EUROPE INNOVA
Innovation and Clusters
NetBioClue

Do's and don'ts for biotech cluster development: the results of NetBioCluE

Foreword

The biotech industry is at the forefront of innovation and represents a major potential for economic development as well as a significant improvement in quality of life with innovative products and technologies.

In biotechnology, cooperation among actors is critical as it is a global industry and what happens in the United States, on the one hand, and in the rising economies of China and India, on the other, affects the overall industry worldwide. This applies also to Europe, which has been characterised by a fragmented structure for research and industry. To improve the European situation and to foster achievement of critical mass to better compete at global level, the European Commission has been supporting cluster network initiatives in various high-tech sectors.

This publication presents the main activities carried out and results achieved by NetBioCluE (Networking Biotechnology Clusters in Europe), the biotechnology cluster network supported by the European Commission within Europe INNOVA. Europe INNOVA is an initiative for innovation professionals supported by the European Commission under the 6th Framework Programme and running now for the last three years. The fundamental objectives of it fall in line with the policy direction set out within the FP6 priority of "Structuring the European Research Area". In acting as the focal point for innovation networking in Europe, Europe INNOVA informs, assists, mobilises and networks the key stakeholders in the field of entrepreneurial innovation, including firm managers, policy makers, cluster managers, investors and relevant associations.

As the biotech cluster network in that, NetBioCluE, managed by the Milan Chamber of Commerce through its Innovhub, involves ten European biotech clusters: Cambridge, Paris-Ile de France, Heidelberg, Munich, as well as Milan-Turin, Dundee in Scotland, Biotech Umeå and Uppsala Bio in Sweden, Aarhus in Denmark, Szeged in Hungary and South Moravia in the Czech Republic.

The network fosters cooperation across clusters in the field of biotechnology for health and in an outward looking approach has involved in its activities also other European clusters and networks.

The added value of the network is that of having identified and validated good practices in biotech clusters' support and provided key messages to stakeholders and policy makers to help biotech cluster development through a bottom-up approach.

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Executive summary

The biopharmaceutical industry is less than 40 years old, but constantly shows double digit growth and holds great strategic potential for the coming years. So far biotechnology has created more than 200 new therapies and vaccines, including products to treat cancer, diabetes, HIV/AIDS and autoimmune disorders. Today there are more than 400 biotech drug products and vaccines currently in clinical trials targeting more than 200 diseases, including various types of cancers, Alzheimer's disease, heart disease, diabetes, multiple sclerosis, AIDS and arthritis. Moreover, as governments struggle under the weight of healthcare expenditures, biotech's promise of highly targeted therapies and the emergence of bio-similars represent a clear opportunity to reduce healthcare costs in developed regions such as Europe, where the incidence of chronic diseases is higher due to aging populations.
At the same time, biotechnology is one of the most research-intensive industries in the world with up to € 35 billion invested every year in R&D globally. With its ambitious Lisbon targets aiming at making it the first knowledge economy in the world, Europe is one of the most relevant players in this sector, but still far behind the US in its ability to transform discoveries in market innovations. At the same time, new players like India and China are aggressively entering the market and are expanding rapidly, taking advantage of their low production costs, strong science base and vast internal market. In this scenario the development and reinforcement of biotech clusters, still today the core of the US life sciences industry, is unanimously acknowledged as a priority for Europe. Success cases such as Cambridge and Heidelberg prove that clusters can grow and flourish in Europe, but many still show teething problems, especially in the technology transfer and business related aspects and struggle with a very fragmented market and IP regulation.
The European Commission has tackled this issue with several measures to support clusters' cooperation in high tech sectors, including biotechnology. Europe INNOVA is one of the main actions, comprising a range of project initiatives such as AFIBIO (Access to FInance in the BIOtech sector), dedicated to improving financing strategies for biotech companies, ABCnet (AgroBiotech Cluster network) and NetBioCluE (Networking activity for Biotechnology Clusters in Europe), the object of this publication, which is aimed at elaborating new recommendations and tools for efficient cluster policies in biotechnology for health.

In particular, NetBioCluE should be seen as a knowledge-hub connecting networks, clusters and communities across Europe and outside, with valuable links to the US and China. NetBioCluE is in fact establishing itself as a gateway to European biotechnology at the international level (see for example its involvement in Bio 2007 in Boston and 2008 in San Diego) and, if implemented further in the coming years, could play a significant role in addressing Europe's fragmentation and fostering entrepreneurship, the continent's Achilles' heel.
NetBioCluE supports networking, collaboration and the transfer of knowledge among innovation stakeholders and actors in biotechnology for health throughout Europe. It started in January 2006 involving ten clusters at different levels of development, from mature clusters like Cambridge, Heidelberg, Munich and Paris, to other clusters, like Dundee, Milan-Turin, Stockholm and Uppsala, Aarhus, and also clusters in the emerging phase in the Czech Republic and Hungary. The network has provided a concise and operational ready set of policy recommendations to be integrated in policies fostering the development of Europe's biotech clusters and industry and looking at key factors for successful biotechnology development (in particular: people, transnational cooperation, convergence across sectors and response to fast changing markets).
The added value of the recommendations, originating from extensive work on the ground and consolidation of previous work and literature, aims at being more than a headline. These multi-level messages

Partner	Cluster	Country
Milan Chamber of Commerce - Innovhub – NetBioCluE project coordinator	Milan-Turin	Italy
Polytechnic of Milan School of Management	Milan-Turin	Italy
Bioindustry Park del Canavese	Milan-Turin	Italy
Areta International	Milan-Turin	Italy
East region biotech Initiative – ERBI	Cambridge	United Kingdom
University of Dundee	Dundee	United Kingdom
Chambre de Commerce de l'Essonne	Paris Ile-de-France	France
Genoptics	Paris Ile-de-France	France
Heidelberg Technology Park	Heidelberg	Germany
Munich Gruender Regio	Munich	Germany
Biotech Valley	Stockholm-Uppsala BioRegion	Sweden
East Jutland Innovation	Aarhus	Denmark
South Moravian Innovation Centre	South Moravia	Czech Republic
South Great Plain Regional Development Agency	Szeged	Hungary

aiming at integration among clusters may be built into policy makers' long-term strategies for the development of the Life Sciences industry.

NetBioCluE's fourteen partners above and coordinated by the Milan Chamber of Commerce include all cluster representatives, from research institutions to companies, local authorities and governing bodies as well as science parks, from ten different European clusters. All partners have been active, in different roles, in the further development of their own biotechnology clusters in a strong outward-looking attitude from the very beginning establishing links with the US and China.

NetBioCluE, in its three years of activity, started with the identification of a theoretical framework for biotech clusters' analysis with the mapping of sixteen clusters at different levels of development and active in biotechnology for health, in the consideration of the international context in which they operate. The study established the distinctive characteristics of each cluster and identified the possible evolutionary path that each cluster may be anticipated to follow. The study, as illustrated in Chapter 1, has taken a bottom-up approach examining together clusters comprising 30,000 employees and 44,000 researchers; 96 universities and 60 research organisations; 70 incubators/science parks and 28 industrial associations/industrial organizations, and describing a total of 600 product-oriented biotech companies (mostly engaged in clinical or preclinical work) and 450 technology-oriented biotech companies (mainly tech platforms), with drugs and diagnostics as main activities. The forces and drivers of bioclusters' growth, together with insights from successful European experiences in a comparison with the US and the rising economies of China and India, are explored in Chapter 2. This analysis is critical to understand the local environment around cluster development leading to the important point that policies cannot be too prescriptive as what is a good method for one cluster will not be a good or feasible practice for another.

Chapter 3 looks at the results of qualified interviews undertaken with biotech actors concerning business models and services that biotech companies may need. This field work also allows to see how perceptions about the status of each cluster differ from cluster managers to companies to Universities thus implying different needs - and actions to be developed - in each cluster. NetBioCluE has looked at the biocluster system as an ecosystem, as a living organism: just like an organism is constituted of many different cells working together, a biocluster is a system of actors as biotech companies, large pharmaceutical companies, universities and research centres, supporting institutions, local agencies, incubators and science parks, involved in tight relationships with one another. Over sixty good practices for bioclusters' development have been collected and categorised in Chapter 4. Those practices were classified according to four main categories:

1. supporting science (support to research and to technology transfer)
2. supporting infrastructures
3. supporting companies (networking, business support, funding, involvement of large pharma companies)
4. supporting bioclusters (creation of cluster consciousness, promotion, cooperation across clusters). Practices have been looked at in a systemic approach: bioclusters' management implies a system of practices aimed at coordinating the cluster's "homogenous" growth.

The models of activity collected fall within the categories mentioned here above. For example, they include technology transfer practices, playing a relevant role in promoting the creation of the much cherished hi-tech European start-ups that should turn knowledge into innovative and successful market products capable of sustaining the growth of European biotechnology (a few examples of that are Heidelberg's Gruender teams, the Discovery Initiative in Milan-Turin and the support in spin-off establishment of the SKNC cluster in Hungary). Other experiences are more focused on business development and support, critical aspects for companies' development and closely related to support of technological and high added value services (an example is value chain coaching from Sweden, conceived in a cluster characterised by the presence of several large pharma companies, the main customers of biotech innovations). Availability of finance is another key issue for companies especially in their early stage and this is reflected in the high number of practices collected (a few examples include the ITI life sciences from Scotland, Genopole Premier Jour from Paris or Next Fund from Milan-Turin). Network and collaboration support, involving actors within the cluster and across clusters is another important tool to boost synergies and partnerships in and across clusters (examples include Bioforum in Milan, BioDundee, Gate2Biotech, the Transalpine Biocluster, Cambridge partnering events).

Once all practices have been categorised, they have been shared among clusters thus allowing them to extend their services to companies based on successful models applied elsewhere. Their reproducibility has then been assessed, as shown in Chapter 5. This test is the result of an accurate and profound involvement of local actors from the observed clusters who have contributed in evaluating the identified practices comparing them with the actual situations and needs they experience on the ground with a view to critical factors for cluster development that still need to be looked at in their specific cluster. The resulting ranking provides key learning for cluster operators and managers in all different clusters' stages of development, from initial, to growth and maturity.

As reported by the companies and experts interviewed in Chapter 6, it is clear that transnational networks like NetBioCluE and other projects as AFIBIO and ABCnet are extremely valuable in pooling resources of many different stakeholders for the support of the European biotech sector. Their strength lies in accelerating the formation of critical mass for funds and investment attraction, but also in exchanging practices and increasing the cluster commitment as well as increasing internationalisation ➤➤

with access to European events and direct contact for future R&D and business partnerships.
Below is an outline of the policy headlines elaborated by NetBioCluE's partners through local and international workshops. The recommendations are organised along four main lines of action: **people**, **flexible boundaries**, **convergence** and **rapid response**, as these are the key aspects to which a cluster should look at, if it aims at getting closer to its vision for growing stronger and more competitive at the international level. NetBioCluE's policy recommendations focus on vital dimensions of cluster development and come from the experience of each of the observed clusters and across the NetBioCluE network. The clusters' different levels of development are taken into account as well as the vision and experiences of all clusters and stakeholders. Key issues included in the messages that NetBioCluE brings to policy makers are, for example, the internationalisation of clusters to be fostered through a satellite system of bio-clusters, support of "closer - to - market" technology transfer mechanisms and in support of business experiences' transfer as well as cross sectorial integration of research activities. With a view to cluster maturity and policy intervention, the best time for policy intervention is also looked at, showing how important it is for example to start from policy actions focusing on "people", as human resources are the principal asset of any biocluster.
NetBioCluE results should not be viewed independently as they are closely linked with a wide number of policy-development initiatives, like for example AFIBIO, with which the linkage is critical: NetBioCluE can help in defining the context and the framework in which funding should be undertaken to help biotech cluster development, while AFIBIO has been looking at the specific tools in a complementary and cooperative way. ■

1. People

Aimed at enabling a cluster emerge and grow through skilled and experienced scientists, business developers, entrepreneurs and innovation facilitators.

1a. Policy headline: Enabling international transfer of commercial biotechnology business experience

Appropriate actions:

1. Exchange of business staff
2. Immersion in developed clusters
3. Taking experience to the regions
4. Short term skills access combined with development of long term skills development

1b. Policy headline: Support for researchers' retention

Appropriate actions:

1. Retention of external early-stage scientists within clusters

2. Flexible boundaries

Aimed at allowing a cluster to expand its activities beyond biotech, for instance in contiguous and emerging sectors such as nanotech and bioinformatics and to a wide variety of financing sources.

2a. Policy headline: Enabling access to funding for all organisation types

Appropriate actions:

1. Enabling organisations of any type to apply for relevant funding
2. Competitive tendering for solutions

2b. Policy headline: Enabling a "dual ladder" career path for academics

Appropriate actions:

1. Making existing barriers more permeable to allow people to move back and forth from academia-industry-academia

2c. Policy headline: Support for closer commercial/closer to market involvement in technology transfer from research

Appropriate actions:

1. Move technology transfer closer to the end market: commercial pull, not academic push

3. Convergence

Aiming at fully integrating tech-transfer with innovation and market launch of products and commercial development.

3a. Policy headline: Support for communication without barriers between all organisations linked to biotechnology

Appropriate actions:

1. Cluster managers collaborate
2. Collaboration across sectors

3b. Policy headline: Support for cross-sector research infrastructure integrating research to research and research to application

Appropriate actions:

1. Create environment for cross-sector collaboration by embedding labs in different sectors
2. Create infrastructure shared by different sectors
3. Rotate tenancy of multi-sector infrastructure with global teams
4. Joint technology Chairs

4. Rapid response

Aiming at enabling all stages and actors in biotechnology to respond quickly to global market changes.

4a. Policy headline: Support for rapid assessment and award of funding

Appropriate actions:

1. Accelerating speed of funding

4b. Policy headline: Support for Europe-wide access to market dynamic information

Appropriate actions:

1. Maximise understanding of the market
2. Radar/observatory in Europe for early detection of new directions and stimuli
3. Reading early signals

4c. Policy headline: Support for faster policy and regulation response to market changes

Appropriate actions:

1. Faster policy changes to enable different company behaviour

The way forward for European bioclusters

a conversation with Reinhard Büscher

Reinhard Büscher, Head of Unit for Support for Innovation at Enterprise and Industry DG of the European Commission speaks about the next steps to be taken in developing Europe's clusters cooperation from Europe INNOVA initiative and beyond. Europe INNOVA is a sector-based approach initiative for innovation professionals supported by the European Commission and bringing together 300 partners from 23 Member States. It acts as the focal point for innovation networking in Europe, informing, assisting, mobilising and networking the key stakeholders in the field of entrepreneurial innovation, (firm managers, policy makers, cluster managers, investors and relevant associations). Büscher points out that policies in support of clusters help the coordination of policies and help looking ahead towards strategic priorities especially in high tech sectors, like biotechnology. New initiatives will include service packages for the internationalisation of clusters, as well as for the better integration of SMEs in clusters. The way forward will be to move from networking activities to implementation of common actions and action plans. Büscher also shares his hopes for the establishment of a European Cluster Manager Association that could play a significant role in raising the quality and professionalism of cluster organisations in Europe connected to the best performing clusters.

Why are initiatives and policies in support of cluster development important?

Clusters represent an interesting concept for regional development and innovation. They often provide a particular fertile ground for the creation and commercialisation of innovative products and services because of the interaction they facilitate between companies, research institutions, public authorities and investors that work in a given geographical area. This is what clusters offer. But it is far from obvious how to promote them. What can be said is that cluster policies help better coordinating between different policies and orienting them towards strategic priorities that are shared with enterprises and other actors in a region. This may help regions to improve their regional strengths and to build their future. In other words, cluster policies offer better ways to spend public money. But whether cluster policies will in the end be successful is yet another question. Not all dreams will come through.

What are the EU's role and mandate in cluster development support?

Our starting point is that in Europe a lot of public money is spent in support of innovation, be it to support regional development, to foster the economic exploitation of research or to help SMEs innovate faster and better. The impact of such efforts would certainly benefit from a better coordination among these different support mechanisms. This is what cluster policy is all about. The Commission is interested in making the best use of Structural Funds as we are in favour of creating more entrepreneurial dynamics in Europe. Cluster policies can contribute to both. Of course, it is not our role to say which cluster should be supported and which not. This is for Member States and regions to decide. But there is scope to learn from each other and to support trans-national cooperation in view to further accelerate the development of more competitive and innovative clusters in Europe. For this, we have received a strong political mandate from the Member States. In December 2006, the Competitiveness Council included cluster development among the 9 strategic priorities for innovation. This confirms the increasing interest of Member States and EU regions to further support clusters as part of their efforts to boost the competitiveness and innovation of their firms and territories. In particular, the Council welcomed the activities of the European Cluster Alliance which brings together with support from the Commission a large number of EU regional and national authorities and innovation agencies with the view to enhance cooperation between them in the field of cluster policy learning and development. It seems that the Commission's role in support of clusters is now fully accepted. The Brussels European Council in March 2008 has recognised the importance of clusters for innovation and competitiveness and urged to improve coordinated efforts to sustain them, including "through improved science-industry linkages and world-class innovation clusters and development of regional clusters and networks". Furthermore, the European Council urged for "facilitation of increased participation of innovative SMEs in clusters". On this basis, the Commission will table a Communication later this year.

What is the focus of EU measures for cluster cooperation?

