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The Case of Byen København as a European ICT Pole of Excellence Experts' Insights into Public Policies

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Preface

The European ICT Poles of Excellence (EIPE) research project is a joint project of DG CNECT and the JRC Institute for Prospective Technological Studies (Project Nr 31786-2010-06). It investigated the issues of growth, jobs and innovation, which have become the main priorities of the European Union's growth strategy programme 'Europe 2020'. The overall objectives of the EIPE project are to set the general conceptual and methodological conditions for defining, identifying, analysing and monitoring the existence and progress of current and future EIPE, in order to develop a clear capacity to distinguish these among the many European ICT clusters, observe their dynamics and offer an analysis of their characteristics.

The EIPE project spanned the period between 2010 and 2013. Over this time, it developed a tool based on a database of original ICT activity indicators, which was enriched with geographical information to allow localisation and aggregation at NUTS 3 level. The tool helps to answer such questions as:

- How is ICT R&D, innovation and economic activity distributed in Europe?
- Which locations are attracting new investments in the ICT sector?
- What is the position of individual European locations in the global network of ICT activity?

The EIPE project had four main steps (see Figure 1). First, European ICT Poles of Excellence were defined. Second, a statistical methodology to identify EIPE was elaborated. Third, the empirical mapping of EIPE was performed and fourth, an in-depth analysis of five NUTS 3 regions was undertaken. This work was documented in a series of EIPE reports:

- Defining European ICT Poles of Excellence. A Literature Review,
- Identifying European ICT Poles of Excellence. The Methodology,
- Mapping the European ICT Poles of Excellence. The Atlas of ICT Activity in Europe.
- Analysing the European ICT Poles of Excellence. Case studies of Inner London East, Paris, Kreisfreie Stadt Darmstadt, Dublin and Byen Kobenhavn.
- Key Findings and Implications of the European ICT Poles of Excellence project.

Figure 1: Overview of the EIPE project

STEP	Defining European ICT Poles of Excellence	Methodology to identify EIPE	Mapping EIPE	Zooming-in at the European ICT landscape
INPUT	Literature Review Taking stock of existing initiatives and case studies	Elaboration of indicators Identification of data sources Composite indicators	4 composite indicators based on 42 indicators on ICT R&D, Innovation and Business for the whole Europe at NUTS 3 level	Detailed information on ICT activity in Inner East London, Paris, Kreisfreie Stadt Darmstadt, Dublin and Byen Kobenhavn
OUTPUT	Definition of European ICT Poles of Excellence	Methodology to identify EIPE	Atlas of European ICT activity	An in-depth analysis of 5 key ICT locations in Europe
EIPE Report	1	2	3	4

More information on the European ICT Poles of Excellence (EIPE) project can be found at: <http://is.jrc.ec.europa.eu/pages/ISG/EIPE.html>

1. Introduction

1.1 Background

This report complements the EIPE case study report. It presents some of the public policies that local experts believe were intended to forge the profile of ICT activity in **Byen København** (code DK011), a NUTS 3 level region.¹

Byen København is part of the broader Danish region, Hovedstaden (NUTS 2), which consists of the municipalities of Copenhagen and Frederiksberg, the former counties of Copenhagen and Frederiksberg, and the regional municipality of Bornholm (Island). It is a NUTS 2 level region with the 24th highest level GDP per capita in Europe (Eurostat, 2013). The map below shows the localisation (in red) of the Region Hovedstaden (NUTS 2) in Denmark.



Byen København corresponds to the capital city of Copenhagen. Shown in the map below, it is located at the extreme south of Hovedstaden. It has a population of around 1.2 million inhabitants.



Henceforth, the report often uses the term "Copenhagen" to refer to **Byen København**.

¹ [Nomenclature of Territorial Units for Statistics \(NUTS\)](http://epp.eurostat.ec.europa.eu/portal/page/portal/nuts_nomenclature/introduction). For a list of the European statistical regions see: http://epp.eurostat.ec.europa.eu/portal/page/portal/nuts_nomenclature/introduction.

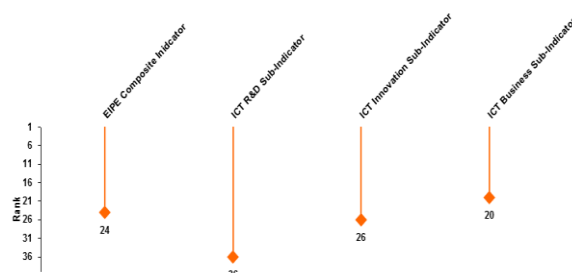
1.2 Copenhagen profile in global indexes and EIPE

1.2.1 Copenhagen in the EIPE ranking

Byen København (DK011) comes 24th among 1303 regions in Europe according to the EIPE final composite indicator ranking. It is surpassed by regions such as for example Munchen, Landkreis; Heidelberg, Stadtkreis; Stuttgart, Stadtkreis; Edinburgh; Berlin; Milano or Hauts-de-Seine.

Figure 2 shows Byen København's position by individual sub-indicators. According to this information, Byen København comes 36th in R&D, 26th in innovation and 20th in business activity.

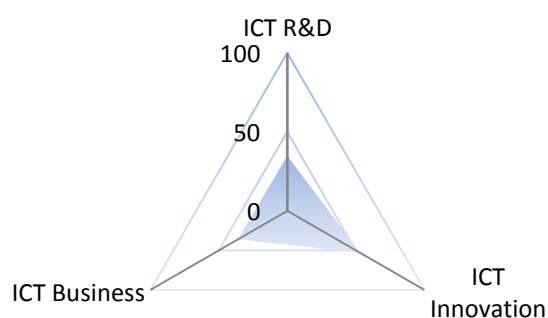
Figure 2: Byen København in the EIPE ranking by EIPE composite indicator, ICT R&D, Innovation and Business sub-indicators



Note: The graph shows the performance of Byen København in the overall EIPE ranking and the ICT R&D, ICT Innovation and ICT Business ranking. The scale represents the rank in comparison with the remaining 1302 European Nuts 3 regions. For further methodological details please refer to (De Prato and Nepelski 2013).

