

- Specialisation: if a region is more specialised in a specific cluster category than the overall economy across all regions, this is likely to be an indication that the economic effects of the regional cluster have been strong enough to attract related economic activity from other regions to this location, and that spill-overs and linkages will be stronger. The ‘specialisation’ measure compares the proportion of employment in a cluster category in a region over the total employment in the same region, to the proportion of total European employment in that cluster category over total European employment (see equation). If a cluster category in a region has a specialisation quotient of 2 or more it receives a star.

$$\frac{(\text{Employment in a region in a category}) / (\text{Total employment in a region})}{(\text{Employment in a category in Europe}) / (\text{Total employment in Europe})}$$

- Focus: if a cluster accounts for a larger share of a region’s overall employment, it is more likely that spill-over effects and linkages will actually occur instead of drowning in the economic interaction of other parts of the regional economy. The ‘focus’ measure shows the extent to which the regional economy is focused upon the industries comprising the cluster category. This measure relates employment in the cluster to total employment in the region. The top 10 % of clusters, which account for the largest proportion of their region’s total employment, receive a star.
- If the number of employees in a cluster is less than 1000 people, the cluster is not given any stars, to prevent the appearance of very small insignificant clusters.

Appendix II

The report has used the ISCED 1997 international standard classification of education which has the following codes:

Code	Label
<input checked="" type="checkbox"/> TOTAL	Total (ISCED 1997)
<input type="checkbox"/> ISCED0	Pre-primary education - level 0 (ISCED 1997)
<input type="checkbox"/> ISCED1_3	Primary and secondary education - levels 1-3 (ISCED 1997)
<input type="checkbox"/> ISCED1	Primary education or first stage of basic education - level 1 (ISCED 1997)
<input type="checkbox"/> ISCED2	Lower secondary or second stage of basic education - level 2 (ISCED 1997)
<input type="checkbox"/> ISCED3	Upper secondary education - level 3 (ISCED 1997)
<input type="checkbox"/> ISCED3GEN	Upper secondary education - level 3 - general programmes (ISCED 1997)
<input type="checkbox"/> ISCED3VPV	Upper secondary education - level 3 - pre-vocational and vocational programmes (ISCED 1997)
<input type="checkbox"/> ISCED4	Post-secondary non-tertiary education - level 4 (ISCED 1997)



Code	Label
<input type="checkbox"/> ISCED4GEN	Post-secondary non-tertiary education - level 4 - general programmes (ISCED 1997)
<input type="checkbox"/> ISCED4VPV	Post-secondary non-tertiary education - level 4 - pre-vocational and vocational programmes (ISCED 1997)
<input type="checkbox"/> ISCED5_6	Tertiary education - levels 5-6 (ISCED 1997)
<input type="checkbox"/> ISCED5A	Tertiary programmes with academic orientation (ISCED 1997)
<input type="checkbox"/> ISCED5B	Tertiary programmes with occupation orientation (ISCED 1997)
<input type="checkbox"/> ISCED6	Second stage of tertiary education leading to an advanced research qualification - level 6 (ISCED 1997)
<input type="checkbox"/> UNK	Unknown

In the report ISCED5A has been used for students at university level and ISCED6 has been used for Ph.D.

Appendix III

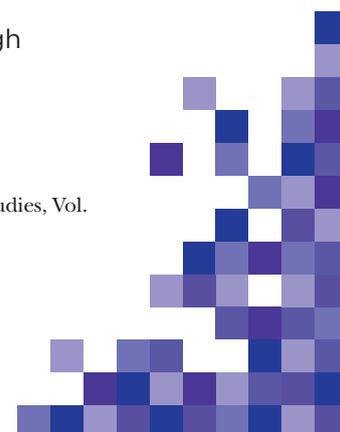
Another study has been carried out by the European Cluster Observatory. The European Cluster Observatory is managed by the Centre for Strategy and Competitiveness (CSC) at the Stockholm School of Economics, and is financed by the European Commission, DG Enterprise and Industry, under the Europe INNOVA initiative. It is the only survey which gives an overview of the different clusters' size relative to each other. This study is, however, associated with such large methodological problems that we have only chosen to discuss it in this appendix.



Table: 1. The specialisation by clusters in Europe 2007⁴²

Cluster	Employees	Size	Spec.	Focus	Eksport
Oberpfalz (Regensburg), DE	15,081	0.73 %	3.83	4.28 %	High
Berks, Bucks and Oxon (Oxford), UK	45,071	2.19 %	3.68	4.10 %	High
Karlsruhe, DE	36,164	1.76 %	3.41	3.81 %	High
Stockholm, SE	34,633	1.69 %	3.21	3.59 %	High
Malta, MT	4858	0.24 %	3.02	3.37 %	Low
Dresden, DE	16,185	0.79 %	2.81	3.14 %	High
Zürich, CH	23,685	1.15 %	2.80	3.12 %	N/A
Kozep-Dunantul (Székesfehérvár), HU	12,535	0.61 %	2.65	2.96 %	Low
Oberbayern (München), DE	45,026	2.19 %	2.56	2.85 %	High
Nyugat-Dunantul (Győr), HU	10,995	0.54 %	2.48	2.77 %	Low
Oslo og Akershus, NO	16,256	0.79 %	2.42	2.70 %	N/A
Kozep-Magyarország (Budapest), HU	30,735	1.50 %	2.27	2.53 %	High
Stuttgart, DE	36,592	1.78 %	2.25	2.51 %	High
Hants and Isle of Wight (Southampton), UK	20,428	0.99 %	2.20	2.46 %	High
Kärnten (Klagenfurt), AT	4635	0.23 %	2.13	2.38 %	Medium
Surrey, E and W Sussex (Brighton), UK	25,743	1.25 %	2.04	2.28 %	High
Darmstadt (Frankfurt am Main), DE	29,884	1.45 %	1.91	2.14 %	High
Lazio (Rome), IT	40,054	1.95 %	1.75	1.96 %	High
Ireland, IE	30,353	1.48 %	1.71	1.91 %	N/A
Inner London, UK	44,950	2.19 %	1.69	1.89 %	High
Île de France (Paris), FR	81,204	3.95 %	1.55	1.73 %	High

42. Definition is based on MICHAEL E. PORTER: The Economic Performance of Regions, Regional Studies, Vol. 37.6&7, pp. 549–578, August/October 2003 and translated to European NACE codes, see appendix IV.