You may be surprised, but clusters don't spontaneously cooperate, nor do regions. It's the people in the clusters who cooperate and this is happening more and more. It is not the task of the Commission to directly support enterprises or research institutes to cooperate. Our focus is on bringing cluster organisations and cluster managers closer together as well as innovation and regional agencies that manage cluster programmes. Cluster managers are not only responsible for driving regional cluster development but they are facilitating trans-national cooperation between innovation actors of different clusters, by building the necessary bridges through interlinking cluster managers across Europe. In DG Enterprise and Industry we are in particular concerned that innovative SMEs participate as good as possible in clusters and this is exactly what the European Council in March 2008 has called for. The second focus is placed on cluster policy-makers because trans-national cooperation at policy level is important for removing the many practical barriers which still hamper cooperation across borders.

How does Europe INNOVA initiative respond to this need?

Europe INNOVA contributes to better involving SMEs into clusters but more needs to be done in this direction. The 11 sectoral cluster networks under the Europe INNOVA offer many good examples and new approaches to be followed in this respect, including your NetBioCluE project. As a result of these projects, many new contacts between companies operating in different clusters were established and cluster management was further improved. The projects under Europe INNOVA prove that there is scope for more intense trans-national cooperation in this field. Some Europe INNOVA projects were at the origin of trans-national cooperation agreements between cluster organisations that were signed by regional authorities. You can find this in the context of your biotechnology project, in the CASTLE cluster project on satellite downstream applications (establishing the ENCADRE network with other projects) and the cluster projects of TCAS and BeLCAR (establishing the European Automotive Strategy Network).

What are the next steps?

We will not continue funding the same type of networking activities further. By now, it should be clearly understood how to organise cluster visits and how to get the most out of such events. Now we have to aim higher. We will facilitate cluster cooperation in particular in areas which are also of interest for the Lead Market Initiative. What we are looking at is the development of new service packages for the internationalisation of clusters, as well as for the better integration of SMEs in clusters. In order to ensure the highest possible impact, it will be important that the future Europe INNOVA initiatives will be supported by strong partners that command own resources and have proven access to enterprises working together in clusters. Our privileged partners in future projects will therefore be well established cluster organisations that are willing to cooperate with others and ready to develop better tools and instruments in support of trans-national cluster cooperation and SMEs' participation. On the other hand, we will support efforts to better train cluster managers and to raise their professionalism. Furthermore, we intend to further develop the European Cluster Observatory towards an open platform which facilitates working with and within clusters, by providing also information on the specific support services offered by cluster organisations and facilitating search for business and research partners. On top of all this I also have a personal wish. It would help enormously to better support clusters and cluster organisations if a truly European Cluster Manager Association would be established that could take the lead on raising the quality and professionalism of cluster organisations in Europe. I could imagine that a European label for high quality cluster organisations could be developed that would also help to identify those institutions which are best placed to manage public funds. We are ready to support such ideas. ■

Meet Europe's bioclusters

A survey of sixteen major European biotech clusters

Summary

This chapter aims to present the main results and conclusions of the survey on European biotech clusters of the NetBioCluE network, within the Europe INNOVA initiative. Data lay the ground for the further analysis conducted in the next chapters. Sixteen clusters have been examined, some of which rated as excellent at European level and others in a developmental stage. The coverage of different countries has been relevant to carry out studies and activities to be significant at European level. The main figures regarding the analysed clusters are: 30,000 employees and 44,000 researchers; 96 universities and 60 research organisations; 70 incubators/science parks and 28 industrial associations/industrial organizations. The sample examined is composed of 600 product-oriented biotech companies (mostly engaged in clinical or preclinical work) and 450 technology-oriented biotech companies (mainly tech platforms), which main activities are drugs and diagnostics. Other areas of importance are plant and industrial biotechnology. The majority of the companies are academic spin-offs funded during the last 5 years.

Main findings according to cluster type and nationality

The majority of the clusters in the survey are in an initial or growth stage of development and operate on a regional level. France and Sweden have the highest number of clusters in the survey (3) followed by Germany and Hungary (2). The highest number of employees is found in the biotech clusters of Great Britain (Cambridge leads both for number of companies and employees), the Czech Republic and Germany, whereas the biotech clusters of Hungary and Denmark have the lowest number of employees. The more mature is the biocluster the larger is the number of large pharmaceutical companies within its geographical boundaries. This suggests that there is a strong mutual benefit from the interaction of biotech firms with big pharma companies. Biotech clusters in Germany have the highest number of researchers (12,000), followed by France (9,000), whereas the lowest number is found in Denmark and the Czech Republic.

1.1 The clusters in the survey: a general overview

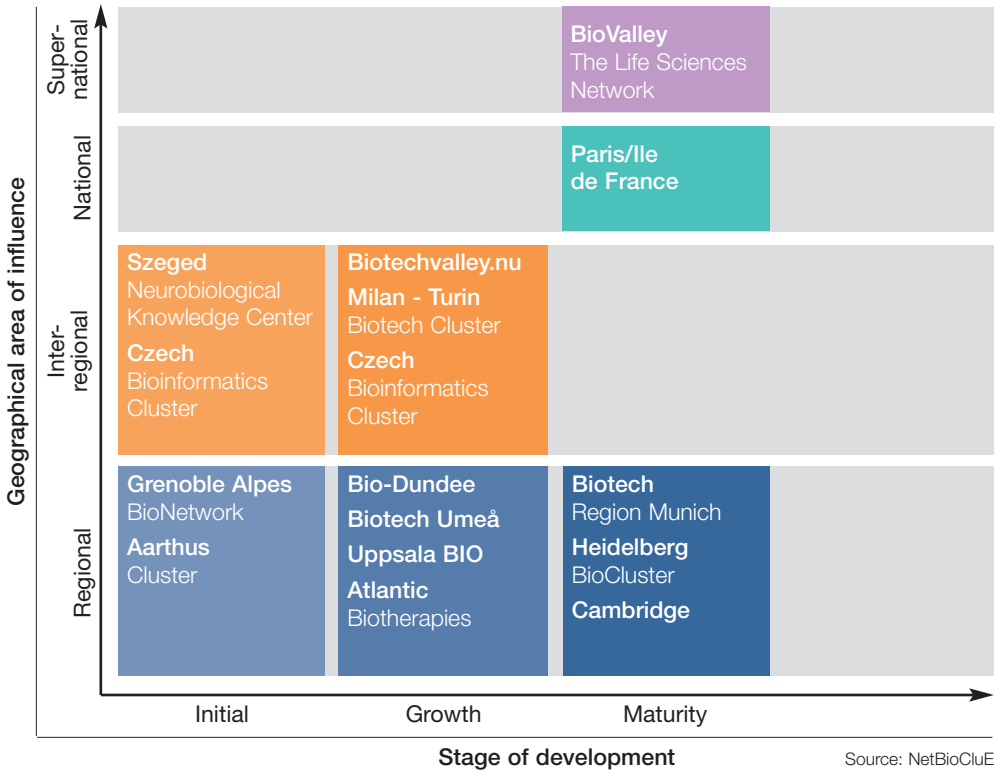
The survey includes sixteen cluster initiatives based in numerous countries (Great Britain, Czech Republic, Denmark, France, Germany, Switzerland, Hungary, Italy and Sweden).
A number of indicators have been set up for this analysis, which also give a brief overview of the population included in the survey (*Table 1*).
Picture1 illustrates the clusters and their relative position to each other regarding stage of development and geographical area of influence.
A majority of the studied clusters are on a regional geographical level, either at an initial or at a growth stage of development (*Table 2*).

Table 1 - Performance indicators[1]

Performance indicator	Threshold value	Numbers in the survey
Number of bioclusters analyzed	20	16
Number of biotech companies analyzed	300	604
Number of research organizations (universities, research centres, ...) analyzed	30	54 (universities) 96 (research centres)
Number of industrial associations and/or institutional organizations analyzed	20	28
Number of support infrastructures (science parks, incubators, ...) analyzed	10	60

Source: NetBioCluE

Picture 1 - Clusters by stage of development[2] *and geographical area of influence*[3]



Source: NetBioCluE

Notes

[1] *All indicators have reached their threshold value except the number of analysed clusters (16 out of 20). The reason for this is that, given the huge number of actors analysed (overall 842 actors in comparison to 360 expected, + 138%), it has been decided to prefer the quality of the analysis in selected clusters (going more in depth) in respect of the quantity of clusters involved.*

[2] *The stage of development refers to creation of new companies within the clusters, and is divided into three stages: initial: defined by young actors' presence and less than 25 companies; growth: more than 25 companies and 10% new companies created every year; maturity: more than 25 companies and less than 10%, but more than zero new companies started every year.*

[3] *Super-national: if the actors that constitute the biocluster are concentrated in a geographical area that spans over at least two neighbouring national states and/or there are tight and formal linkages (frameworks of collaboration, established scientific and economic exchanges, ...) between actors operating in bioclusters belonging to different (and not necessarily neighbouring) national states.*

Table 2 - Overview of the clusters in the survey (2005)

Cluster	Nationality	Area of influence	Stage	Product-oriented companies	Tech-oriented companies (4)	Research organiza-tions	Industrial Associations and other Instituitions	Support infrastructures (incubators and science parks)
Aarhus	Denmark	Regional	Initial	25	4	4	1	2
Atlantic Biotherapies	France	Regional	Growth	13	18	7	1	2
BioDundee	Scotland - UK	Regional	Growth	9	7	4	5	4
Biotech - Region Munich	Germany	Regional	Maturity	96	74	6	2	3
Biotech Umeå	Sweden	Regional	Growth	12	14	3	1	2
BioValley - The Life Sciences Network	Germany, France, Switzerland	Super-national	Maturity	30	-	6	n.a	12
Biotechvalley.nu (Sweden)	Sweden	Inter-regional	Growth	4	12	3	3	1
Cambridge	Great Britain	Regional	Maturity	225	197	13	1	13
Paris/Ile de France	France	National	Maturity	-	-	29	4	12
Czech Bioinformatics	Czech Republic	Inter-regional	Growth	7	14	15	n.a	5
Grenoble Alpes BioNetwork	France	Regional	Initial	4	10	14	1	3
Heidelberg Bio	Germany	Regional	Maturity	90	31	8	4	3
MI -TO Biotech	Italy	Inter-regional	Growth	67	47	25	4	6
Szeged Neurobiological Knowledge Center	Hungary	Inter-regional	Initial	2	5	3	n.a	0
Uppsala BIO	Sweden	Regional	Growth	18	19	6	1	2
Vaccine Therapy	Hungary	Inter-regional	Initial	2	1	4	0	0
TOTAL				**604**	**453**	**150**	**28**	**70**

Source: NetBioCluE

Notes

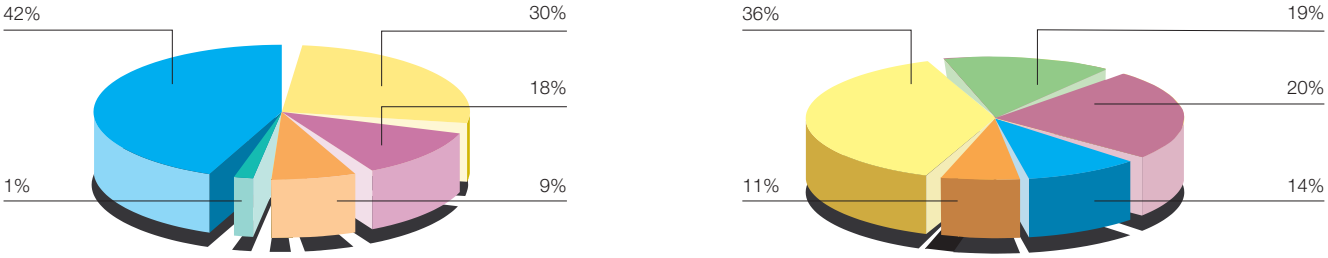
[3] *Product-oriented biotech firms: companies whose primary activity refers to the research and/or development and/or commercialisation of biotech-based drugs and/or other therapeutics and medical treatments (gene therapy, stem cells therapy, etc); technology-oriented biotech firms: companies whose primary activity refers to the research and/or development and/or commercialisation of biotech-related technologies (bioinformatics, diagnostics and other technology platforms) and scientific services (CROs and others).*

1.2 Firms, supporting structures and Universities: the three pillars of biotech clusters

1.2.1 The firms' activities

The most common activities carried out by the product-oriented biotech firms[3] are "Pre-clinical testing" (42%) followed by "Research" (30%). Among technology-oriented biotech firms the most common activities are "Technology platforms" (36%) and "Diagnostics" (19%).
The stock of companies is relatively young. About 55% of the product-oriented firms are founded between 2000-2004, and only about 15% are older than 15 years.

Picture 2 - Activities of product-oriented and technology-oriented biotech firms[4]



Product-oriented
- Research
- Clinical testing
- Pre-clinical testing
- Commercialisation
- Other

Technology-oriented
- Diagnostics
- Bioinformatics
- CROs
- Technology platforms
- Other

Source: NetBioCluE

Table 3 - Number of products in pipeline by cluster and phase

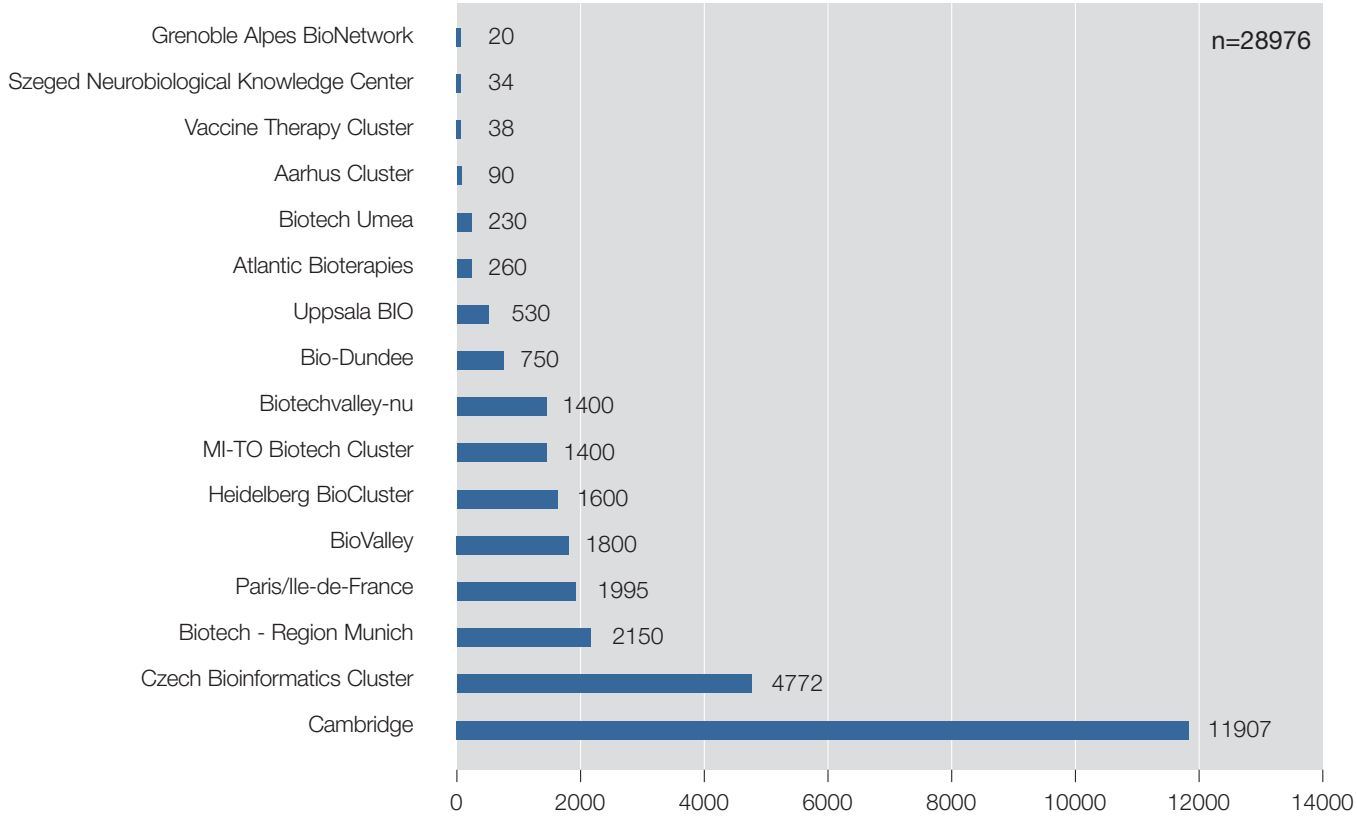
Cluster name	Pre-clinical products	Phase I	Phase II	Phase III	Comment
Aarhus Cluster	11	3	0	1	Other artificial tissues
Atlantic Biotherapies	6	-	-	-	
Bio-Dundee	N/a	N/a	N/a	N/a	
Biotech - Region Munich	41	16	7	4	
Biotech Umea	3	1		1	
BioValley - The Life Sciences Network	N/a	N/a	N/a	N/a	Approx 75 in all phases
Biotechvalley.nu (Sweden)	5	0	0	0	
Cambridge	N/a	N/a	N/a	N/a	
Paris/Ile de France	7	41	39	7	Other diagnostics
Czech Bioinformatics Cluster	0	0	0	0	Other artificial tissues Proteins, Antibiodies
Grenoble Alpes BioNetwork	0	0	0	0	
Heidelberg BioCluster	6	0	1	-	
MI-TO Biotech Cluster	24	4	11	4	
Szeged Neurobiological Knowledge Centre (DVNT)	N/a	N/a	N/a	N/a	
Uppsala BIO	N/a	N/a	N/a	N/a	
Vaccine Therapy Cluster (VTC)			2		
TOTAL	**103**	**65**	**60**	**17**	

Source: NetBioCluE

Notes

[4] *The category "Other" includes a wide range of activities such as medical devices, process engineering, speciality chemical and drug delivery. Also, the companies in the studied bioclusters perform more than one activity and most of product oriented companies also perform activities that are typical of technology oriented companies (e.g. they offer to other companies internally developed technology platforms). This is due to the need for product oriented companies to sustain the long-term orientation of their main business activity (i.e. new product development) with the short-term cash inflows generated by side activities.*

Picture 3 - Number of employees in product-oriented biotech firms by cluster[5]



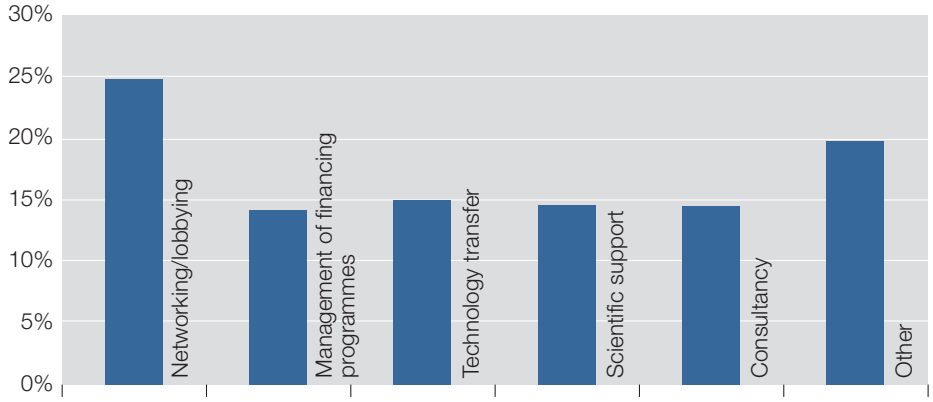
Source: NetBioCluE

1.2.2 Key organizations, supporting structures and financial actors

The majority of key organizations – which here refer to "organisations that act as coordinators of the biocluster activities and/or that play a clearly pivotal role in the cluster management" - are financed by public funding (56% of the 66 organizations identified in the survey). About 17% have mixed private/public funding and 27% are financed by the private sector.