Its relative performance in all three domains, i.e. ICT R&D, ICT Innovation and ICT Business is depicted in Figure 3. This figure compares the performance of Byen København across all three domains, i.e. ICT R&D, ICT Innovation and ICT Business. It shows that Byen København performs best in the ICT innovation ranking. On the normalised scale, it scores 50 points out of 100. In the remaining two categories it reached 36.

Figure 3: Performance of Byen København in ICT R&D, Innovation and Business



Note: The graph represents the performance of Byen København in the ICT R&D, ICT Innovation and ICT Business rankings. The scale represents normalized scores with maximum 100 and minimum 0. The rankings are based on the analysis of 1303 European Nuts 3 regions. For further methodological details please refer to the report documenting the methodology behind the EIPE ranking (De Prato and Nepelski 2013).

1.2.2 Denmark and Copenhagen in global indexes

Denmark is classified as an OECD high-income country with a GNI per capita of US\$ 60,390 by the World Bank's "Doing Business: Economy Profile: Denmark" report.² Of the 185 countries ranked by the World Bank for their business environments, Denmark comes 5th. Compared with similar economies, Denmark is ahead of Norway (6th), Finland (11th), Sweden (13th), Iceland (14th) and Germany (20th).

Denmark ranks 4th in terms of digital economy, according to a 2012 report from the French Ministry of Finance.³ The last issue of the Global Innovation Index (GII 2013) ranks Denmark 9th⁴ (down from 7th in 2012). According to the GI report, Denmark fares very well on indicators for government bodies and activities in the digitization index. Chapter 1 of the GI report comments: "The strength of this country of 5.8 million people is in the Input Sub-Index⁵ (8th), with a 14th position in the Output Sub-Index.⁶ Its best showing is its 1st place in Institutions; its other rankings are all at leader positions (within the top 25): Human capital and research (7th), Infrastructure (13th), Market sophistication (7th), Business sophistication (19th), Knowledge and technology outputs (19th), and Creative outputs (8th)".⁷ See figure on the next page.

Table 1: Global Innovation Index 2013 ranking

Top Ten 2013 Ranking			
1	Switzerland (No. 1 in 2012)	6	Finland (4)
2	Sweden (2)	7	Hong Kong (China) (8)
3	UK (5)	8	Singapore (3)
4	Netherlands (6)	9	Denmark (7)
5	USA (10)	10	Ireland (9)

Source: GII 2013⁸

Denmark is classified by the Innovation Union ScoreBoard⁹ as an innovation leader as regards regional innovation in the EU, because of two of its regions: Hovedstaden (i.e. Capital region) (DK01), the NUTS 2 region that includes Byen København, and Midtjylland (Central Jutland Region)¹⁰ (DK04).¹¹ In 2013, Denmark ranks 3rd in the Innovation Union ScoreBoard,¹² well above the average for the EU27. The ScoreBoard highlights the fact that Denmark's "relative strengths are in open, excellent and attractive research systems, for sales of new-to-market and new-to-

² The "Doing Business" is a series of annual reports from the World Bank. It does not cover the IT sector as such but allows giving an overview of the business environment. Doing Business 2013, World Bank, 109p. Available at: www.doingbusiness.org.

³ « Le soutien à l'économie numérique et à l'innovation ». A report from Inspection Générale des Impôts, French ministry of economy and finance. Paris, January 2012, 421 p. The authors have built a composite indicator based on three international rankings: the "e-readiness ranking 2010" (The economist), the Global Innovation Index 2011 (Insead), and the "IT Industry Competitiveness Index 2011" (Business Software Alliance). As of 2011, the five leading countries were: Sweden, Finland, US, Denmark and Singapore.

⁴ The Global Innovation Index (GII). The Local Dynamic of Innovation, 2013, is published by Cornell University, INSEAD, and the World Intellectual Property Organization (WIPO). <http://strat-staging.com/content.aspx?page=gii-full-report-2013/> <http://strat-staging.com/content.aspx?page=data-analysis>

⁵ Based on five pillars: institutions, human capital and research, infrastructure, market and business sophistication.

⁶ Based on two pillars: knowledge and technology outputs and creative outputs.

⁷ Chapter 1. Soumitra Dutta, Cornell University, Daniela Benavente and Bruno Lanvin, INSEAD, Sacha Wunsch-Vincent, World Intellectual Property Organization, "The Global Innovation Index 2013: Local Dynamics Keep Innovation Strong in the Face of Crisis". P.13

⁸ Press release, July 1, 2013: <http://strat-staging.com/content.aspx?page=press-release>

⁹ Innovation Union Scoreboard 2013. Available at: http://ec.europa.eu/enterprise/policies/innovation/facts-figures-analysis/innovation-scoreboard/index_en.htm

¹⁰ Central Denmark Region or Central Jutland Region. Århus is the major city with leading universities.

¹¹ Box 1.

¹² Down one rank from 2009 but 3 indicators changed since 2011.

firm innovations growth has been highest for all Member States and growth was also high for new doctorate graduates". On the negative side, the Scoreboard states that Denmark suffers from "a relatively strong decline (...) for communications, linkages and entrepreneurship, and intellectual assets", showing a "relative weaknesses (...) in human resources and firm investments".¹³

The Capital Region (DK01) is geographically the smallest in Denmark, with only 2,561 km² - 6% of the Danish area. According to the 2011 EU Regional Innovation report (RIM),¹⁴ the Capital region (DK01) is the leading region in Denmark with regards to economic performance. The region has a GDP per capita of €50,000 which is around 40% higher than the average GDP per capita in Denmark. The region generates about 40% of the Danish GDP, and 75% of the employment growth in Denmark over the last decade was created in the region. Despite this good ranking, the two reports (GII 2013, RIM 2011) note that the region is losing ground on important parameters such as labour productivity, which has a negative impact on the innovation capacity of the region.