A great problem of this study is that they will not reveal the NACE codes, which they have used for defining the ICT sector, although we have contacted them many times in this issue. The classification of European clusters in European Cluster Observatory is based on: Michael E. Porter: The Economic Performance of Regions, Regional Studies, Vol. 37.6&7, pp. 549–578, August/October 2003:

Information technologies are here defined as follows:

- Computers
- Electronic components and assemblies
- Peripherals
- Software
- Communications services
- Distribution and wholesaling
- Other electronic components and parts
- Recording media services
- Online information services
- Computer services
- Instruments
- Communications equipment
- Research organizations

From the list above we can see that the study uses a much broader definition of the ICT sector than the OECD. The above study includes for example media and research organizations.

Appendix IV

In the report the following OECD definition of the ICT sector has been used:

Definition of the information and communication technology (ICT) sector

- Basis: NACE, rev. 1.1 Level of definition: 4-digit
NACE, rev. 1.1 Descriptions
- ICT manufacturing:
 - 3001 Manufacture of office and accounting machinery
 - 3002 Manufacture of computing machinery
 - 3130 Manufacture of insulated wire and cable
 - 3210 Manufacture of electronic valves and tubes and other electronic components
 - 3220 Manufacture of television and radio transmitters and apparatus for in telephony and line telegraphy
 - 3230 Manufacture of television and radio receivers, sound or video recording or reproducing apparatus, and associated goods
 - 3320 Manufacture of instruments and appliances for measuring, checking, testing and navigating
 - 3330 Manufacture of industrial process control equipment



- ICT wholesale:
 - 5143 Wholesale of electrical household appliances and radio and television goods*
 - 5184 Wholesale of computers, computer peripheral equipment and software
 - 5186 Wholesale of other electronic parts and equipment
 - 5187** Wholesale of other machinery for use in industry, trade and navigation

- Telecommunications:
 - 6420 Telecommunications

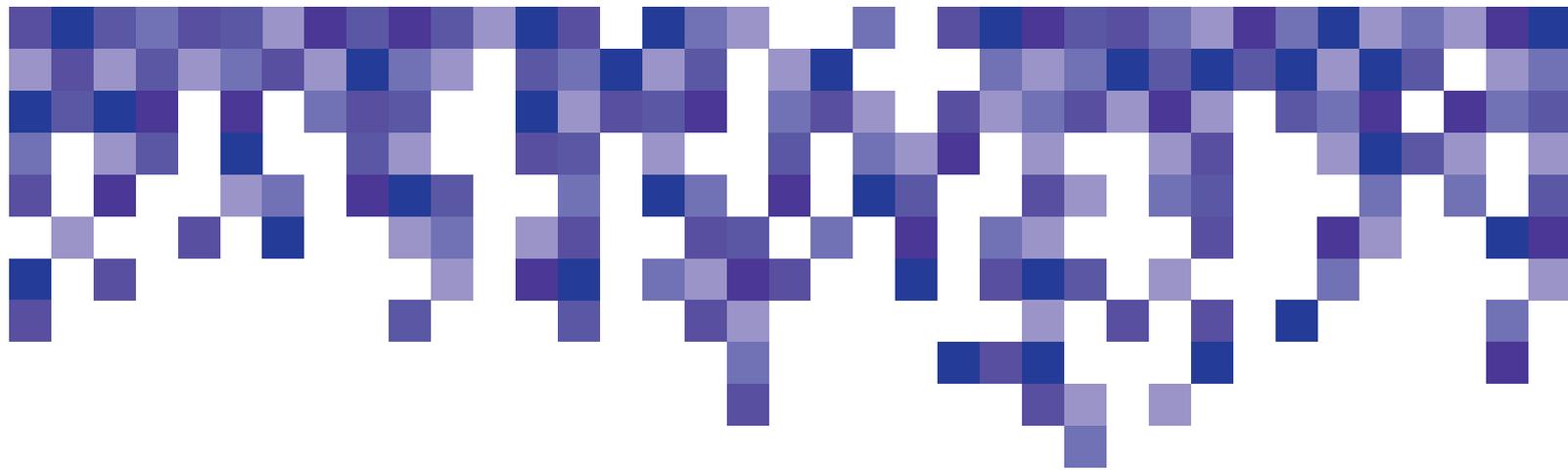
- ICT consultancy services:
 - 7133 Renting of office machinery and equipment including computers
 - 7210 Hardware consultancy
 - 7220 Software consultancy and supply
 - 7230 Data processing
 - 7240 Data base activities
 - 7250 Maintenance and repair of office, accounting and computing machinery
 - 7260 Other computer related activities

Source: United Nations Statistics Division: Correspondence tables between ISIC Rev 3.1. and NACE Rev 1.1.

* Here, Danish Statistics and Swedish Statistics have used a fifth digit to specify ICT -51432 Wholesale of radio and television

** Here Danish Statistics and Swedish Statistics have used a fifth digit to specify ICT. In Denmark it is 51871 Wholesale of electrical-installation material and in Sweden 51872 Wholesale of computerized material equipment and 51873 Wholesale of tele-products.





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