Networking/lobbying is the most common main activity carried out by these organizations followed by **technology transfer** and **management of financial programmes**.

Picture 4 - Main activities among key organizations[6]



Source: NetBioCluE

Notes

[5] *Some of the clusters are dominated by a few number of very large firms, while other clusters consist of a higher number of SME. As for clusters with a few very large firms, an example is the Czech Bioinformatics Cluster, with the highest average number of employees in each firm, followed by Biotechvalley in Sweden.*

[6] *The category "Other" includes activities such as Business development, International Affairs, and Managing European and International tradeshows and EU-projects.*

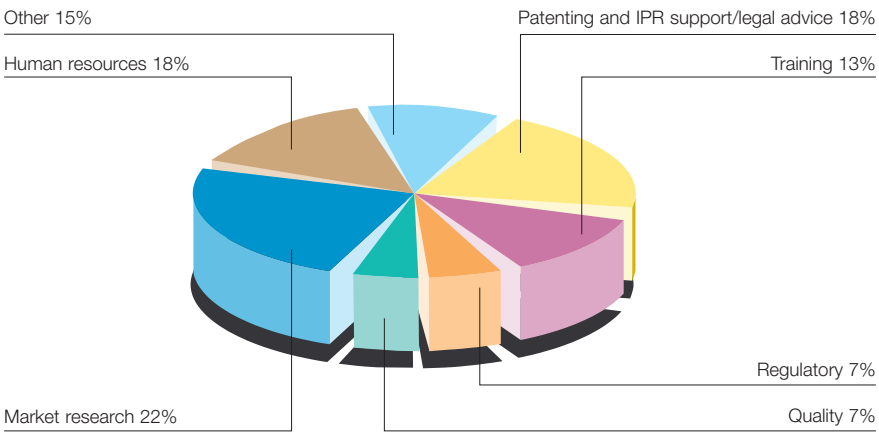
As shown in *Table 2*, the highest number of **incubators** and **science parks** is found in Cambridge, Paris/Ile-de-France and Biovalley - the Life Sciences network. Two clusters lack incubators and science parks. There seems to be a connection between the level of maturity (i.e. stage of development) and the number of incubators/science parks in the cluster. This connection indicates that the supporting structures play an important role in facilitating growth of the clusters. The **mature** clusters have more than **four times** the number of incubators/science parks than the clusters in the initial stage. Among the most common activities carried out to support clusters' development are support with facilities such as laboratories and premises, networking with local actors, project evaluation, start-up consultancy and innovation support (*Table 4*).
This indicates that there is a larger need for facilities and networking in the clusters in the growth and in the mature stage than in the Initial stage clusters. These ones, instead, seem to require more of innovation support from their supporting actors. **The financial actors** active in the clusters are mainly private (67%), 21% are publicly financed and 12% have mixed private/public funding.
The vast majority of financial actors - 76% - have venture capital as their main activity, followed by seed capital (17%) and business angels 7%.

Table 4 - Three most common supporting activities in each cluster-type

	% share of support activities
Initial-stage	
innovation support	20 %
Evaluation of innovative projects/start-up consultancy	15 %
Technology transfer	15 %
Growth-stage	
Facilities (rooms/laboratories)	15 %
Networking with local actors	13 %
Evaluation of innovative projects/start-up consultancy	12 %
Mature-stage	
Facilities (rooms/laboratories)	20 %
Technology transfers	10 %
Networking with local actors	10 %

Source: NetBioCluE

Picture 5 - Main activities carried out by supporting actors in the clusters (% share of total)



Source: NetBioCluE

1.2.3 Universities and research centres

Throughout the clusters, public institutions - 3 out of 51 universities are private, and 12 out of 84 research centres - prevail on private universities and research centres. The highest number of universities is found in the growth-stage clusters (20 universities), while the highest number of research centres is found in mature-stage clusters (36 research centres). There is no direct connection between the stage of development and the number of research institutions, except for the fact that the number of research centres increases with the stage of development. The highest number of private institutions - both universities and research centres - is found in the growth and initial stage clusters.

Table 5 - Private and public universities and research centres by stage of development

	Public	Private
Initial-stage		
Universities	13	1
Research centres	20	6
Growth-stage		
Universities	20	2
Research centres	28	6
Mature-stage		
Universities	18	0
Research centres	36	0
Total number of universities	51	3
Total number of Research centres	84	12

Source: NetBioCluE

1.3 Cross-cluster comparison

This section aims at comparing the surveyed clusters with a particular attention to **nationality**, **stage of development** (initial, growing mature) and geographical **area** of influence (regional, national, super-national).

1.3.1 Comparison by nationality

The highest share of product-oriented firms by number of employees is found in Cambridge.

Table 6 - Number of employees in product-oriented biotech firms by country

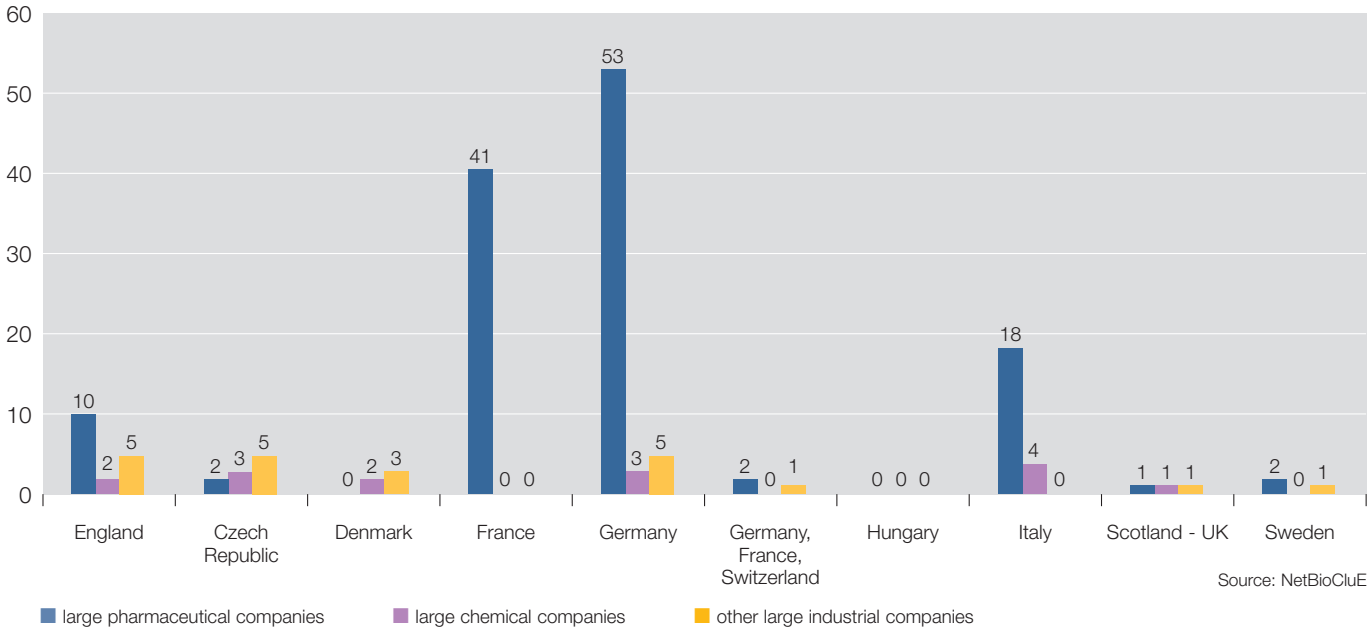
	Employees	% share
United Kingdom (Cambridge)	11,907	41%
Czech Republic	4,772	16%
Germany	3,750	13%
Sweden	2,560	9%
France	2,275	8%
Italy	1,800	6%
Germany, France, Switzerland	1,400	5%
Scotland - UK	750	3%
Denmark	90	0,3%
Hungary	72	0,2%
Total	**29,376**	**100%**

Source: NetBioCluE

1.3.1.1 Industrial context (presence of large companies)

The respondents for each cluster have been asked to estimate the number of large industries (pharmaceutical, chemical and "other" industry) with interest in the cluster. As shown in *Picture 6* the number differs between the countries involved. Large industries with interest in the clusters are dominated by pharmaceutical companies as in Germany, while Italy displays a considerable number of chemical and pharma companies.

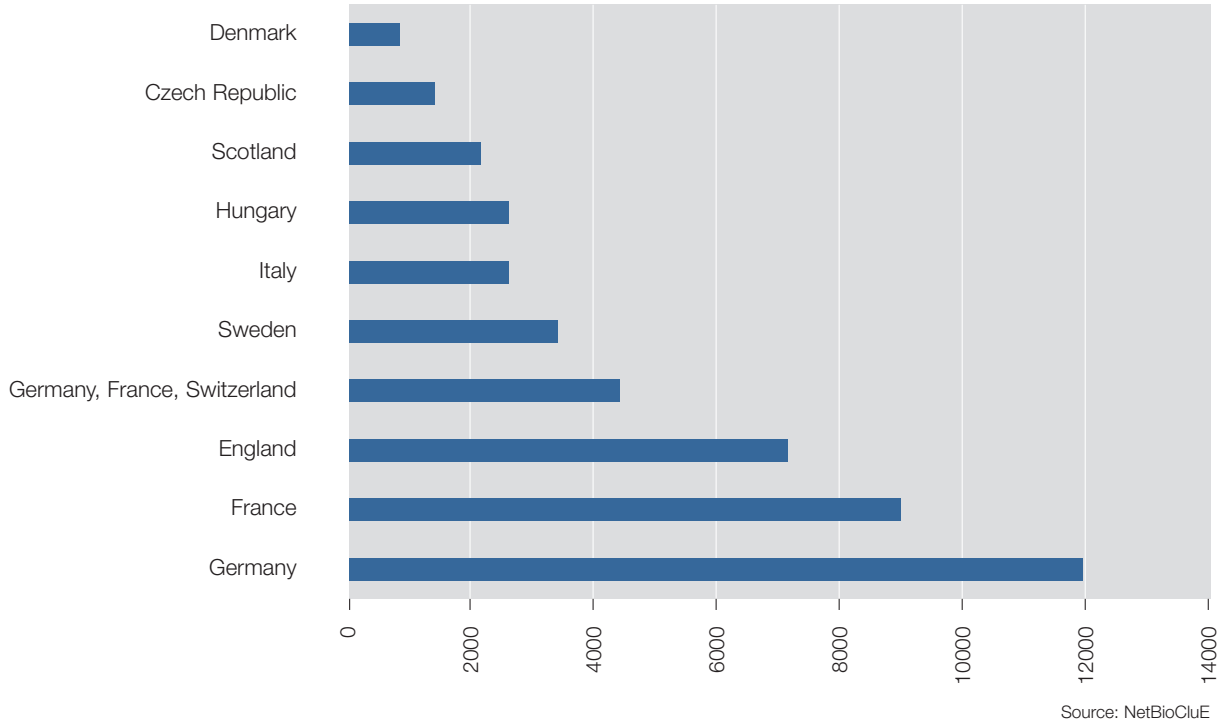
Picture 6 - Number of large pharmaceutical, chemical and other industrial companies in the clusters by nationality



1.3.1.2 Scientific context (presence of researchers)

The survey has shown that German and British clusters are particularly strong if looking at the number of researchers in the clusters by country. However, there are some differences: in total there are 44,371 researchers in the clusters (36,022 in universities, 3,849 in research centres and 4,500 in other organizations).

Picture 7 - Number of researchers by country



Comparing existing clusters within one country is important but, at this level and within the clusters surveyed, the activity can be carried out only for the following countries: France, Sweden, Germany, Hungary (*Table 7*).

It should be noted that Sweden has three clusters in the growth stage while the Hungarian clusters are both in an initial stage of development - which corresponds well to their size (measured by number of firms and employees). The French and German clusters are all in different stages of development. This seems to suggest a correlation between the stage of development and the number of researchers.

Table 7 - Comparison between countries with several clusters

	FRANCE			SWEDEN			GERMANY		HUNGARY	
	Paris/Ile de France (2004)	Grenoble Alpes BioNetwork	Atlantic Bio-therapies	Uppsala BIO	Biotech-valley	Biotech Umeå	Heidelberg	Biotech - Region Munich	Vaccine Therapy Cluster	Szeged Neurobiological Knowledge Center
Number of employed (product-oriented)	1,995	20	260	530	1,400	230	1,600	2,150	38	34
Number of product-oriented firms	133	4	13	18	4	12	90	96	2	2
Number of technology oriented firms	N/a	10	18	19	12	14	31	74	1	5
Number of product oriented subsidiaries	N/a	N/a	0	4	5	0	3	N/a	1	0
Number of researchers	7,400	1,500	0	2,500	2,000	950	3,000	9,000	470	1,920
Stage of development	Maturity	Initial	Growth	Growth	Growth	Growth	Growth	Maturity	Initial	Initial
Geographical area of influence	National	Regional	Regional	Regional	Inter-Regional	Regional	Super-National	Regional	Inter-Regional	Inter-Regional

Source: NetBioCluE

1.3.2 Comparison by stage of development and geographical area of influence

The majority of the clusters in the survey are regional in their geographical scope and growing in terms of stage of development.

Mature clusters display a larger number of employees. When considering the geographical area of influence, most of the employees are found in clusters operating on a "regional" level (*Table 8*).