Denmark is one of the few countries to meet the Lisbon target of investing 3% of GDP in R&D: 1% public, 2% and above for business.¹⁵ Most of the public funding is allocated to universities. The Capital region has the highest level of expenditure on R&D in Denmark. The region spends 6% of its GDP on R&D. This percentage is also high compared with other Scandinavian countries (4.6% in the capital region of Sweden and 3.6% in the capital region of Finland). The share of private business enterprise expenditure on R&D is close to 80% in Copenhagen which is also higher than it is in Sweden and Finland.

The RIM report comments:¹⁶ *"The innovation performance is strong in the Capital region. The region is home to a number of large and top-performing universities including the University of Copenhagen (the largest university in Northern Europe), the Technical University of Denmark and the Copenhagen Business School. 53% of all Danes with higher education live in the region.*

Some of the region's main challenges with respect to innovation are a low number of entrepreneurs which fulfil their global potential, a relatively low number of highly educated people in the workforce compared to other northern European metropolitan cities,¹⁷ and a lower growth in key clusters e.g. ICT, Medico and the knowledge economy than other capital regions".

Copenhagen is not listed among the top twenty of the *Startup Genome Ecosystem 2012 Report*.¹⁸ However, the city is quoted in the list of the 20 runners-ups.¹⁹ The city does not appear

¹³ P.31.

¹⁴ Regional Innovation report. [DK01] Hovedstaden - Regional Innovation Report: Danish Capital Region. Available at: <http://ec.europa.eu/enterprise/policies/innovation/policy/regional-innovation/monitor/index.cfm?q=p.reportDetails&id=15476>. The Regional Innovation Monitor (RIM) is an initiative of the European Commission's Directorate General for Enterprise and Industry, see: <http://www.rim-europa.eu>

¹⁵ A recent article (May 2013) stressed however than in 2011 for the 1st time the country failed to reach the 2% for business R&D expenditures. "Denmark's policymakers puzzled by stagnation in industry's R&D spending", Research Professional: <http://www.researchprofessional.com/login>

¹⁶ P.31.

¹⁷ The new 2013 Danish Government growth plan allocated DKK 1 bn. (\$ 175 mill.) for continuing education to further raise the competence level of the workforce in order to improve productivity and growth. Source: <http://www.investindk.com/News-and-events/News/2013/Denmark-Reduces-Corporate-Tax>

¹⁸ Startup Genome Ecosystem 2012 Report, Startupgenome/ Telefonica Digital. The report builds a Startup Ecosystem Index of the state of entrepreneurship around the world, based on data from more than 50,000 start ups.

¹⁹ The next twenty: at p.121. No ranking provided; the cities are just listed in alphabetical order.

either in the 27 PWC 2012 *Cities of opportunity*.²⁰ Copenhagen has a service-oriented economy. An important sector is life science and R&D plays a major role in the economy of the city.

From a national perspective and according to the Danish agency “Copenhagen Capacity”, Copenhagen is home to six world-class clusters: Cleantech, Life Science, ICT, Transport/ Logistics, Creative Industries, and Foods.²¹

The agency does not dwell on Copenhagen as an ICT cluster: it mentions the Science Parks, pointing mainly at the Oresund cluster.²² Rather, the agency presents the creative industries cluster of the Copenhagen capital region as the largest business cluster in Denmark that competes internationally.²³

Creative industries in Denmark

The creative industries in Denmark employ approximately 85,000 people. The agency reports that Copenhagen is the 4th most specialized city in Europe, alongside cities like London, Berlin, and Stockholm. The creative industries constitute 6-7% of the total Danish employment and revenue. The creative professions contribute 10% of Danish exports. In the period 2003-2010, the business areas Fashion & Clothing, Architecture and Design experienced revenue growth of between 19-60% over the period. Export of Danish fashion increased 13.4% from 2010-2011.

The entire Oresund region, in cooperation with Sweden, is being promoted as Medicon Valley. Also, major Danish pharmaceutical companies like Novo Nordisk and Lundbeck, both of which are among the 50 largest pharmaceutical and biotech companies in the world, are located in the greater Copenhagen area. Oresund is also the main Danish IT cluster. Denmark is often seen as a test bed for international IT companies (mostly from the US), as illustrated recently with HBO Nordic starting its EU operation there.

2. The policy framework and the main public actors²⁴

The capital region is home to a number of leading global companies (80% of all high tech-enterprises in Denmark are located in the region) and successful entrepreneurs. The start-up creation rate was as high as 11.4% in 2007, corresponding to 9,057 new companies (RIM: 10). This is on a level with the best regions in Europe and the USA. The high start-up rate reflects the fact that it is very easy to start a business in Denmark, due to a strong political focus on improving the business environment over the last 10 years. There has been a growing acknowledgement among Danish policymakers that entrepreneurship plays a key role in innovative societies, and that entrepreneurship is an important driver of wealth creation and economic recovery. In the last decade, Denmark’s national policy has focused strongly on improving the general framework conditions for business and innovation.

²⁰ But Stockholm ranks 5th behind New York, London, Toronto and Paris. Available at: <http://www.pwc.com/us/en/cities-of-opportunity/assets/cities-opp-2012.pdf>

²¹ Copenhagen Capacity is the Danish capital city region’s official organisation for investment promotion, business development and cluster growth. Founded as a non-profit organisation with the mission to grow business capacity in the Copenhagen region. Source: Copenhagen Capacity. <http://www.copcap.com/BusinessOpportunities/ICT>

²² Øresund is the strait that separates the Danish island Zealand from the southern Swedish province of Scania. The Oresound bridge was opened in 2000. The IT Cluster 55 (former Oresund IT) claims to outperform most other cluster organizations within ICT when it comes to matchmaking, building of network etc. as one of the oldest cluster organizations in Europe – founded 1999. <http://cluster55.org/facts-figures/>

²³ The cluster consists of various enterprises in architecture, design, literature & Press, Art & Handicrafts, Radio & TV, Film & Video, content production, music, commercials, fashion, furniture (including Interior Design).