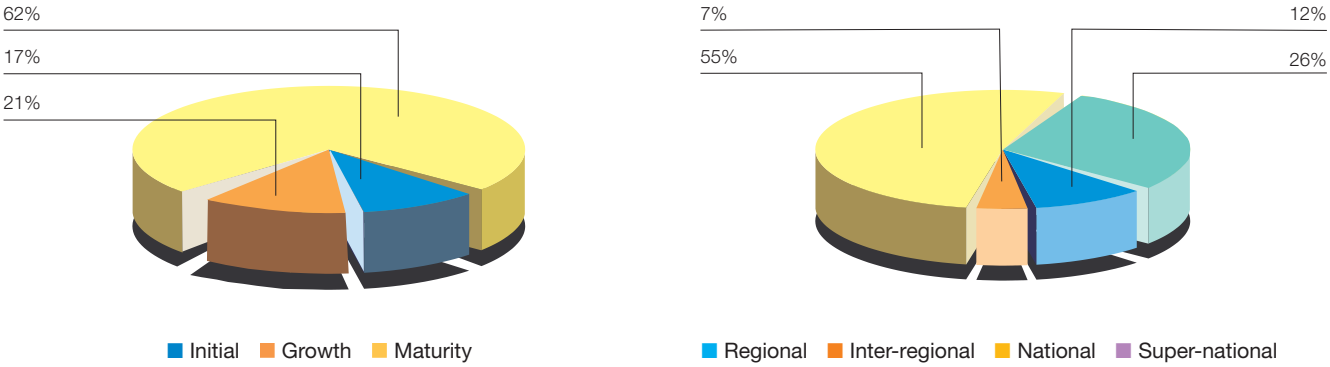
Table 8 - Clusters by area of influence and stage of development - number of employees

Type of Cluster	Number of employees
Inter-regional Growth	2,800
Inter-regional Initial	4,844
National Maturity	1,995
Regional Growth	1,770
Regional Initial	110
Regional Maturity	14,057
Super-national Growth	1,600
Super-national Maturity	1,800
Total	28,976

Source: NetBioCluE

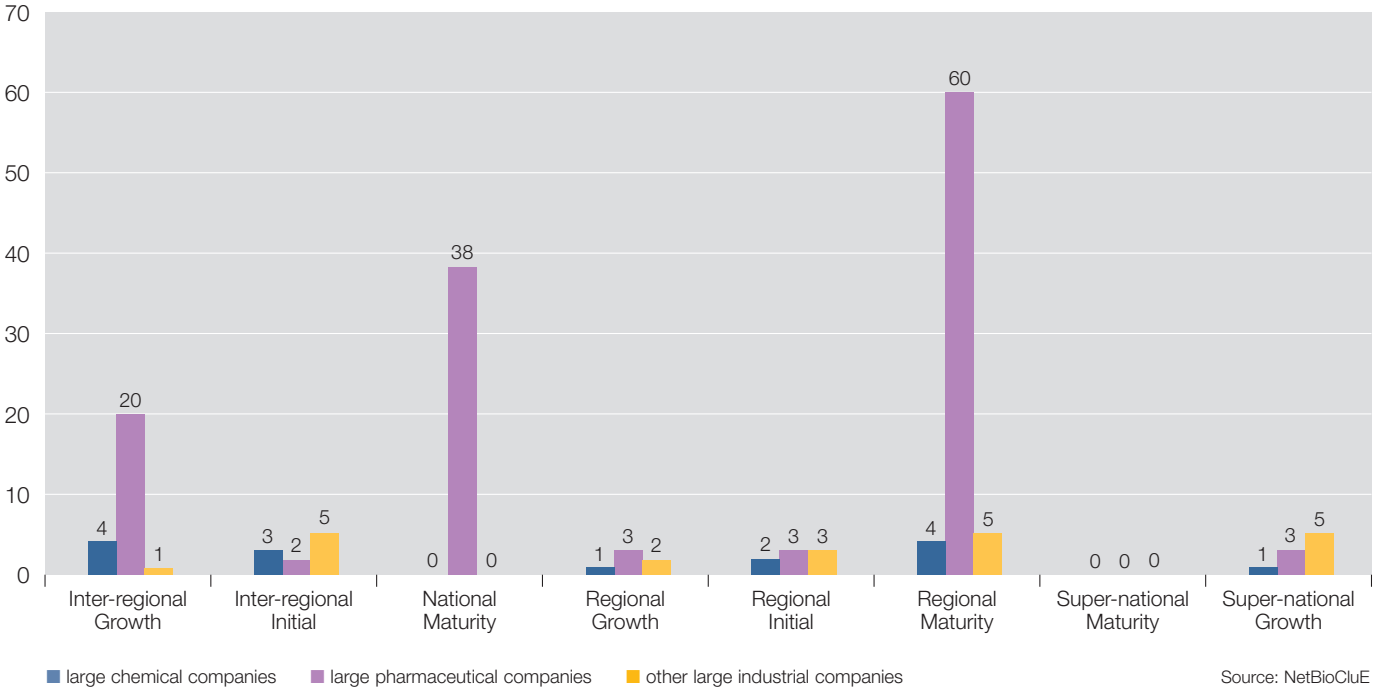
The distribution of product-oriented biotech companies follows the same pattern.
The highest share of both firms and employees is found in "regional-maturity" clusters while the lowest number of firms is found in the "national-maturity" cluster type (*Picture 8*).
The number of large pharmaceutical, chemical and other industrial companies distributed by cluster type reveals a similar pattern as above. The highest number is found in "regional-maturity" clusters, followed by "national-maturity" and "inter-regional-growth" (*Picture 9*).
Large companies are mainly present in clusters which are mature and which have a regional area of influence.

Picture 8 - Share of employees by stage of development and geographical area of influence



Source: NetBioCluE

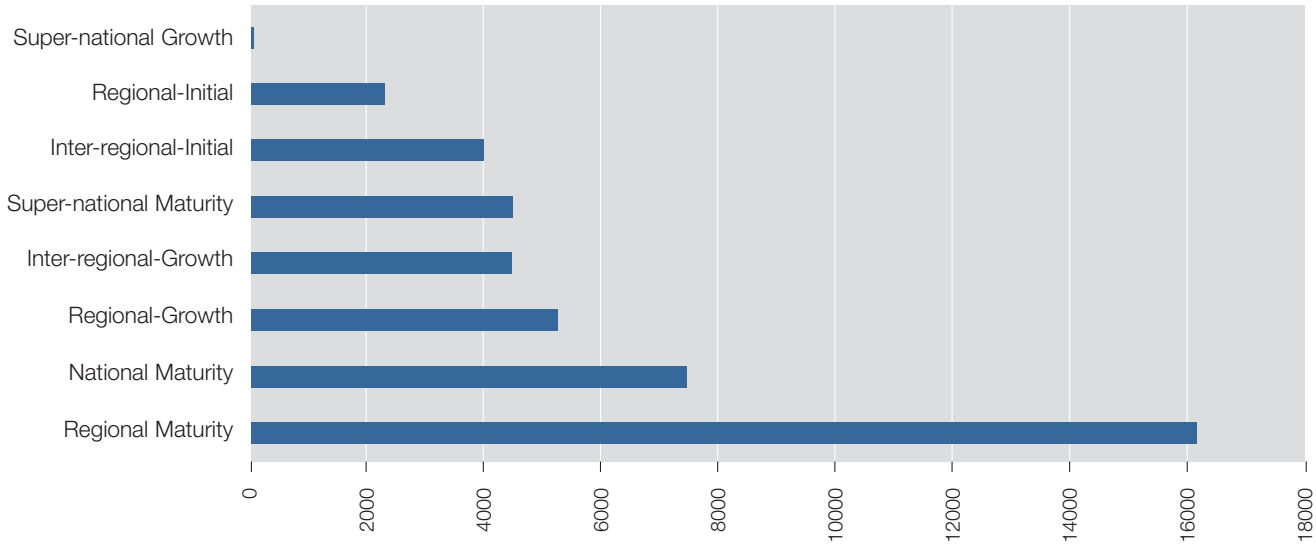
Picture 9 - Number of large pharmaceutical, chemical and other companies by cluster type



Source: NetBioCluE

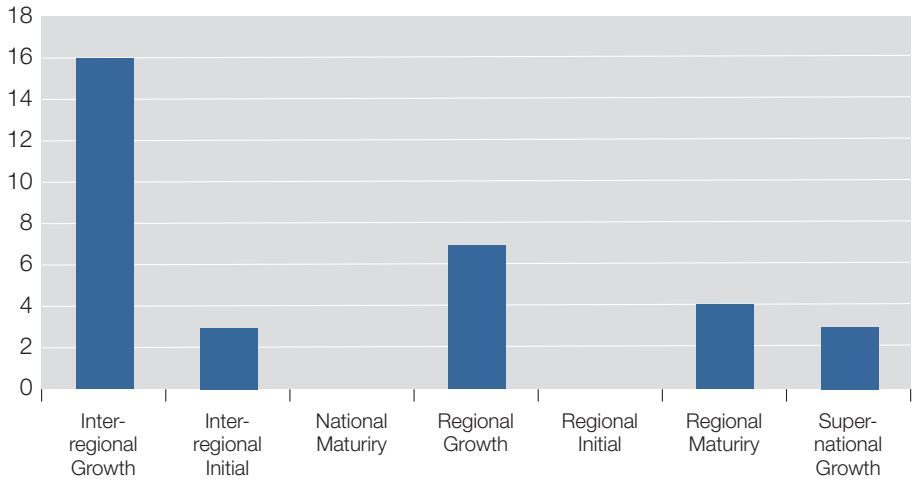
When looking at the number of researchers by cluster type, "**regional-maturity**" clusters have the highest number of researchers, followed by "**national-maturity**" and "**regional-growth**" clusters (about 6-.000-8.000 researchers) (*Picture 10*).
The number of product-oriented biotech firms' subsidiaries in the cluster varies between the cluster types. The highest number is found in "**inter-regional-growth**" clusters, followed by clusters characterised by "regional-growth" and "regional-maturity" (*Picture 11*).

Picture10 - Number of researchers by cluster type



Source: NetBioCluE

Picture 11 - Total number of product-oriented biotech firm's subsidiaries by cluster type



Source: NetBioCluE

1.4 Main results of the survey

The five most prominent key factors playing a pivotal role in the development of clusters covered by this survey are: determined **stakeholders**; strong **scientific** base; strong **industrial** base; **critical mass** of actors and network and availability of **finance**, funding and tax incentives.

a. Stakeholders

Several of the clusters emphasize the importance of stakeholders from the public, private and academic sector with long-term commitment. Aarhus cluster, for instance, stressed the fact that all major regional stakeholders, from the university, to the industry, the financial sector, the city and the county of Aarhus are determined to drive expansion of Aarhus' biotech potential and similar statements came from Atlantic Biotherapies in France and the Milan-Turin (MI-TO) interregional biotech cluster network in Italy. In Bio-Dundee, in the UK, the evolution of the cluster is closely connected to the city regeneration project undertaken in the '80s (the Dundee project) and the work with local economic development involving the public and private sector as well as the university. Another example is Uppsala Bio, which is a cluster initiative financed by the national Swedish "VINNVÄXT"-programme, based on the so-called triple-helix policy approach, i.e. industry, academia and the public sector.

b. Strong scientific base

Several of the clusters have a history of leading research within a specific field within Life Sciences. This scientific base has in many cases been crucial for cluster development and growth during the last 10-15 years or more.

c. Strong industrial base

The importance of presence of large companies within the field of Life Sciences in the clusters is highlighted as a key factor for cluster development and growth (i.e. Paris/Ile de France, Biotechvalley, MI-TO biotech cluster).

d. Critical mass of actors and network

The majority of the clusters in the survey point at local interactions between key actors as important.
BioDundee stresses the critical mass of trained bio-scientist and bio-research output formed by universities and research hospitals. Another example is Biotech Umeå, which points at the cluster initiative's role as a link between the industry, the university and its incubator, and the regional and local authorities.

e. Availability of finance, funding and tax incentives

The availability of venture and seed capital - both private and public - is identified as a crucial factor for cluster development and growth.
In the case of MI-TO biotech cluster, the governmental investment in start-up companies has in part helped to attract less risk-willing private venture capitalists. Other clusters where the availability of risk capital are highlighted is BioDundee, Biotech-Region Munich and Biovalley. Funding and tax incentives also play an important role for the clusters in the survey. Seven of the clusters receive some kind of tax incentives such as income tax exemption for young companies with strong investments in R&D (i.e. Atlantic Biotherapies, Grenoble Alpes Network and Paris/Ile de France). Cambridge mentions a recent R&D tax credit scheme functioning as a financial boost to the cluster. In addition to tax incentives, seven clusters receive funding from regional or national bodies in order to facilitate their activities. For instance Aarhus Cluster is funded with 1,000,000 from the Aarhus kommune (regional/local authority).

1.4.1 Mature clusters: four key factors behind success

Five clusters in the sample are in a mature stage of development - Biovalley, Cambridge, Paris/Ile-de-France, Munich and Heidelberg. This means that they have a relatively high number, greater than 25, of operating biotech firms and that they also have an increasing number of new companies (the ratio between the number of new companies created per year and the total existing companies is below 0,10 but positive). The key factors these "successful" clusters highlight as important for their growth and development run along the same lines that have already been identified.

a. Strong scientific base

The mature clusters in the survey emphasize the importance of high-class research within Life Sciences. Cambridge points at the excellent scientific base within the cluster as a key-factor (home of the discovery of the DNA-structure and Sanger centres Human Genome Project). In the case of Biovalley, five scientists from the region have received the Nobel prize in medicine/chemistry during the last 15 years, and the region hosts six universities, of which two are in the field of Life Sciences. The Paris/Ile-de-France region hosts a total of 11,800 researchers (these figures refer to the entire region, not only to the cluster). ➤➤

b. Availability of venture and seed capital

The supply of venture and seed capital is an important factor for all the mature clusters according to the survey. Cambridge stresses the change in investment attitudes at the time of the launch of the first biotechnology companies. High-risk investment has become more accepted and there are more venture capitalists providing early stage companies with seed capital. It is interesting to note that in the case of Cambridge no individual funding policy has contributed to the cluster development. The growth of biotechnology companies in terms of obtaining finance has been primarily linked to commercial VC investments. Biovalley also points out the availability of different types of risk capital, together with a well-developed supporting infrastructure as a pivotal factor for cluster development.

c. Strong supporting infrastructure

All mature clusters in the survey highlight the supporting structure, such as incubators and science parks, as important for the cluster development, like in Heidelberg and in Munich. Biovalley emphasises the good technology infrastructure as a key factor. Cambridge points at the excellent supporting industry and the availability of lab and office space through the university development of science parks as crucial factors for development. It is interesting to note that the mature clusters have the highest number of incubators and science parks in the survey sample.

d. Industrial base and interaction between industry and academia

The presence of large pharmaceutical companies in the clusters is put forward as a key factor for cluster growth. The Paris/Ile-de-France region hosts several of the world industrial leaders within pharmaceuticals/biotechnology and medical devices, and a large share of the researchers works in the industry. Cambridge points at the existing technology industry (in ICT and electronics) for providing technology knowledge and solutions used in the Life Sciences industry. The large pharmaceutical companies in the region facilitate the cluster's development by consolidating and releasing managers and technologies, and creating technology spill-over effects.

1.4.2 Initial clusters: science and infrastructure are key

This survey examined five clusters in initial stage of development (i.e.: "initial clusters" with young actors and less than 25 companies), namely Aarhus, CETI, Grenoble Alpes BioNetwork, Szeged Neurobiological Knowledge Centre and Vaccine Therapy. On a general level these clusters seem to face two main challenges: strengthening their scientific base and further developing the supporting infrastructure.

a. Strengthening the scientific base

A challenge for the "initial clusters" is to further develop the scientific base and increase the number of researchers in Life Sciences. Obviously, and as expected, the "initial clusters" have a considerably lower number of researchers than those in a "mature cluster". About 6,000 researchers are found in the "initial clusters" while the "mature clusters" host almost four times as many (24,000).

b. Further developing the supporting infrastructure

One of the main challenges for the "initial clusters" is to strengthen and develop their supporting structures in order to facilitate the cluster's growth.

The so-called clusters in the initial stage have a relatively low number or still lack incubators and science parks, which will need to be developed. Looking at what the "mature clusters" have pointed out, i.e. the importance of a strong supporting structure, it will be a key point for initial clusters to develop a supporting structure including all aspects of biotech support (from financial support, to business development, from IP protection to partnerships and internationalisation).

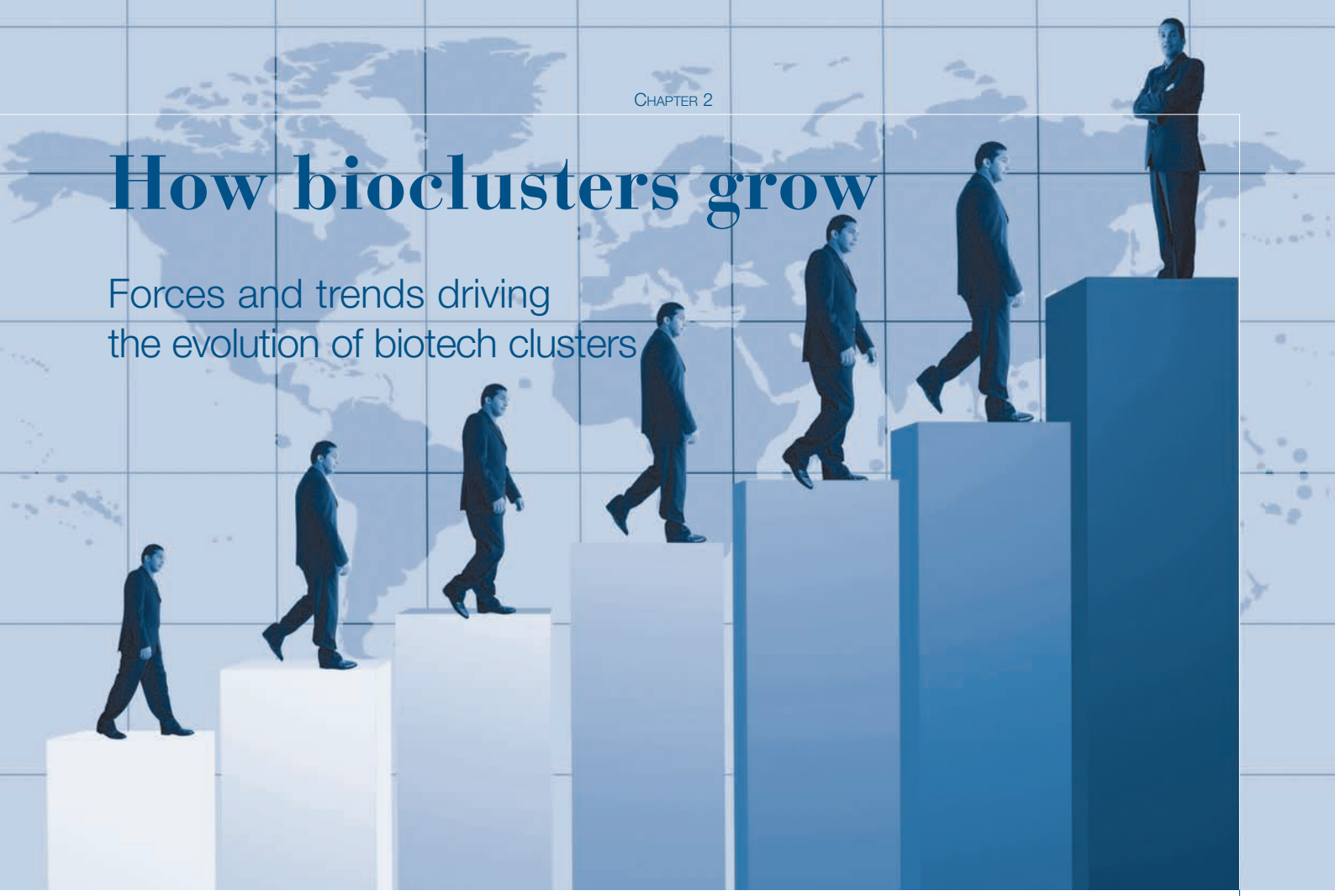
Conclusions

As anticipated, the bulk of the clusters observed by NetBioCluE's survey are in an initial or growth stage and operate at a regional level. France and Sweden tower among other countries with the highest number of clusters in the survey (3) followed by Germany and Hungary (2). Overall, the more mature the biocluster, the larger seems to be the number of pharmaceutical companies within its geographical boundaries. This suggests, on the one hand, that, given the excellence of science, a large industrial base is a key driver in the development of a biocluster and, on the other hand, that bioclusters represent a favourable environment for the growth of pharma companies themselves.

The next chapters will identify the factors leading to growth and their interactions, also outlining some of the local specificities. ■

How bioclusters grow

Forces and trends driving the evolution of biotech clusters



Summary

Biotech clusters, defined as the coexistence in a specific geographic area of both a medical Life Sciences knowledge infrastructure and a related set of dedicated firms, have become a key element in the production of knowledge and new products. Some of them are part of a larger trans-national "distributed innovation system" as described by Coombs and Metcalf in 2002. However, each cluster is the result of a specific mix of factors. As evidenced in the previous chapter, the five elements playing a pivotal role in the development of clusters are: determined stakeholders; strong scientific base; strong industrial base; critical mass of entrepreneurial actors and networks and availability of finance, funding and tax incentives. Historically biotech clusters first originated in the US, but in recent years have been in the spotlight of European policies aiming at the development of a knowledge based economy. Moreover, bioclusters are now becoming, albeit with different dynamics, a significant driver of growth for the biomedical industry of developing countries such as India and China. This chapter gives an overview of the origins and evolutionary paths of biotech clusters and proposes the major paradigms of their development laying the ground for NetBioCluE's investigation on the interplay of the different factors in the observed European clusters presented in Chapter 3. On top of the necessary conceptualisation of the cluster structure, the main focus of the chapter is on the analysis and comparison of the factors differentiating US and European experiences. A brief insight on the role of Asian clusters is also outlined. The chapter concludes proposing a new paradigm for the growth of EU biotech companies identifying the role of the supporting infrastructure as a key success factor. Additionally, the appendix to this chapter provides a case study covering the evolution of the main European biotech clusters completed through interviews with senior managers of biotech companies and key stakeholder organisations.

2.1 Bioclusters, a distributed system for global pharma innovation

The frame of reference for understanding NetBioCluE's work on clusters is the global pharmaceutical industry. Biotech is an industry developed by local and territorial factors but working on a global scale. Its red, pharma oriented branch, in particular, has established itself as the innovation source for the global drug development industry.

How important biotech will be in supplying the pipeline of drug companies is already evident in market figures. Biotech drugs, which are made out of living cell cultures, instead of the simple chemical molecules used to create traditional pharmaceuticals, are an attractive investment for big pharmas for two reasons: the industry's profitability depends upon the flow of new drugs and treatments and more than 50% of the present blockbuster patents will expire in the next 10 years. Biotech products are also interesting since generic competitors cannot touch them. As a consequence, the biotech industry is expanding much more rapidly than pharma. U.S. biotech sales grew 20% to $40.3 billion in 2006, while pharma sales grew 8% to $275 billion, according to IMS Health.

In this global scenario, to grow successfully biotech companies and clusters need to attract investments and partnerships from the pharma sector which is becoming more and more outsourced to access specialised know-how and to control R&D costs. The pharma R&D has in fact recently been described as a "distributed innovation system" (Coombs & Metcalf, 2002, 263),[1] in which biotech clusters have emerged as a critical source of better diagnostics and new therapies. Today, biomedical R&D is a global industry, but its fundamental steps still happen at local level where research centres, access to risk capital, entrepreneurship and national and regional policies play a prominent role.

Life Sciences research institutions are the essential source of new basic research discoveries. Where these institutions have spawned a set of innovating biotech firms a biocluster may be said to have emerged. The research base most often comprises research-led universities but it can also include the research institutions of pharmaceutical companies or other governmental agencies. Knowledge transfer from the research base into exploitable applications is the vital element of bioclusters. However to attract a pharmaceutical company's interest a biocluster must be able to combine at least two essential elements. First of all, to possess research institutions with a global leadership in focused research areas with recognised health-care application. Secondly, to have present effectively managed biotech companies with relevant leading-edge technologies and IP suitable for R&D investment.

Not all European bioclusters achieve this combination of key success factors. However by capacity-development of the research institutes to achieve research leadership and by the vigour of capable entrepreneurship this can be changed. Much depends on the support provided by the "national innovation system" and by concerted local initiatives in enabling such local developments.

2.2 The global context: US vs EU

Drug innovation takes place in a highly competitive context, in which the US still remains the leading player, but where Europe might soon have to face the threats coming from lower-costs but highly specialized biotech environments as those developing in the Southern hemisphere and Far East.

The medical biotechnology industry was created in the US. Genentech, the first dedicated medical biotech firm was established there as recently as 1977. The structure of the medical biotech industry was established in the US during the 1980s. This industry expanded greatly in the 1990s and in the US has matured in the last 10 years.

Extracts from the recent comparative study made by Critical I[2] highlight the competitive disparity of Europe compared to the US:

"The European and the US biotech industries both have around 2,000 companies, but the US sector employs nearly twice as many people, spends around three times as much on R&D, has twice the number of employees involved in R&D, raises over twice as much venture capital, and has access to 10 times as much debt finance. It earns twice as much revenue."

The competitive advantage held by the US biotech industry is a systemic outcome of long-run forces in the form of large-scale public research funding and break-through life sciences research discoveries, massive R&D investment by pharmaceutical companies, the demands of wealthy

Notes

[1] *Coombs, R & Metcalf, S. (2002), "Innovation in Pahermaceutical: Perspectives on the Coordination, Combination and Creation of Capabilities". Technology Analysis & Strategic Management, vol. 14, no. 3, 261-271)*

[2] *Critical I, (2006) "Biotechnology in Europe: 2006 Comparative study", European Association for Bioindustries*

health-care systems, generous fiscal policies with regards to venture capital, entrepreneurship and innovation, and favourable patenting and drug approval regimes.

However, the evolution of the biotech industry in the US has not been one of continuous growth. In parallel with the dot.com 'boom and bust', excessive investors' exuberance built up in the late 1990's and led to a market collapse in 2001. The resulting loss of investor confidence deprived new start-ups of development capital. However biotech firms with a R&D project nearing the end of the development pipeline continued to be financially supported by their financiers seeking to protect their investments. After 2002 a more cautious style of VC investment was evident limiting investment into later-stage R&D.

Around a number of leading Life Sciences research universities in the US a set of mutually reinforcing and aligned interests emerged (Feldman & Francis, 2002)[3] fostering creation and development of bioclusters. Such developments were concerted initiatives by collaborating key institutional actors in an essentially social cooperative process, in line with the triple helix model of aligned interests between public agencies, Universities and industry proposed by Etzkowitz & Leydesdorff[4]. A mapping of the factors shaping the evolution of the US biotechnology innovation system is set out above in *Table 1*.

Table 1 - Evolutionary paradigm of bioclusters in the US

US National Innovation System (NIS)	Local (Regional Innovation System RIS)
Directed public funded life science research	"Knowledge Infrastructure" continuously developed in leading research universities & institutes
Market-driven NIS (led by pharmaceutical companies demand for new/faster product leads)	"Triple Helix" responses by leading research universities partnering with pharmaceutical industry/property developers and city/regional public authorities to develop "Support Infrastructures".
NASDAQ market & development of VC industry	Entrepreneurial opportunities entice formation of independent biotech enterprises
Professional innovation "support industry" develops	Growth of business-like biotech companies linked into wider NIS.

Source: NetBioCluE

2.3 The key success factors of US bioclusters

Table 2 - Success factors of US bioclusters and their resulting advantages

At national level	At local level	Resulting advantage
1. Large-scale public funding of premier universities **2.** Demand for new drug treatments from a competitive health-care sector **3.** Large pharmaceutical companies willing to invest in biotech R&D **4.** Existence of favourable regulatory regimes for IP and drug approval **5.** Fiscal provisions favouring entrepreneurship, innovation, and VC investment in new companies	**1.** Rapid generation of new knowledge and high skilled researchers by world-class research institutions **2.** Readiness of universities to patent and license research discoveries, and become involved in infrastructure development to provide business incubators and science parks **3.** Life scientists who are prepared to enter the commercial sector as entrepreneurs **4.** Mobility of individuals with industrial experience **5.** Successful biotech business models to be emulated **6.** Tolerance of financial losses and continuing availability of risk capital	**1.** World-class centres of Life Sciences research **2.** Established biotech companies with deep competences in their R&D specialisation **3.** Companies have learnt how to operate commercially within the drug development industry. **4.** Access to better financial resources than European companies **5.** Company longevity has also given them a market reputation and thus access development capital from a more experienced investment industry **6.** A large population of well-established biotech companies partnering and cooperating as a political lobby for their interests

Source: NetBioCluE

Notes

[3] *Etzkowitz, H. & Leydesdorff, L. Eds. (1997). "Universities in the Global Economy: A Triple Helix of University+Industry+Government Relations", Cassell Academic, London. Etzkowitz, H. & Leydesdorff, L. (2000), "The dynamics of innovation: from National Systems and 'Mode 2' to a Triple Helix of university+ industry+government relations", Research Policy 29, 109-123, Elsevier Science BV*

[4] *Feldman, M.P. & Francis, J. (2002) "The Entreneurial Spark: individual agents and the formation of innovative clusters in complexity and industrial clusters" in Quadro Curzio, A.& Fortis, M. (eds.) Heidelburg, Stringer Verlay. (2003) "The Case of Entrepreneurship & the Capitol Region Biotechnology Cluster" European Planning Studies, vol. 11, no.7*

2.4 India and China, the rising new players

Biotech is developing rapidly in the East. It's not only Japan and Australia, but especially India and China the countries bound to become major players in the Life Sciences based market. Lower costs, abundance of world class scientists and access to sources of public and private capital are transforming the once second-line suppliers into challengers in the main markets.

The advent of the internet and of international express parcel services has enabled low-cost communication and rapid exchange of materials between R&D teams both in public research institutions and by private R&D firms and the large pharmaceutical companies. Developments in computer processing capacity and speed made possible ever-more complex research analysis and data management. Greater physical distance between research partners has been enabled. This linked to the development of biotech in lower cost countries has a new significance.

Bio-industries are present in Japan and Australasia, but it is in the developing economies of Asia that a new dynamic in biotech is increasingly apparent, namely low-cost R&D. The impacts of their investment in higher education and the return of émigré scientists to their home countries are now re-distributing the location of R&D activity. The developing economies of India, China and South East Asia are acquiring biotech capabilities. Graduates, often trained in North America or Europe, are working in research institutions and in producer companies in these and other developing countries. Whereas weakness in the protection of intellectual property remains a constraint in these countries, where this is addressed, for example in Singapore, then these lower-cost economies offer attractive alternatives to North American and European locations for contracting R&D activity.

2.5 European bioclusters, a difficult growth

The 2000 Lisbon EU strategy[5] to accelerate the transfer of university research knowledge into the development of knowledge-based industries has steered public research funding towards a greater emphasis upon its exploitation by high-tech industry. Notwithstanding initiatives at the EU level, the development of the European biotech sector still remains very much determined by factors at country level.
Starting from the later years of the 1990's a number of European countries sought to foster local 'triple helix' collaboration between industry, research institutions and universities, and public development agencies aimed at increasing innovation-led business growth. Such "concerted initiatives" to stimulate the development of bioclusters often took the form of 'kick-start' public-funding initiatives (for example, the German Bio-Region competition).
These actions have met an entrepreneurial response by way of the preponderance of very small and young biotech companies which have emerged since 1999. However, the venture capital industry in Europe remains highly fragmented, and since 2001 has been disinclined to invest in biotech start-ups. Many of the recent young biotech companies remain dependent on public funding.

International analysis, as the recent Critical I[6] study, reported that, compared to their US counterparts, on average European biotech companies grow slowly, mostly remain SMEs, have trouble competing at the international level and a majority of the mature ones have been acquired by US firms or are looking at the US for funding and market.

In this context, the aim of the NetBioCluE project has been to investigate the key success factors of sixteen European bioclusters and their interplay placing them in a global frame of reference. Among the most interesting deliverables of this work are the good practices for clusters' development and policy recommendations outlined in Chapter 7.

Notes

[5] *Lisbon strategy (2000), "The Lisbon European Council - An Agenda of Economic and Social renewal for Europe", EC DC/00/7*

[6] *Critical I, (2006) "Biotechnology in Europe: 2006 Comparative study", European Association for Bioindustries*

2.6 A closer look at EU bioclusters

NetBioCluE has investigated the issues in the development of biomedical clusters placing them in the conceptual framework of Porter's "National innovation system"[7] model integrated with secondary sources of data both on the US and Europe. Moreover, the analysis has examined the local factors, with particular attention to the role of public institutions as well as provisions such as incubators supporting firms' growth and market entry. The work has covered both emergent and mature forms of bioclusters since, quoting Maskell, et. Al (1998)[8], *"It is the specific situation of each firm and cluster that defines which geographic level will be most important for the innovation activity, knowledge creation and learning".*

Data on the development of each European cluster were collected through interviews led by the project partners with local actors who were active within each cluster either in a coordinating capacity or as biotech entrepreneurs. Information on the links between local actors in the clusters was obtained and the nature of enabling institutionalised process elements was identified.

Although exploratory, and not comprehensive of the experience of all biotech firms stakeholders, this work has been able to propose an interpretation of the pattern of evolution of clusters and the appendix compares the project clusters in terms of the factors shaping the start-up of biotech companies (the emergence of the cluster) and those factors which allow advance to growth of these companies (the development of the cluster). This analysis has covered twelve bioclusters in eight different nations based on company interviews exploring links held by biotech firms at the time of start-up and at the time of the interview.

Table 3 - Cluster location and country

Cluster	Country
Aarhus	Denmark
Biotechvalley (Strangnas)	Sweden
Cambridge	England - UK
Dundee	Scotland - UK
Grenoble	France
Heidelberg	Germany
Lombardy-Piedmont (Milan-Turin)	Italy
Munich	Germany
Paris/Ile-de-France	France
South Moravia	Czech Republic
Szeged	Hungary
Uppsala	Sweden

The summary analysis for each of the above clusters is set out as Appendix 1.

Source: NetBioCluE

Notes

[7] *Porter, M. E. (1990). "The Competitive Advantage of Nations". Free Press, New York*

[8] *Maskell, P. et. Al. (1998) "Competitiveness, Localised learning and Regional Development. Specialisation and prosperity in small open economies". Routledge, London/New York*

2.7 Comparison of EU bioclusters

Companies were analysed looking at age and size, as well as relationships with firms and academic institutions. This work shows that all biotech companies, regardless of age, retain links with their local "knowledge infrastructure" and relationships outside the cluster are more frequently formed with firms rather than universities suggesting that the connection is about R&D cooperation or market entry.

Life Sciences are characterised by "open innovation", implying that the increasingly specialised, complex and widely distributed knowledge nature of biotechnology requires that firms and research centres exchange knowledge between other firms and research institutions locally as well as non-locally[9]. Scale matters however, for in clusters with concentrations of firms and research centres, such as Boston, San Diego, and Cambridge, firms may more readily find other firms with complementarities leading to collaboration[10]. However, at the same time, global networks are indispensable. The published papers of Life Sciences researchers are readily accessible at a distance, and by way of participating in international conferences and biotech commercial gatherings, researchers and firms may seek out face-to-face introductions to individuals, firms and research institutions which then may subsequently develop into contracted collaborations and formalised information exchange. Indeed market entry by European biotech firms into the US is often built upon technical collaborations with complementing commercial partners already active in that market-place.

An extensive programme of interviews of biotech firms in the Scandinavian cluster, Medicon Valley, confirmed that firm-firm collaboration in basic research within the cluster is rare, that most research collaboration is with the public research organisations, and that informal collaboration is very limited, that nearly all collaborations are formalised by contracts at an early stage[11]. The Medicon experience is not the exception. However, new firm creation arises from face-to-face idea spawning and early-stage development to establish proof of concept requires the close interaction of the pioneering entrepreneurial team in what inevitably is phase of hands-on experimentation. Later phases of development involve clinical trials and systematic documentation which may be contracted to others with appropriate expertise and resources outside the cluster. Both close-by and distant partners are involved in life-science biotech. Independent of the scale of the cluster, the creation of new firms requires close local interaction. However the growth of such firms will depend upon their ability to develop both local and distant partners.