²⁴ The first part of this section builds on the RIM report. The second builds on the interviews and on the further documentation gathered.

2.1 The main public actors

2.1.1 National policies

There are a number of national measures that fund regional innovation activities. The largest complementary state funding sources in Denmark are the Energy Technology Development and Demonstration Programme (EUDP), Green Development and Demonstration Programme (GDDP), The Danish Council for Strategic Research, the Business Innovation Fund, The Danish Council for Technology and Innovation, and finally, The Danish Public Welfare Technology Foundation (PWT). The most important for the capital region are, according to the RIM report, the Danish PWT Foundation, the Business Innovation Fund and the Danish Council for Technology and Innovation.

2.1.2 The Danish PWT Foundation – Investments in Public Welfare Technology

The Danish government allocated approximately €400 million for the period 2009 - 2015 to a programme dedicated to developing and improving public sector services through the implementation of labour-saving technologies and more efficient working processes. In a country described as a Welfare State, this appears to be an important component of the policies. The PWT Foundation currently funds projects in different areas including “Telecommunications Solutions and Information and Communication Technology (ICT)”, “Robotics and Automation”, “Digitalisation” and “CareTechnology”.

2.1.3 The Business Innovation Fund

The Business Innovation Fund is a government initiative, established in autumn 2009 under the Danish Ministry of Economic and Business Affairs. About €100 million was allocated to the fund for the period 2010-2012. Private enterprises operating in the areas of green business or welfare technology can apply for grants in three focus areas: innovation, market maturation and change-over. As Copenhagen is home to a large number of companies working in these areas, it is expected that a relatively large proportion of the funds will go to companies located in the Capital Region.

The Business Innovation Fund provides financial support to large, cross-functional innovation projects in green business and welfare. The support will mainly be granted to projects based on user-driven innovation. The aim is to develop innovative commercial products and services that can meet the increasing global demand for green solutions and welfare and also generate growth and employment in Denmark.

2.1.4 The Danish Council for Technology and Innovation (RTI)

The objectives of the Danish Council for Technology and Innovation are to promote collaboration and dissemination of knowledge between researchers, research and educational institutions, advanced technology groups, knowledge institutions and enterprises. The Council has two main tasks: to advise the Minister for Research, Innovation and Higher Education on technology and innovation policy, and to manage the programmes that the Minister assigns to the Council. The initiatives of the council comprise four main pillars:

- Collaboration between business and research (via programmes for innovation projects and innovation networks).
- R&D-based technological service (via the 9 Approved Technological Service institutes – ATS institutes).
- Commercialisation of publicly-funded research (via 6 innovation incubators and 2 proof-of-concept consortia at Danish universities).
- Access to a highly-skilled workforce (via programmes for Industrial PhD and “Knowledge Pilots”).

Regional policymakers have focused strongly on improving knowledge diffusion in Copenhagen. More than €26 million from the regional development fund have been channelled into the area of innovation, knowledge sharing and knowledge building (close to 60% of all funds for regional business development). The RIM report stresses, nevertheless, that there is some evidence that

knowledge diffusion is not functioning optimally in the region. The region faces a challenge in ensuring improvement in cooperation between the universities and the business sector so that the universities create and spread knowledge that has relevance for businesses and society as a whole.

The RIM report claims that Finland and Sweden are faring better and that knowledge diffusion from universities to the private sector is not sufficient. This is echoed by recent data from the Danish Statistics Institute (Danmarks Statistik) which show that the number of employees in R&D in foreign branches of Danish companies increased by 59% between 2009 and 2011 while the number of those employed in R&D in Danish headquarters only increased by 7% in the same period.²⁵ At the same time, the number of foreign researchers in Danish universities increased by 38% in Copenhagen University and 33% in Aarhus (Jutland) over the last four years.

2.1.5 The Danish Council for Strategic Research (DSF)

The Danish Council for Strategic Research supports research which targets the challenges facing Danish society. The objective is to support Denmark's position as a welfare-oriented, economic and scientific front-runner in global contexts in both the short and long term. Strategic research is often conducted across professional disciplines, across public and private institutions and organisations, the business community, etc.

2.1.6 The Danish National Research Foundation (DG)

The Danish National Research Foundation is an independent foundation which aims to strengthen Denmark's research-related development capacity by funding outstanding research at an international level. Support is chiefly given through the establishment of Centres of Excellence, but the Foundation has also launched a number of activities which aim to increase the internationalisation of Danish research.

2.1.7 The Danish Council for Independent Research (DFF)

The Danish Council for Independent Research supports concrete research activities in all scientific fields. Activities must be based on the researchers' own initiatives and, at the same time, should strengthen the quality and internationalisation of Danish research. The Danish Council for Independent Research also provides research-related consulting services within all scientific fields for the Minister of Science, Innovation and Higher Education, the Danish Folketinget (Parliament) and the government.

2.1.8 The Danish National Advanced Technology Foundation (DNATF)

The DNATF was founded in 2005 by the Danish government. Broadly, its objective is to enhance growth and strengthen employment by supporting strategic and advanced technological priorities. Its aim is to make Denmark one of the world's leading advanced-technological societies. DNATF provides government funding for public-private research collaborations, which facilitate bridge building between Danish public research institutions and Danish companies in order to generate growth and technologies that benefit Danish society as a whole.

The foundation covers 6 main areas: biomedicine, energy/environment/ forest/ construction/ production/ produce and food/ ICT. The latter is expected to be at the core of other projects, which are supposed to be multidisciplinary. For instance, a piece of software may be needed for a wind turbine. ICT is a very important component of energy and platforms of technologies.