NetBioCluE's analysis of the evolution of the bioclusters in the sample indicates that European companies have gone through three waves of biocluster emergence: before 1995; between 1995 and 2000 and in the last eight years.

The first wave was a time of pioneering and experimentation where, in spite of little or no government policy in place, many outcomes were successful and still thrive today. Examples are Cambridge in the UK and Stockholm or Heidelberg's clusters which took advantage of substantial resource endowments in the form of medical Life Sciences research institutes and universities and the presence of research facilities of large pharmaceutical companies.

A critical factor were scientists and venture capitalists who became the biotech entrepreneurs, property developers and financial risk takers in these locations. There was no coherent local strategy to develop a biotech cluster. There was little university and research centre buy-in. The initiatives were essentially addressing singular opportunities to launch as a biotech company, to provide a venture capital fund (for example, Merlin VC in the UK), or to satisfy demand for accommodation by high-tech companies.

The second wave, in the mid 1990s, originated from the will of many Western European governments to counter the US dominance in pharmaceutical innovation making R&D "sticky" rather than foot-loose process. "Triple Helix" relationships in localities with suitable strong presence of research institutes and pharmaceutical companies, and with enabling local and regional public authorities provided a strategic approach for focusing both the allocation of public research and regional development funding. "Buy-in" at the local level was achieved by requiring the declaration of local key stakeholder partnerships committed to driving a concerted regional innovation strategy before the allocation of new Government public funding would be confirmed. Results

Notes

9 *Cooke, P. (2004), "The accelerating evolution of biotechnology clusters". European Planning Studies, 12:915-920*

10 *Cooke, P. (2005), "Rational drug design, the knowledge value chain and bioscience megacentres". Cambridge Journal of Economics, 29: 325-341*

11 *Moodysson, J. (2008) "Explaining spatial patterns of innovation, analytical and synthetic modes of knowledge creation in the Medicon Valley life-science cluster". Environment and Planning A, 40:1040-1056*

of these strategies were the German Bio Regio Competition (Heidelberg and Munich) and the French Innovation Technopole as well as the regional development approaches pursued at the time in Denmark, Scotland and Sweden.

The third and latest wave in the sample of bioclusters examined by NetBioCluE are the two experiences from recent EU accession countries (Czech Republic and Hungary). Here, the approach followed for creating bioclusters in South Moravia (Czech Republic) and Szeged (Hungary) complies with the national strategies already enacted in Western Europe. The "Triple Helix" model is promoted, which benefits from directed public funding of research and regional development funding. Again the effort is to develop a concerted cluster support system. However, an approach that may be effective in regions with multiple, well-funded research centres and pharmaceutical companies presence, may be less appropriate in localities which have smaller scale by way of established resources and have little venture capital activity.

The example of Aarhus, Denmark may be useful to understand the importance of the scale of the "support infrastructure" required for a small biocluster. A relevant scale of support infrastructure (East Jutland Innovation, Incuba VC Fund, BioMedico Forum and Aarhus Science Park) has achieved a crop of small biotech enterprises. The linkage of Dundee to a fuller "support infrastructure" at the Scottish level may be a useful pointer to how to connect a small biocluster into the resources of a "small country". Dundee may be viewed as a small city-based biocluster. Scotland is geographically a small country characterised by hosting a number of such city-clusters (Aberdeen, Dundee, Edinburgh, and Glasgow. There are also biotech companies outlying these centres.) Much effort has been placed in the last five years to developing a Scottish network system to link the local support-providing institutions to provide a comprehensive and complementary "support infrastructure" at the Scottish level which delivers locally.

2.8 Three models for company support

Establishing a successful biotech product is like making good wine some experts say to explain that more than applying a given set of rules, successful managers must adapt continuously to a different set of circumstances. Bioclusters are not different, since all develop from common elements: finance, high-knowledge basis, public policies and entrepreneurship, but all differ in the final outcome and identities. Thus, classifying them in theoretical models might appear limiting, but is a necessary step to lay a general frame of reference for NetBiocluE's analysis.

Clusters have traditionally chosen three types of approaches ranging from a close business development support on an individual company basis, to help in building supply chain networks between firms and research, and finally to establishing coordinating institutions to direct regional innovation systems. Each of these approaches has been associated with the creation of specific types of "supporting" institutions.

Business development support is the most familiar form of aid provided to biotech companies and covers business planning, IP, guidance and "soft" finance provided to intending start-ups by services providers at the level of the local cluster. The Danish Aarhus biocluster is a good example of such a coordinated local "services package". The East Jutland Innovation is a private company, but publicly-funded, which essentially provides a coordinating "business angel" role for biotech start-up. The Science Park RAF of the San Raffaele Foundation, in Milan, Italy, is another private "support infrastructure" provider able to provide a full-services package to incubate the enterprises arising from within its parent corporation. Involvement extends to providing support for the growth of the biotech firm. This support may be sourced locally or may be found at the regional/national levels. Accounts of large-scale funding and facilities support for biotech companies of high-growth potential are featured in a number of company interviews. (Cyclacel, Dundee; Esperion AB, Biotechvalley, Sweden; TRION Pharma, Munich; Rhinolight, Szeged). The supporting partner has on occasion been a public development agency levering private VC investment and providing physical premises (Dundee and Uppsala), but in the cases of the Munich and Szeged companies each has had an established "commercialising company" as the prime partner. ➤➤

Building supply chain is a particularly interesting support approach for biotech as innovation in this sector is essentially one of "technology push". Two interesting institutional developments have been identified in the Dundee account addressing these issues: ITI Life Sciences and the TMRC, both located in Dundee, are multi-million pound institutions serving the Scottish biotech system which will be more extensively covered in Chapter 4.

The ITI Life Sciences (Intermediary Technology Institute) is a public-funded private development organisation established in 2004. ITI Life Sciences is driven by a market fore-sighting approach. Against identified market opportunities it attracts R&D proposals from companies and research institutions to undertake the necessary development. This "contract" R&D is funded by the ITI which licences the IP created. The aim is to close the "funding gap" and realise high value outcomes that the contracted companies can take forward. The TMRC (Translational Medicine Research Collaboration) was established in 2006. This is a public-private venture to research, develop and clinically test bio-markers creating IP for commercial exploitation. The consortium partners are Wyeth, a large pharmaceutical company, the four leading Scottish universities in medical life sciences, the Scottish National Health Service, and Scottish Enterprise, the national economic development agency.
The TMRC in effect creates a "bench to bed-side" R&D supply chain for the generation of bio-markers.
A number of specialist biotech firms have become involved in the project.

Creation of coordinating institutions often have associated services delivery; however at the strategic level they are seeking to engineer new configurations between local bioclusters and with higher-level public and industry players to attract investment and partnerships at the national and international level.
Long-established examples of this type of institutions are Heidelberg Technology Park, BioM in Munich, and ERBI in Cambridge, England. These bioclusters are viewed as essentially encompassing substantial economic regions.
Examples of emerging such "regional innovation system" coordinating institutions are Medicen, Paris, France and BioMilano, Italy. Interviews obtained for these institutions are revealing about their vision and the strategic terrain in which they operate. Again Chapter 4 may well examine the directional contribution which such institutions can provide.

2.9 Identification of major paradigms in biocluster evolution and conclusions

2.9.1 The evolutionary paradigm of bioclusters' emergence and growth in the US and Europe

The evolution of the biotech industry in the US as reviewed in Chapter 2 has historically been driven by three related forces, namely a strong demand of biotech R&D products from the pharmaceutical industry, supply factors such as skilled researchers as well as favourable legal regulations as the 1980 Bay Dohle Act providing Universities with the rights to patent new potentially exploitable knowledge arising from public funded research; the founding of the NASDAQ, and drug approval regulation.

Thus, the new biotech companies located close to the leading public research institutions gained from both the benefits they secured from ongoing knowledge transfer from their parent institutions, and the efforts made by the latter in conjunction with local public authorities to secure the 'lock-in' of these companies for the economic benefits arising.

A small number of examples of well-established companies occur in the European a case-studies. These firms have significant scale of employment and sales turnover. However when examining the linkages of these firms it appears that they have relatively little dependence on the local "knowledge" and "support" infrastructures. These firms are already mature in that their operations and revenues depend on linkages beyond their local base. This suggests that such firms are not critical for the emergence of a biotech cluster.

On the contrary, the NetBioCluE study has established that the key pre-requisite of a cluster is a well-established "knowledge infrastructure". This, together with an appropriate "support infrastructure" as science parks, incubators and financing possibilities, provides the foundation for creating new biotech businesses emerging as "academic spin-outs".

Academic spin-outs are essentially locally based, rely on proactive coordinators and do not have pre-established commercialisation links, because of their origin. Industry spin-offs are generally able to access a wider range of support and contacts as well as business expertise. However, bioclusters formed by industry spin-offs are not common in Europe. So, if the "knowledge infrastructure" is the key pre-requisite, the patterns of biocluster development observed in NetBioCluE's case studies suggest the paradigm for the emergence of bioclusters in Europe closely resembles that of the paradigm in the US. *Table 4* summarises the specific factors at the local and national levels.

The slower growth of the European biotech sector and companies compared to the US is partly a reflection of the fragmented and more conservative capital environment. However, growth is not simply realised by the application of investment, if firms are to grow it requires that they actively develop relationships with other organisations and businesses which operate in the wider value chain and that these firms reach out to the market place.

The start-up of a biotech firm is essentially a case of "technology push" which can be supported within the local cluster network. However, without the development of commercial understanding and recognition of external "market pull" opportunities there can be no growth of the biotech firm. The acquisition of the strategic and business management competences become of increasing importance beyond the proof of technical concept stage. The practice of these competences extends the firm beyond the local cluster network.

Table 4 - Emergence of biotech clusters (Europe)

Structural element	Local (Regional Innovation System)	National Innovation System
Knowledge infrastructure	Vital - tech-transfer of new knowledge & qualified people is pre-requisite for biotech start-ups	Vital - leading-edge research institutes must maintain high levels of public funding in order to sustain research output
Support infrastructure (public)	Vital - "Triple Helix" leadership of initiatives to establish an innovation support process for academic spin-outs covering proof of concept and pre-clinical development stages. Includes finance and facilities (seed capital, co-investment, incubation, etc.)	Significant for inward investment firms. However the latter are essentially attracted for reason of the "knowledge infrastructure".
Support infrastructure (private)	Vital - local business angels to introduce new scientific entrepreneur to understanding financial risk/return issues. Desirable locally - professional specialist services must be accessible within country.	Vital - investor finance must be accessible for successive rounds of investment required to advance a drug lead towards regulatory approval.
Commercialising companies	Desirable, but may not be locally located.	Market linkages become vital when biotech firm seeks revenue cash flow.
Biotech companies	Vital - the biotech companies must: • Have IP & relevant technical competences • Must gain strategic & business management competences.	Vital - NIS must enable biotech companies to exploit industry opportunities & realise financial value.
Observations	Development of the "knowledge infrastructure" & biotech company "support infrastructure" must go hand-in-hand.	Essentially creating conditions for favourable operation of market systems.

Source: NetBioCluE

2.9.2 Why bioclusters' coordinators are important

The development of a medical biotech industry within a country very much depends on the market conditions and its NIS (National Innovation System). However, the case studies for bioclusters such as BioValley, Sweden indicate the beneficial results that flow from the concerted leadership of three related dimensions of activity as a local presence of world-class medical life sciences research; an effective and risk-taking "Triple Helix"; the provision of support services for new firms.

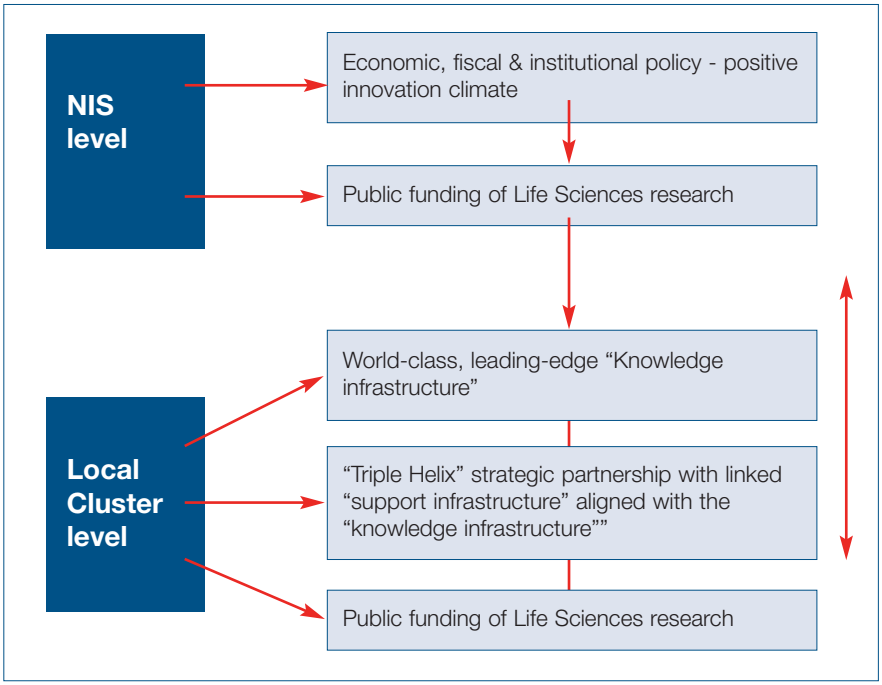
Table 5 illustrates this proposition. As for the clusters in NetBioCluE, they vary considerably in size. Paris, at the city level, might usefully be viewed as describing a multiplicity of local clusters which are distributed around the perimeter of the city. The Swedish local clusters of Biotechvalley and Strängnäs are within the regional influence of Stockholm. Dundee is clearly a small local cluster, but increasingly is a key node in a Scottish biotech cluster comprising the four principal cities in Scotland (Aberdeen, Dundee, Edinburgh and Glasgow).

The point worth stressing here is that depending upon the aspect of support required, the provision of services may for particular needs be initiated at the local level (for example, incubator accommodation) and for other needs, is better initiated at the regional or country level (for example, co-investment funding or international services support) .

Coordination of the leadership of such a regional innovation system is a multi-level and multi-institution process. The strategic requirements of a motivating vision and shared mission have to be formed. The initiatives of the clusters within the regional innovation system have to be communicated and the learning from them shared. The organisation Medicen in Paris is an interesting example of network institution for collaboration at the regional innovation system level.

The appropriate types of initiative for generating spin-outs at the local cluster level are reasonably well understood. However, there is increasing importance for addressing the structuring and initiatives of the multi-cluster regional system for it is through such systems that the growth of the "knowledge infrastructure", the "support infrastructure" and the growth of biotech companies is most efficiently guided. ■

Table 5 - The positioning and role of bioclusters' "coordinators"



Source: NetBioCluE

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The making of bioclusters

A survey about the driving forces and constraints behind the rise of European biotech clusters

Summary

While not providing a description of each individual cluster, this chapter proposes an interpretation of the data gathered among the clusters involved in NetBioCluE. The analysis presents a selection of answers from over 40 interviews conducted with cluster management, cluster members and political key persons and aimed at defining the main constraints of cluster development and what actions were implemented to overcome them. These actions include fostering networking, internationalisation and commercialisation, strategies aimed at developing the knowledge infrastructure as well as funding mechanisms. An aspect of the analysis has also looked at the definition of the stakeholders in a biocluster, of their change in role over time.

The main purpose of this work has been to collect information to serve as the decision base for defining good practices as presented in Chapter 4 and outlining policies for biocluster innovation and management in the subsequent chapters.

3.1 Industry and market constraints

Creation, development and operation of a cluster are no easy tasks and different constraints arise or even out with time and with the maturation of the system. According to the investigation performed, a major obstacle to cluster formation is the commitment of the potential participants of the cluster. Scientists often appear fearful of leaving academia, as it is particularly stressed by the Hungarian initiative respondents also due to a lack of finance and relevant infrastructures. Finance may remain an issue even for clusters already in operation, although for the more mature areas these problems seem to even out.
Last but not least, a technical differentiation works against the cohesion and general drive of the member companies to identify in the cluster and work in synergy. NetBioCluE believes this remains a critical point for all public decision makers involved with cluster planning. The following is a summary of the most insightful answers emerged during interviews with cluster key actors.

Question 1. What were the main constraints against formation of the cluster?

Answers pointed out the "fear of scientists of moving outside the University" in Europe compared to the USA where "existing programmes with incubators, facilities and lab space" make it much easier to make the transition. Another relevant point was ignorance of start-up companies of "what a cluster was, how it works and how it will work in the future" making it "necessary to discuss about the companies entering the cluster with people from the research sphere to identify who to address". Some more mature experiences, however, did not identify any constraints with this regard: the Swedish Biotechvalley reported that "No significant constraints existed, basically because the strategic group that was the core behind the cluster initiative was very committed. Industry has always been interested in supporting this cluster organisation since we have always been very close to support the firms".

Question 2. What were the main constraints against operation of the cluster?

Respondents pointed at "the cluster's internal mechanisms, how the involved subjects would work together" and an insufficient support of "the cluster legislation" as well as "Investment availability, suitable property, lack of academics willing to move to industry". A different comment came from successful northern European clusters where "the cluster to some extent relies on a number of key individuals, basically the same ones that started the cluster" and the group managing the cluster has been so "successful" that cluster companies have in some way "been a bit spoiled" lowering their active commitment.