DNATF is the only Danish government funding source that exclusively supports public-private research collaborations. Funding for collaborations of this kind, however, can also be obtained from other Danish government sources.

DNATF uses a bottom-up approach in the application process. It seeks to fund the best ideas within the broad realm of advanced technology. The investment portfolio covers sectors ranging

²⁵ See Berlingske Tidende article from 1 August 2013: <http://www.b.dk/kommentarer/forskningen-er-ved-at-stagnere>

from robotics, agriculture, livestock, biotechnology and medicine, all the way to telecommunications. Looking at the projects funded from DNATF's inception in 2005 up until 2011, the largest sector in DNATF's portfolio is biomedical sciences, which makes up 30% of all investments, while 26% are in energy and environment, 20% in IT and communication, 14% in production, 5% in agricultural production and food, and 5% in the construction sector.

By the end of the 2005-2012 period: DNATF had made 238 investments with a total project budget of €361.3 million. Half of this was invested according to DNATF's 1/6 – 2/6 – 3/6 investment model. In 2012, for instance, the public research institution(s) (typically a university or hospital) funded 1/6 of the total budget (€15.5 million in 2012), private firm(s) 2/6 (€25.5 million) while DNATF funds 3/6 (€45.5 million). Neither participating firms nor academic institutions are required to pay back the awarded funding: therefore using the self-financing scheme ensures that all parties have something at stake. A project has a typical duration of 4 years and on average receives DKK 12 million from DNATF (ca €1.69 million).

The Foundation actively supports and works with the parties involved to increase the likelihood that projects reach their goal. In 2012, the parties involved in the finished projects consisted of 54 companies, 31 universities and 8 hospitals. DNATF awards grants for projects that encompass cooperation between at least one academic institution and at least one firm. The allocated amounts are committed at the time of award, but progress payments are contingent on performance. A key component of the award is a facilitation model in which a small team of DNATF staff actively engages with the parties involved. While mostly focused on progress monitoring; this team actively seeks to mediate in conflicts and misalignments that arise across institutional boundaries between scientists and technologists.

According to Chai et al (2013) its “mediated funding” model for public-private partnerships is unique. Chai et al show compelling evidence that mediated public-private partnership funding affects firm performance especially in the mid-term range of 3-4 years after funding. The outputs of the DNATF model are seen as highly positive and the results of the analysis highlight its effectiveness. Chai et al (2013) demonstrate that mediated public-private partnerships alleviate financial constraints and help significantly decrease the likelihood of firm bankruptcy while substantially increasing the average level of employment. Funded firms were awarded significantly more patents and published more peer-reviewed papers, and the impact of these publications was significantly higher. Finally, mediated public-private partnership funding altered the nature of the knowledge produced and also the collaborative behaviour of scientists with significantly higher levels of citations and more cross-institutional co-authored publications.

2.1.9 Regional policies: the Growth Forum

In Denmark, regional innovation policies are the responsibility of the regional authorities within the Danish regions. The governing bodies of the regions are the regional councils which are directly elected for four-year periods.

The Danish institutional setup for the development and implementation of regional innovation policies underwent a major reform in 2007. One of the goals of this reform of local government in 2007 was to ensure stronger co-ordination between regional innovation strategies and the broader national strategy within business, innovation and education – called the Danish Globalisation Strategy. To this end, a yearly partnership agreement was created between the newly created entities, Growth Forum, and the national government (the Ministry of Economics and Business Affairs). This institutional setup has been in place for several years and is generally considered a success.

Following this reform, the Danish regions have increased their focus on regional commercial and industrial development and innovation support. Thus, the regions have been given the opportunity at a regional level to launch many of the same types of research and innovation support initiatives that are launched nationally by the government, as illustrated in Figure 1 on the next page.

Since the reform, only the Growth Forum in Copenhagen – the Capital Region Growth Forum – can launch regional innovation and business development initiatives in Copenhagen. The Capital Region Growth Forum is therefore the most important institution for developing and implementing innovation policy measures in Copenhagen. The Growth Forum brings together the region's key policymakers from industry, research, education, labour, municipalities and regional councils.

The Growth Forum itself does not implement the different initiatives and projects which it launches. These are implemented by others, for example municipalities, research institutions or other independent legal entities. Almost all of the activities which the Growth Forum launches are co-financed with EU structural funds.

A key task for the Growth Forum is to design a long-term strategy for business development in the Capital Region. The strategy sets the course for business and innovation development within the region for a five-year period. The main focus in the present strategy is the development of stronger clusters (for instance, by supporting cluster organisations in Cleantech or Medicon, two of the priority clusters), more growth entrepreneurs (for instance, through support to entrepreneurship counselling) and a continuous development of the workforce through a number of different training and educational programmes.

Table 2: Initiatives in the capital region

Pools/Initiatives in the Capital Region of Denmark	
Growth Forum of the Capital Region's development strategy 2011-13 with action areas and major activities in relation to innovation, intelligent public demand and increased internationalization.	Capital Region of Denmark
The Regional Council's Regional Development Plan	
Policy for Health Research, Innovation Policy and Climate Strategy (with the Municipal Contact Council	

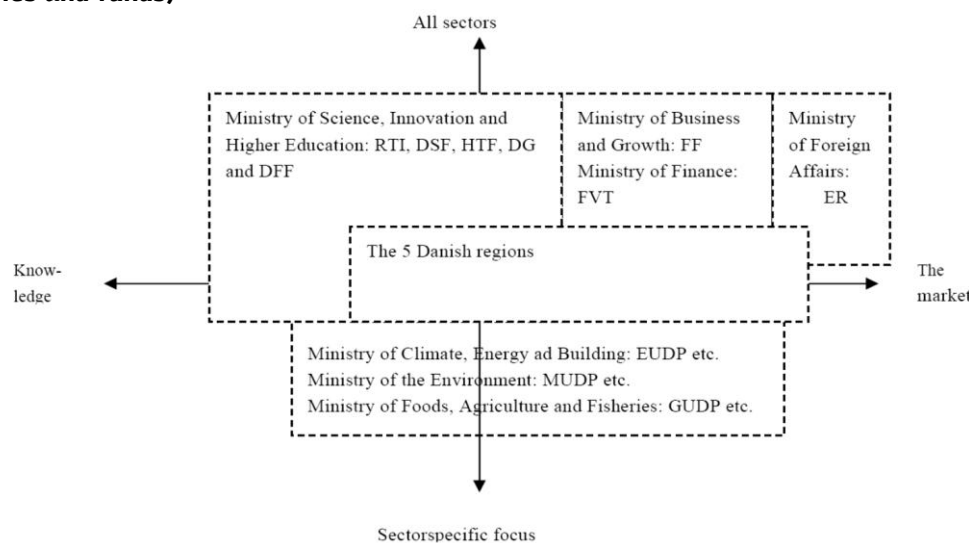
Source: General Overview of the Public Support System for Research and Innovation in Denmark, p.14.

The Capital Region has approximately €25 million available for business development per year in the period 2010 to 2013. €9 million comes from the EU structural funds. According to policymakers in the region, the three most important regional innovation measures for Copenhagen are the following:

1. "Accelerace" aims to spur growth in potential high-growth start-ups and other promising small businesses.
2. Copenhagen Cleantech Cluster aims to develop an clean technologies cluster in the Capital Region.
3. The Healthcare Innovation Centre is a strategic initiative to improve quality and efficiency in the healthcare service.

The first two programmes are strategic schemes with quite substantial budgets, while the latter is viewed as important because regional policymakers see great potential in encouraging innovation in healthcare, in line with the Danish policies mentioned earlier.

Figure 4: Division of work between authorities in the research and innovation system (Ministries and funds)



Source: General Overview of the Public Support System for Research and Innovation in Denmark.²⁶

Table 3: Existing regional innovation support measures

Title	Duration	Policy priorities	Budget	Organisation responsible	More information
Growth Forum Initiatives (Capital region)	2010- 2013	<ul style="list-style-type: none"> • Innovation strategies • Strategic Research policies • Support to innovative start ups incl. Gazelles 	€25m	Capital Region Growth Forum	http://www.regionh.dk

Source: RIM report

The Capital Region has, up until 2010, approved projects for a total of approximately €44 million. More than €26 million has been given to the action areas innovation, knowledge sharing and knowledge building. Furthermore, 75% of the €26 million are given to projects concerning interaction on innovation.

2.2 A shift away from ICT?

2.2.1 The end of an era?

Before the economic crisis, Copenhagen used to be a centre for 1G/2G mobile. The first GSM phone was developed in Denmark, giving Denmark a historically strong position in international mobile communication research and development.²⁷ However most of the leading companies have left the country: the worst case was Nokia which closed down its Copenhagen site, including its R&D activities in 2011-2012 with a loss of 1,000 jobs, Motorola scaled down its operation, and Ericson and Tellabs are no longer in Copenhagen. These somewhat traumatic events put an end to the mobile cluster.

Besides, companies like Nokia did not contribute to setting up companies in the immediate area (unlike in Helsinki where the company is much more involved in setting up companies). A lot of companies that had hoped to become suppliers of a larger one remain, but the dynamic has collapsed. Some 40 companies are still located in the building left by Nokia and now the Centre established by the Aalborg University is trying to drive this forward, by continuing to back some 15 companies (apps/ software/ consulting):

²⁶ Available at : <http://fivu.dk/en/publications/2012/files-2012/general-overview-of-the-public-support-system-for-research-and-innovation-in-denmark.pdf>

²⁷ Source: <http://www.investindk.com/Clusters/ICT/Wireless-and-mobile-technology>

- Some bigger companies, like Volvo, are planning their future entertainment system/ car to car communications, based on the Nokia legacy. The university is setting up a science park to improve collaboration.
- Future communication systems: search machines for big data/ next generation communications, a cooperative project among Nordic universities.

The regional neighbourhood relationships with Sweden were also hit by the decline of mobile/ telecom and the exit of Nokia. However, Microsoft is now playing a leading role in Denmark for IT and is interacting with SMEs, backing them and also helping by providing consultants. Microsoft also takes part in several PPPs.

Some IT firms left the country as the business environment²⁸ was not perceived as attractive (taxes/wages too high). The government therefore decided to bring down taxes to the Swedish level. In May 2013, the Danish government agreed on the main elements of a growth plan estimated at DKK 75 billion (ca. €10 billion) which will improve the framework conditions for operating a business in Denmark.²⁹ The plan³⁰ includes a gradual reduction of corporate taxation from the current 25% to 22% by 2016 (current EU average is 23%) and increased tax credits for costs linked to R&D activities.

2.2.2 Promoting digitization and infrastructure

Although there is some support for start-ups, a change has taken place and the overall policies do not favour ICT as much as they did 15 years ago. This is reflected in the closing down of the National IT and Telecom Agency in 2012 and the transfer of its activities to different Ministries. There is no emphasis on IT in the policies, and policies focus instead on the digitization of local businesses. For example, the government set up a growth team from various sectors to promote growth and prepare its plan, in which IT was not initially included. The Confederation of Danish Industry has been lobbying hard to have the IT sector included as a specific sector. By the same token, there is a strong focus on the provision of digital infrastructure in rural areas with mobile and fibre.

A new innovation strategy, described as a 'paradigm shift', was introduced on 20 December 2012 under "Denmark – a nation of solutions".³¹ There are three focus areas: innovation driven by societal challenges, more knowledge translated to value with a focus on more effective innovation schemes and better mutual knowledge transfer between companies and knowledge institutions; and education as a means of increasing innovation capacity.