3.2 Constraints to business development

Biotech is a very different market from other hi-tech sectors both for its long-term development and return time for investors as well as the intrinsical risk associated with dealing with Life Sciences and human health. Not surprisingly, the interviewees have stressed this point. However, some answers also underline some significant advantages for companies operating in this sector, such as the high knowledge base and the ties with local research or clinical institutions. Some companies also pointed out the need for setting up a "European NASDAQ" with special attention to the Life Sciences, as "everything else afterwards is the consequence of that". Many of the start-up companies interviewed cope with the limited funding through a slower growth rate, through offering service activities in order to finance their core R&D and seeking larger partners interested in adopting their pipeline. As for the offer of services, there seems to be no connection with the degree of maturity of the cluster. Other constraints emerging from the investigation are scarce market penetration as well as excessive red-tape in complying with regulations.

How to deal with these constraints? An answer might be the combination of national/regional initiatives together with a strong entrepreneurial culture in cluster management this seems to be a highly effective mix as it is seen with the Milan Cluster. Here, the development of a national biotech company database ("Italian Biotechnology Directory") is widely supported by the local authori-

ties. Together with regional initiatives such as the "Start-up grant" and the "Innovate your business" scheme, a high focus is set on the development of young biotech companies. These kind of initiatives are connected to the political driven clusters in areas where development of biotech industry is seen as a tool for local economic development.

Question 3. What are the perceived constraints to the company's development?

Lack of financial resources and of a VC community at local level, especially in the seed stage, has been identified by all respondents as a primary constraint, but many remarks have also highlighted criticalities regarding "not proactive academics" and "not well managed IP". "If a cluster could implement a capital fund for companies in order to fill the gap until a new financing round has been closed, this would be very helpful for young biotechs" says one respondent. Other criticalities are the ever stronger competition coming from Asia and difficulties in attracting funds for companies not simply doing their own research but also selling services to maintain their turnover.

Question 4. How is the company tackling these issues?

Companies are trying to deal with that by "identifying local business angels and private investors", "looking also abroad for VC, private investment and partnership", or working on "grant projects cooperating with other companies within the European Union", as well as simply adjusting to "slower growth and saving money so as to get better financing".

Question 5. What actions have been implemented by the cluster to overcome these constraints?

The strategy of NetBioCluE's clusters seems to vary widely: some have invested in creating an "internal network and the establishment of contacts" with business angels and VCs and through "social and professional events where companies and employees can meet each other". Others have set up "one to one meetings with the administration of the cluster and the companies", or created a "sales training course very hands-on". Benchmarking and assistance to young spin off companies is also offered with regards to Quality, Security, Environment certifications, as ISO 9001. On a wider level, clusters have worked to set up regional or national grant and financing schemes. Other clusters, in their initial stages of development, simply "do not participate on overcoming these obstacles" as they still are in the initial stage and companies do not expect the cluster to solve their problems.

Question 6. As the cluster matures, how have constraints changed for the company and what actions have been undertaken by cluster managers?

Significant answers came from the more mature companies underlining how in the initial stage the main problem was "finding an appropriate location for the company" while today "the main constraint is raising and managing the funds needed until the company meets the break even". In Heidelberg, for example, the Technology Park management tries as much as possible to support the company in this matter, for example through facilitation of contacts for companies with Venture Capitalists or business angels that might ask for first suggestions for interesting investment targets.

3.3 From breakthrough product to cluster success

Here is the information collected through interviews with member companies on some of the actions implemented by the NetBioCluE clusters to overcome the financial, market and regulatory constraints previously outlined and which will be further analysed and developed in Chapter 4 about good practices for bioclusters' management.

Why clustering is important

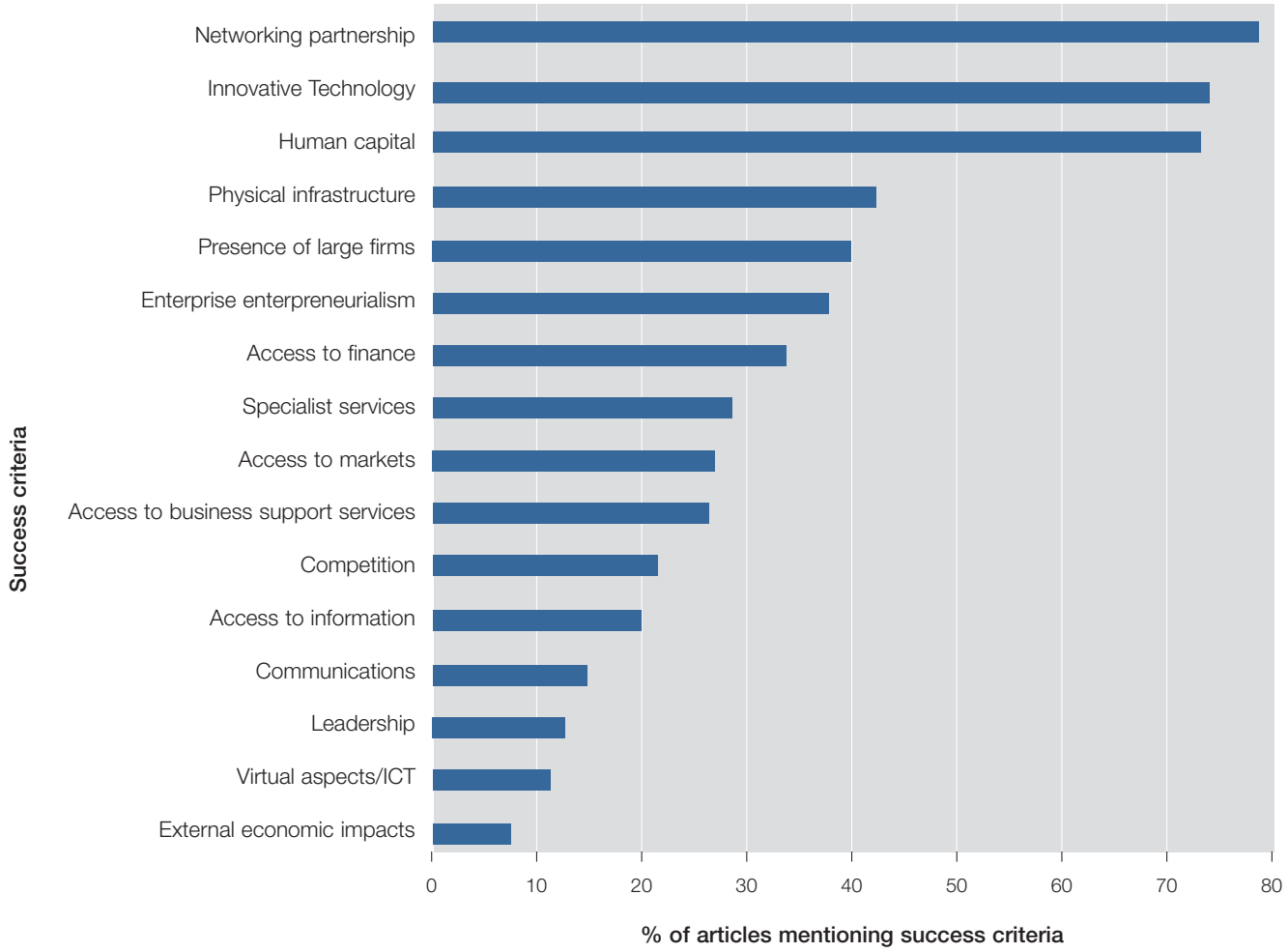
Economic development is a collaborative process: clustering gives businesses an advantage over more isolated competitors providing access to more ➤➤

suppliers and customized support services, to experienced and skilled labour pools, and to the inevitable transfer of knowledge that occurs when people casually meet and talk science and business. In order to function properly, the new knowledge economy of which biotech is certainly one of the most prominent examples, requires geographic proximity to professional colleagues, cutting- edge suppliers, discriminating customers, highly skilled labour pools, research and development facilities, and industry leaders. Thus clustering brings on "hard" and "soft" benefits[1]. Hard benefits are those gained from more efficient business transactions, wiser investments, and reduced expenditures that produce profits and jobs. Soft benefits are derived from the learning, benchmarking, and sharing that expand knowledge and lead to innovation, imitation, and improvement. Soft benefits are the intangible assets that are not so directly transferred to a profit-and-loss statement, but potentially have an even greater impact on the bottom line than the hard externalities as the advantages coming from a mobile workforce and the flow of knowledge among firms through formal and informal discussions with peers, suppliers, and customers. The range of potential interventions is extensive, as this chapter will briefly anticipate and as the next chapters will show in detail, but not all will be appropriate to any single cluster, nor to any single region.

The critical factors behind a successful cluster

Just like territories, national cultures and economic environments, all clusters are different but a number of common features stand out as critical factors for success. In the "Practical Guide to Cluster Development" the first three of these factors are the presence of functioning networks and partnerships; a strong innovation base, with supporting R&D activities where appropriate; and the existence of a strong skills base (*Table 1*).

Table 1 - Critical success factors identified within global literature search



Source: Ecotec/NetBioCluE

Note

1 "A Governor's Guide to Cluster-Based Economic Development" - Copyright 2002 by the National Governors Association, 444 North Capitol Street, Washington, D.C.20001-1512. ISBN: 1-55877-356-8

3.3.1 European networking initiatives

Besides NetBioCluE as main network supported by the European Commission in Europa INNOVA to foster clusters cooperation in red-biotech, there are and there have been other European initiatives in the field like Clever Bio, CEBR or the IRE network. CleverBio aimed at defining a normative model for cluster approach in the biotech sector, which identifies key mechanisms to favour the growth and development of a cluster. CEBR, the Council of European Bio Regions enables its members to share experiences and provides the best support possible to biotechnology companies in their region.

IRE - Network Regional Development includes around 235 member regions with the mission of "*Strengthening the global competitiveness of European regions by promoting innovation policies, and providing a unique platform for regions to cooperate and learn from each other.*"

Innovation is closely connected to research and the Seventh Framework Programme (FP7) is designed to support a wide range of participants in their research: universities, public authorities and small enterprises and researchers in developing countries.

To make innovation more achievable for companies and to help translating research into business, the Enterprise Europe network offers a unique gateway to international partnership opportunities for small companies, by matching technology offers and technology requests. Within these activities pharmalicensing represents a specific tool for enhancing partnering opportunities for pharma and biotech companies in the process of acquisition, development, and exploitation of new technologies and products.

3.3.2 National and regional initiatives

Besides various European networking initiatives, there are national and regional initiatives aimed at supporting cluster development through taxation and regulatory measures as well as through an efficient financial and legal infrastructure. These policies are effective in promoting the start-up of clusters, but are seldom a long-term source of competitive advantage. Tax incentives for R&D activities are a common feature in most US states and in parts of France. For example, in Massachusetts a number of tax incentives are available including a 10-15% tax credit for 15 years on research and 3 year 3% tax credit on fixed assets. In Midi Pyrénées 3 year property tax exclusions are provided for new businesses. The opportunities offered by non-targeted financial incentives, such as Regional Selective Assistance or the Structural Funds for example, should not be over-looked and practitioners may wish to consider how these might be packaged to the advantage of identified clusters within a region.

3.3.3 Making things happen locally

Research throughout the world shows clusters cannot be simply parachuted into local economies without some base on which the cluster can form. Local institutions may play a pivotal role in identifying the regional strengths, the needs of a cluster in making sure that the cluster stakeholders are fully engaged with and supportive of its initiatives. The formation of private sector led Steering Groups to provide strategic direction to the cluster work and to act as champions of the cluster with other potential stakeholders may help in maintaining and widening private sector involvement and preventing a supply-led public sector approach.

3.3.4 Clusters: the survey's results

Table 2 below presents the result of the questionnaires' quantitative survey on the importance that companies perceive concerning services provided in the clusters, followed by a sample of the most significant answers. The respondents were asked to quantify the level of service on seven different main areas:

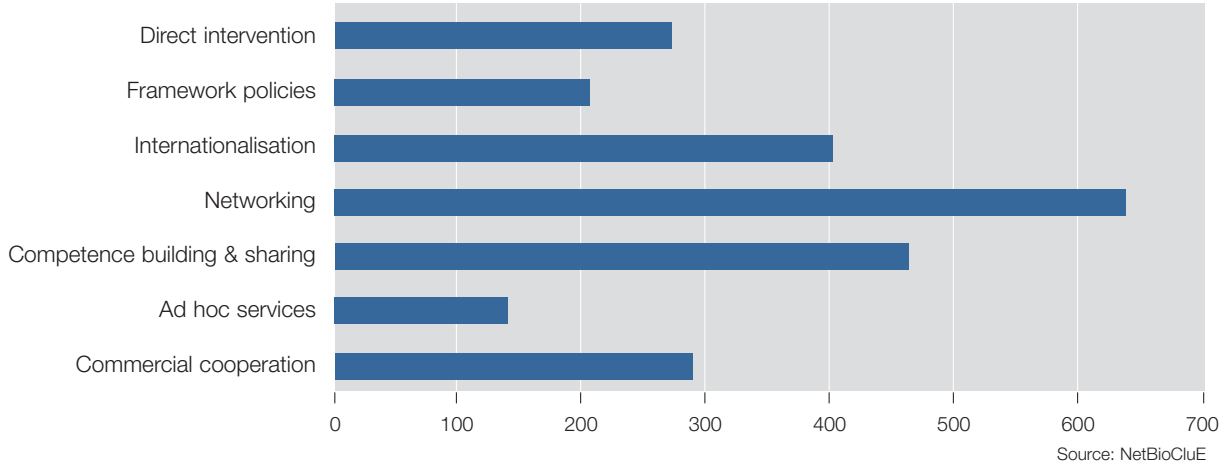
1. *Direct interventions*
2. *Framework Policies*
3. *Internationalization*
4. *Networking*
5. *Competence building and sharing*
6. *Ad hoc services*
7. *Commercialization*

The summarized results are shown in *Table 2* by adding the scores of the different subjects of the respondents. It is noteworthy that the higher scores are connected to cluster management or political stakeholders, while the reports from the connected companies do not at all reflect the same commitment.

Highest scores are assigned to networking activities, internationalization initiatives and activities on competence building and sharing. The single most important operating principle of competitive clusters is the ability to network extensively and form networks selectively. Networking activities are by far the most provided service, while help with internationalisation and competence building and sharing are the next most provided services. Discussion forums play an important role in the formation of the cluster and in understanding the interest of ➤➤

different actors. Direct intervention and commercial cooperation are not as focused, but some respondents think they are very important in the cluster. It appears that there is not much inter-company co-operation in the cluster but a high degree of inter-personal contact as informal supervision and mentoring.

Table 2 - The seven main areas - final scores



Source: NetBioCluE

1. Direct intervention

Promoting inward investment can contribute to cluster development strategies[2]. Described as a 'transplant' strategy by Enright, distinguishing it from approaches based upon organic growth, this will commonly be pursued in order to strengthen the cluster in an identified manner. The intention is generally to increase the overall stock of businesses or to fill an identified weakness in the current configuration (for instance a structural gap within the supply chain through the relocation of a major player). It is less common for authorities to try building a whole cluster by this process. Practitioners have a range of instruments available as part of their inward investment. They include the provision of financial support, tailored training packages, the construction of suitable facilities and supporting infrastructure as well as more generic advice. Comments gathered by NetBioCluE in the survey evidenced that "the impact of the Local Authoritiy's activity is small" since "it is difficult for the Local Authority to cover all the areas of operation of the companies" in the cluster. In companies' opinion, more important are the initiatives aiming at setting up investment funds specifically aimed at biotech.

2. Framework policies

As for framework policies, respondents remarked that "innovation coaching is useful in the framework of a cluster but it is not a typical cluster function".

3. Internationalisation

As for support to internationalisation, this has been identified as "one of the key issues" by several different cluster managers as they want " both the park where they are and the companies to be internationally connected and well known". Some clusters have already established "good connections to all the other important biotech clusters worldwide, be it Dubai, Korea, China, Singapore, Dublin. Often there are visits from delegations from other clusters, organized together with the Bavarian Ministry for Economy" and others are developing this support area especially with EU associated countries as Israel.

4. Networking

Not all answers have been positive on this point, sometimes because of an actual failure from the management to develop this aspect or for the limited dimensions of the cluster still in its initial stage. However, networking has been identified across the board as "one of the key function of clusters. Helping awareness is very important" and is "promoted by several means, for example: by providing support to information resources for marketing , by promoting regional networks to better help increase in visibility and therefore opportunities for networking and by setting up international region to region agreements". Some clusters though, may deal with that informally, with "no official mentoring programmes". Others have invested in a dedicated web site updated every day and a monthly mailing letter sent to all contacts. A network must be created and maintained: "you should never be tired of maintaining it and keeping it alive".

5. Competence building and sharing

Respondents from most of the successful clusters stressed the importance of competence building and sharing as the "services are very important to make a cluster work. Especially important is managerial training, because it is very rare in biotech and innovation". Particularly appreciated are multiple day education programmes which some respondents have suggested turning into "a half-year study course where you can earn a certification at the end".