Despite the lack of specific ICT policies, digitization is very strong in Denmark compared to other countries. Its overall policies are designed to foster ICT as a general purpose technology, as an enabler within an advanced digital infrastructure and IT is already used intensely in the administration. These policies involve 7 Danish Ministers and the Prime Minister, which explains Denmark's excellent score for digital economy.

The dynamism of ICT is therefore driven by the demand other vertical sectors and government digitization policies. For instance, the overview of public initiatives³² does not include any sector or technology-specific pools but refers instead to energy, environment and food. Looking at the intensity of R&D as a whole, one finds very little direct ICT funding: the focus is on ICT as facilitator, and not as a core development. The shift in government policies toward Life Science and Cleantech may reflect the acknowledgement that all countries now have some ICT

²⁸ The World Bank report is more positive.

²⁹ Source: <http://www.investindk.com/News-and-events/News/2013/Denmark-Reduces-Corporate-Tax>

³⁰ According to Computerworld it may not be enough to reduce taxation as wages remained too high. <http://www.computerworld.dk/art/224862/kendt-it-ivaerksaetter-du-skal-ned-i-loen>

³¹ The innovation strategy contains 27 policy initiatives regarding research, innovation and education. Source: <http://fivu.dk/en/newsroom/issues/innovation-strategy>

³² Quoted earlier see note 19.

development capacity while value creation is now more likely to emerge from other sectors like pharmaceuticals.³³

Therefore, policies are promoting other kinds of clusters, such as biomedical, rather than ICTs. As there are a lot of activities, it is expected that the ICT sector will cooperate with these. ICT innovation concentrates on other vibrant sectors such as energy backed by government policies (energy/ smart grid): Vestas Wind Systems is now a world leader with Siemens for wind turbines.³⁴ These companies are deemed to have a huge impact on ICT supplying companies, which are often niche providers rather than leading ones. Healthcare policies are also attracting IT companies, for instance, IBM established its competence centre for healthcare IT in Denmark (Aarhus, Odense and Copenhagen) with an exclusive focus on supplying solutions for the healthcare sector.³⁵

These policies are in line with policies designed for other sectors: building harbours for shipping, helping create the wind turbine industry. The main clusters are for “Cleantech” but also medicine/ Health in a “Welfare” country. IT is playing an important role as a general purpose technology.

4. Some lessons: the on-going supply / demand-side policies debate

Danish policies aim to supply the right business environment for broadband and digitization, i.e. at “providing the highways but not the cars,³⁶” through selected sector-specific industrial policies and clusters: wind energies, cleantech, and health. This appears to be consistent with other policies (infrastructure, harbours) and is well reflected in international rankings. The figure below illustrates the role of digitization and infrastructure policies. It shows examples of areas where Denmark has been in the Top 5 at least once during the last three years in the IMD’s World Competitiveness Yearbook (May 2012).

However, results do not look as positive in the EIFE ranking where Copenhagen is ranked 24th as noted above. Similarly, the RIM report states some rather critical conclusions about the effectiveness of the policies. It stresses the discrepancy between strong framework conditions (as have other reports and most recently the GII 2013 report) and the limited number of initiatives that perform strongly as regards innovation. For example, Denmark scores around average in the Community Innovation Survey (CIS) for its share of small and medium-sized enterprises (SMEs) that are innovative in product, process and marketing. The score is below EU average on the share of turnover attributable to innovations, both for products that are “New to Market” and “New to Firm”.³⁷ This indicates that SMEs are not fully capitalising on their innovations, whether for internal reasons or external factors (e.g. intensity of competition, demand conditions) resulting in a low innovation performance for the region.

According to various experts, some of the region’s main challenges with respect to innovation are the low number of entrepreneurs who fulfil their global potential, a relatively low number of highly-educated people in the workforce compared to other northern European metropolitan cities, and lower growth in key clusters, e.g. in ICT and Health, than other capital regions. Most of

³³ Data from the French trade association of venture capital investors (AFIC) confirm this analysis with the medical and biotech sector showing the most important growth of their revenues and human resources. See Ernst & Young (2012), “Caractéristiques et croissance des entreprises accompagnées par les acteurs français du Capital Investissement en 2011”. Available at: http://www.afic.asso.fr/Website/site/fra_rubriques_activiteperformance_statistiques_impacteconomie_etsocialducapitalinvestissement.htm

³⁴ The company operates manufacturing plants in Denmark, Germany, India, Italy, Romania, Britain, Spain, Sweden, Norway, Australia, China, and the United States, and employs more than 17,000 people globally.

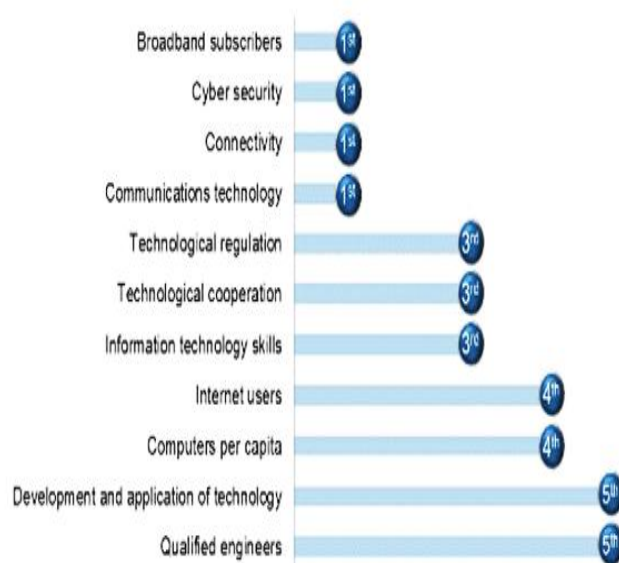
³⁵ Source : <http://www.investindk.com/Business-cases/IBM-Healthcare>

³⁶ Interview.

³⁷ RIM at 2.

the experts appear to share this view, also adding a lack of competition and the negative side of welfare policies that foster services, but do not promote risk-taking and innovation.

Figure 5: Areas where Denmark has been in the Top 5 at least once during the last three years in the IMD's World Competitiveness Yearbook (May 2012)



Source: Copenhagen Capacity, <http://www.copcap.com/BusinessOpportunities/ICT/Facts>

This misalignment between apparently robust policies and disappointing outcomes in terms of the diffusion of innovation and economic growth raises interesting policy questions about supply side (infrastructure/ digitization/ connectivity) policies vs. demand side policies focusing on ICT.

Clearly, an overemphasis on infrastructure triggers the issue of a possibly over-estimated demand. Eventually, there is an important discrepancy between deployment in Denmark (which has very speedy and successful deployment (80%) of ultra-high broadband) and low take up (3%) - attractive applications or daring entrepreneurs may be lacking to bridge the gap. The report from the French Ministry of Finance offers similar conclusions about the discrepancy between the rate of deployment of ultra-high broadband in South Korea and the lack of usage, concluding that the benefit of this deployment of infrastructure remains suboptimal. Experts point that only a few players are still promoting the cluster idea for ICT, at least in the Copenhagen region, as though the momentum had gone. Denmark as a country may have the potential to become a very large cluster: there have been plans around Denmark leading regionally for "big data" but they have not materialised so far.

Successful policies in the energy sector point to the possibility of creating effective/sustainable clusters. The strong wind turbine industry and world leaders like the often quoted Vestas³⁸ have benefited from a good mix of national and EU support. Endeavours like this may require, as suggested by some industry members,³⁹ a stronger link with a market, as there is a need for a market to keep a cluster going.

For the agency in charge of attracting foreign investors, the business models for R&D centres may be changing, making it more and more difficult for small countries like Denmark to attract R&D centres from foreign companies. In line with the analysis of other experts, the country may have to rely on a more organic growth with strengthened centres of excellence, which could be the way forward with the right talents.

³⁸ Interviews. Although end 2012 the company went through job cuts and financial losses according to Bloomberg but manage to improve its situation since, See <http://www.bloomberg.com/news/2012-11-07/vestas-to-cut-headcount-to-16-000-by-end-of-2013-from-22-721.html> and <http://www.vestas.com/en/media/news/news-display.aspx?action=3&NewsID=3321>

³⁹ Interview.

Bibliography

Doing Business 2013, World Bank, 109p. Available at: www.doingbusiness.org.

De Prato, G. and Nepelski, D. (2013) 'Identifying European ICT Poles of Excellence. The Methodology', JRC Scientific and Policy Reports – EUR 26264 EN. Seville: JRC-IPTS. Available at: <http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=7020>

Ebdrup, T., Stig, N., Lasse, N., *Regional Innovation report. [DK01] Hovedstaden - Regional Innovation Report: Danish Capital Region*. Technopolis/ Maastricht University. Fraunhofer, 2011. Available at: <http://ec.europa.eu/enterprise/policies/innovation/policy/regional-innovation/monitor/index.cfm?q=p.reportDetails&id=15476>.

EC (2013), *Innovation Union Scoreboard 2013*. Available at: http://ec.europa.eu/enterprise/policies/innovation/facts-figures-analysis/innovation-scoreboard/index_en.htm

General overview of the public support system for research and innovation in Denmark. Available at: <http://fivu.dk/en/publications/2012/files-2012/general-overview-of-the-public-support-system-for-research-and-innovation-in-denmark.pdf>

Hansen, P.A, Serin, G., *The European ICT clusters – an overview of selected ICT clusters in Europe. 2010*. Available at: http://rucforsk.ruc.dk/site/files/32956338/the_european_ict_clusters_web_0.pdf

The Global Innovation Index (GII). *The Local Dynamic of Innovation, 2013*, Cornell University/ INSEAD/ WIPO. Available at: <http://strat-staging.com/content.aspx?page=gii-full-report-2013/>
<http://strat-staging.com/content.aspx?page=data-analysis>

PWC 2012, *Cities of opportunity*. Available at: <http://www.pwc.com/us/en/cities-of-opportunity/assets/cities-opp-2012.pdf>

Chai, S., Shih, W., "Fostering Translational Research: Using Public-Private Partnerships to Improve Firm Survival", *Harvard Business School, Working Paper 13-058*. January 2, 2013, Mimeo 42p.

Simon Jean Paul, *EIPE Case study review – Copenhagen*, IPTS, 2013.

Startup Genome Ecosystem 2012 Report, Startup genome/ Telefonica Digital. Available at: http://multisite-blog.digital.telefonica.com.s3.amazonaws.com/wp-content/uploads/2013/01/Startup-Eco_14012013.pdf

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Abstract

The European ICT Poles of Excellence (EIPE) project is a joint research project of DG CNECT and the JRC Institute for Prospective Technological Studies. It established the conditions for defining, identifying, analysing and monitoring the existence and progress of current and future European ICT Poles of Excellence (EIPE), in order to distinguish these among the many European ICT clusters, observe their dynamics and offer an analysis of their characteristics.

A case study report investigates 5 selected EIPEs – Inner London East, Paris, Kreisfreie Stadt Darmstadt, Dublin and Byen Kobenhavn. It presents and interprets the data collected during the course of the project to understand the actual facts, context and story of each location, i.e. its R&D, innovation and business activity.

The case study report is complemented by 4 short reports, which offer the summarised views of local experts on the role played by public policies in the emergence and the sustainability of ICT activity in their region. This report is about Copenhagen.

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new standards, methods and tools, and sharing and transferring its know-how to the Member States and international community.

Key policy areas include: environment and climate change; energy and transport; agriculture and food security; health and consumer protection; information society and digital agenda; safety and security including nuclear; all supported through a cross-cutting and multi-disciplinary approach.