Note

2 "A Governor's Guide to Cluster-Based Economic Development" - Copyright 2002 by the National Governors Association, 444 North Capitol Street, Washington, D.C.20001-1512. ISBN: 1-55877-356-8

6. Ad hoc services

The choice of specific services may vary widely among clusters and go from "dedicated resources needed in various fields (e.g. business development and Tech transfer)" to "supporting the firms, particularly with business assistance, or value chain coaching" which are regarded as "some of the most important tasks of the cluster". Critical are the mechanisms to "activate local financing resources coming from other sectors in order to support start up companies through seed capital".

Last but not least, the ability of local administrators and managers to attract the larger pharmaceutical companies through fiscal incentives and other means is seen as a crucial ingredient for success of the cluster.

3.4 The bioindustry's stakeholders

For a successful cluster a number of key players are necessary at different times in its lifetime. Stakeholders are "any organization, governmental entity, or individuals that have an influence on or may be impacted by a given approach taken in the cluster". Stakeholders have been interviewed with a series of questions concerning the political, economic and social consequences of a biocluster development. Although the success of bioclusters is a high priority for the European Commission, it is noteworthy that none of the respondents have identified stakeholders at the super-national level as strategically important. The same can be said about the national level: in spite of a high national political priority, apparently the national level is not visible as stakeholder, except for Czech Invest, who is successfully applying most of the pre-seed financing in the Czech area. Hungarian bioclusters formed as results from national initiatives, which are nevertheless seen as not very influential. None of the Techtransfer units are seen as active players either in the embryonic or the more mature stages. It is also pointed out that clusters do not form as such, but are the outcome of some stakeholders initiative, most commonly through a convergence from academic and local policies. This statement covers the point that clusters are not formed per se and do not manifest themselves as clusters without a helping hand but are always results of initiatives from parties with special interest in the formation of clusters i.e Regional Bodies, Science Parks and others.

Who benefits from cluster development?

The benefits in terms of higher productivity and increased innovation can be felt by all firms in the cluster. The implications for existing firms are to examine the relationship they have with firms in the cluster and consider the services they offer. Are professional services firms specialised enough in the particular needs of firms in the cluster or do these have to go else-where for specialised advice? Can manufacturing firms fit into the supply chain of firms located in the cluster, again reducing the need for them to go elsewhere to source their inputs? Are universities and other higher education establishments providing people with the required skills for the firms in the cluster? Are public bodies providing the infrastructure which firms need if they are to be competitive?[3] All firms, public bodies, educational institutions and actors in a cluster need to consider what linkages and what role they could play within the cluster.

Who should be involved?

The main players in cluster development are the companies. Only through their active involvement will a cluster strengthen and develop. Business leaders thus play a crucial role. However, they are not the only players. Universities and educational institutions do play a role, and so do financial intermediaries, such as venture capital firms and business service organisations with expertise relevant to the cluster. Local authorities are also involved in facilitating the development of clusters through supportive policy interventions.

Question 7. Who are the stakeholders influencing growth in mature clusters?

At a **regional** level, respondents identified local governments, as "from a political point of view it is extremely interesting for local politicians" to have a successful cluster in their community, but also "large pharma companies", due to their interest in the technologies developed by start ups that the large pahrma could acquire and commercialize later on. Universities are also mentioned, although less strongly, as relevant stakeholders.

At a **cluster** level stakeholders include research institutes but also academic and higher education ➤➤

Note

3 *"A Governor's Guide to Cluster-Based Economic Development" - Copyright 2002 by the National Governors Association, 444 North Capitol Street, Washington, D.C.20001-1512. ISBN: 1-55877-356-8*

institutions. Furthermore there are also local authorities at different level, from Chambers of Commerce to industrial and entrepreneurial associations. At a **company** level, stakeholders seem to be predominantly "service providers", like "large companies and start-ups and to some degree Science parks" but also people from the public sector (particularly, the County Council) and academic institutes holding companies interested in IP development.

Question 8. Which stakeholders were the most active in the formation of the cluster and why?

Answers here differ from cluster to cluster: For example, in Cambridge the decision to start the cluster originated as a bottom-up approach from "influential people that started companies rather than creating infrastructures which essentially evolved (and continue to evolve) in response to demand". In other cases:
Academia, with the creation of a S&T park, has been instrumental together with national investment agencies. The formation has rarely been initiated but almost always supported by **larger pharma** companies, as well as the "National government, because the political decisions are made there, if not the support".
Spin-outs, start-ups and small companies, are also identified as part of the cluster formation phenomenon as "they tend to stay here and grow in the area rather than being run by a remote head office which can close or move operations as conditions change".
National initiatives were seen as important for creating the backgorund and long term conditions for cluster formation and growth as the cluster "has two important tasks: programming documents that define development priorities negotiations and agreements between countries (esp. China)".
Regional initiatives from municipalities, counties and provinces also seem to play a relevant role as, in the words of the respondents "local authorities can be the real engine of cluster formation. Start-ups are the largest beneficiaries of the cluster but they do not really have influence on the formation. National government owns the financial tools, so it is also very influential in terms of economic conditions". Local authorities often keep supporting the cluster financially even in its more mature stages.

Conclusions

Before heading on to Chapter 4 illustrating the good practices for biocluster creation and growth distilled from NetBioCluE observations, it is worth recalling a few essential points emerging from the presented survey. As for the classification of clusters', the consortium investigation identified seven main areas of action common to all clusters (1. Direct interventions; 2. Framework Policies; 3. Internationalization; 4. Networking; 5. Competence building and sharing; 6. Ad hoc services; 7. Commercialization) but confirmed once more what has emerged in literature and specialists' workshop, namely the impossibility to define an ideal type of cluster as they act as living ecosystems. Two or more of them may have traits in common, but ultimately dynamics and interventions are widely diverse as it will be explained in Chapter 4.
This highlights the central role of local decision makers, be they public authorities, academics or entrepreneurs that should act as a "triple helix" if the cluster model, not only in biotech, is meant to succeed.
Once again the effective management and coordination of all stakeholders is paramount: as research and experiences throughout the world show clusters cannot be parachuted into local economies without some base on which the cluster can form. In this respect local authorities usually play a pivotal role in identifying regional strengths, supporting the cluster and involving all local operators. ■

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Manage to succede

Why clusters are like living organisms and the only efficient action is holistic

Summary

Economic development has much more in common with biology than we often may think. This is particularly evident in biotech, where business development is an extremely complex and articulated process resembling closely to living organisms' growth and evolution. Like a living organism is constituted of many different cells working together, a biocluster is a system of actors such as biotech companies, large pharmaceutical companies, universities and research centres, supporting companies, local agencies, incubators and science parks, involved in tight relationships with one another. Borrowing a metaphor well-known in managerial literature, it is even possible to look at a biocluster as a "living" system , whose growth and "wellness" are ensured only if each actor follows stage by stage the development of the whole system, as happens with organs of a living body. Biocluster management thus implies a system of practices aimed at coordinating this "homogenous" growth.

After setting the conceptual and historical frame of reference of the biotech innovation sector and outlining the profile of the clusters observed by NetBioCluE (Chapters 1 and 2) as well as the results of a European cluster survey (Chapter 3), the goal of this fourth chapter is to identify good practices in biocluster management and provide effective guidelines for cluster management. This has been done bearing in mind that actions on bioclusters should maintain a holistic approach. The work has allowed to select a range of practices, classify them and analyse them collectively with all NetBioCluE members.

In the endeavour, major types of good practices have been identified: practices aimed at strengthening the **scientific base** (section 4.3); at supporting **infrastructures** (section 4.4); at supporting **companies** (section 4.5); and at supporting **bioclusters** (section 4.6). Examples of practices belonging to each of these categories are presented, while all the practices collected are reported in the appendix to this chapter. Each of the above categories has been further detailed and has led to several interesting results stressing, for instance, the importance of involving both small and large companies in defining the "direction" of research activities within universities and research centres. Examples and implications resulted are discussed in the chapter.

In cluster management, both a "one-size fits all" solution or a "copy and paste" approach are deemed to be unsuccessful for the very heterogeneous and continuously developing nature of the structures compared. Experienced analysis and careful management thus remain a central asset for success of innovation-based clusters.

4.1 Clusters, where the system is more than just the sum of its parts

The previous chapters have highlighted that rather than simply being a collection of actors involved in biotech activities in the same area, a biocluster is a complex system where small firms, start-ups, large pharmas, universities and research centres, as well as industrial associations and public institutions interact and evolve in a unique way. In management literature[1], a cluster has often been described as a "living" ecosystem, whose growth is ensured not only by the growth of each actor but also by the fact that their growth is "homogenous", i.e. every actor (organ) follows stage by stage the development of the whole system (living organism). This premise is important to frame the relevance and applicability of the practices described in this chapter, keeping in mind that they are specific to the needs and development of each cluster and not a national or European-level provision.

To agree with this is crucial to identify efficient practices in biocluster management. Managing a biocluster means to implement a system of practices able to sustain the "homogenous" and synergic development of all actors in the system. It is not possible to focus actions only on one actor (e.g. on biotech companies). The consequence of such focus, indeed, might be a temporary growth of that part of the system (in the example, might be the birth of a number of new biotech companies) but in the mid and long-term, if the other actors of the system (e.g. science parks or universities) are not able (or are not supported) to follow this growth, the whole biocluster will under-perform and may disintegrate.

A system implies a repeating pattern of interaction: a biocluster is a complex of regular interactions between actors engaging in mutually beneficial relationships. The occurrence of these interactions can be stimulated and supported by a purposive application of knowledge and resources. The cluster exists when a high intensity of interaction is evident. Geographic proximity favours such interaction and clustering can usually be observed at regional and also city levels.

The need for addressing a practice to all the actors of a cluster does not necessarily imply developing only general purpose actions (e.g. financing programmes) but means setting up a number of focused actions for the different actors aiming to achieve growth and wellness of the system as a whole. Secondly, it is necessary to highlight that in several cases an initial "accelerator" might be required to re-equilibrate the system before starting a more balanced intervention targeted to different actors. Consider, for example, the case of a biocluster where the presence of support infrastructures (incubators and science parks) is clearly inadequate to respond to the demand of space and services from a growing number of new and small biotech companies. Before balancing the effort of sustaining the different actors, it is necessary to cover the gap in the support infrastructures, with an "accelerating" action to help the actors' growth. Once the system is in equilibrium, cluster managers can start adopting a more balanced system of practices to foster further growth. The current situation of biclusters in Europe, as emerged in the first chapter, is often shaped by those original "disequilibria" that need to be carefully considered when looking at the suggestions for implementing biclusters' management practices.

4.2 Good practices in biocluster management: an overview

Standardized data on practices, from supporting R&D to fostering internationalization of companies was collected by all NetBioCluE clusters. A classification of the above practices in four categories was then set up so as to look at them with a particular attention to reproducibility, i.e. the possibility to transfer and reproduce the action even outside the original environment where it has been developed. Other aspects have been taken into account, like the impact of the action and its cost efficiency.

A full list of the practices collected is available in the appendix to this chapter.

Given that a biocluster is an articulated ecosystem, it is influenced in its development and success by exogenous (e.g. national tax regulation) as well as endogenous actions and conditions (e.g. investment in infrastructure and funding). NetBioCluE's work has concentrated on the latter

Note

[1] *"The Keystone Advantage" of M. Iansiti.*

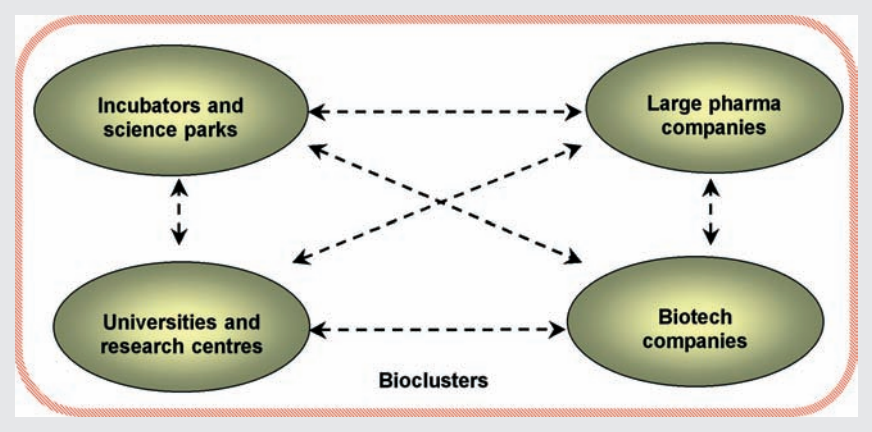
with the aim of emphasising the actual levers available to actors and managers within the cluster to stimulate and promote the system development.

A graphic representation of the possible interactions taking place within the cluster is presented in *Figure 1* with the four main actors of a biocluster:

1. **Universities and research centres**, representing the scientific base upon which the cluster and particularly its origin usually relies;
2. **Biotech companies**, representing the industrial base of the cluster and its actual engine of growth;
3. **Large pharmaceutical companies**, representing a "natural" market for new biotech products, other than constituting the industrial sub-stratus of the biocluster;
4. **Supporting companies, local agencies, incubators and science parks**, and other forms of development and cluster-promoting agencies and local institutions representing the support infrastructures. The connections identify the main network of relations among the different actors, the "blood" of the biocluster "living" system.

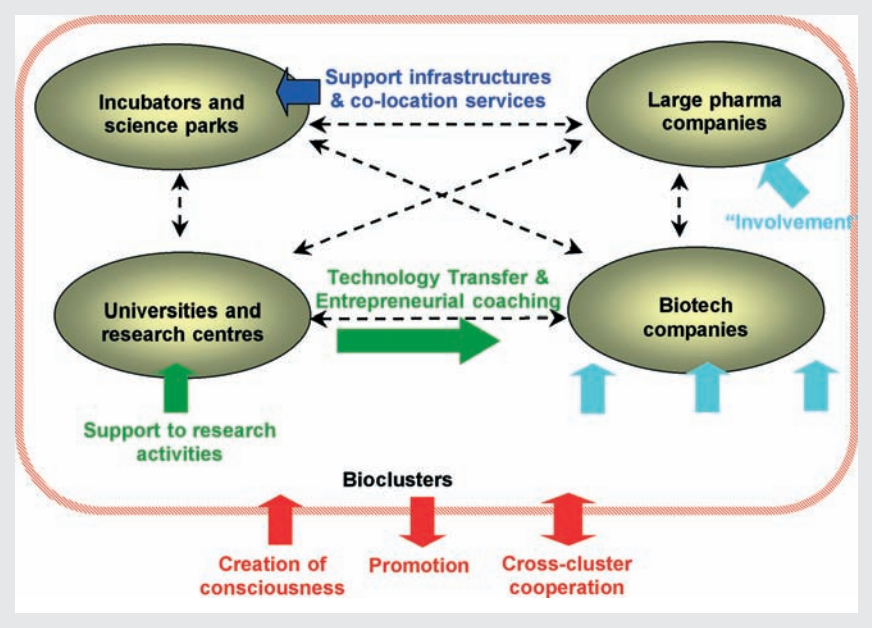
The four main actors are surrounded by a red line to make it clearer that the biocluster is like a "living" system itself. After the identification of the system of actors and of their interrelations (e.g: scientific knowledge and discoveries flowing from research centres to companies, coaching and funding from larger companies to start-ups and academia, planning and infrastructure use from incubators to all other members of the cluster), the system of practices can be applied. *Figure 2* above visualizes the system of practices. The arrows identify the different categories of practices addressed to all the actors of the system with the purpose of fostering the desired relationships between them so as to sustain cluster development.

Figure 1 - The biocluster as system of actors



Source: NetBioCluE

Figure 2 - System of practices for cluster management



Source: NetBioCluE

Legend:

in red:	actions to strengthen the scientific base
in green:	actions to improve infrastructures
in dark blue:	actions to promote biotech companies
in light blue:	actions to stimulate bioclusters

4.3. Good practices to strengthen the scientific base

These practices, identified with the green arrows in *Figure 2*, are addressed to universities and scientific centres and aimed at supporting research activities or fostering technology transfer and entrepreneurial coaching. Examples of the first ones are actions aimed at helping universities and research centres to develop new and improved competences. The latter typically aim at tightening the key relation between universities and research ➤➤

centres on the one side and bio-pharmaceutical companies on the other, by favouring an efficient and effective transfer of scientific knowledge to industry through research contracts, out-licensing agreements, or through the creation of spin-offs.
Among the practices collected by NetBioCluE and aimed at supporting research activities, *Table 1* displays two examples identified in Scotland and France.
Both these practices aim at widening the local scientific discovery capacity by attracting more qualified researchers. While TMRC is based on cooperation of four Scottish Universities with Wyeth Pharmaceuticals, and is able to show already significant economic returns (50 jobs in the TMRC laboratory and rising to 120 over five year plus generation of exploitable IP), Genopole a return grants aim at contrasting brain drain offering young researchers coming back from their research experience overseas with permanent posts, with the purpose to develop a research group at Genopole.

Both actions seem reproducible in other environments but should be accompanied by the presence of professional evaluators able to identify and evaluate exploitable innovations.

Technology transfer and entrepreneurial coaching

Among the collected practices a significant sample of those aimed at technology transfer and entrepreneurial coaching is listed in *Table 2*.
Technology transfer can be seen as particularly country - specific as it is greatly influenced by local regulations, market conditions as well as culture and attitude of researchers.
In Germany, Biotech-region Munich has implemented four successful measures: **Fraunhofer Patentstelle**, providing research in patent, literature, trade & industry databases, assessing and evaluating inventions, patents and technologies; **Max-Planck Innovation GmbH**, supporting discovery and assessing commercial potential of research results; **Ascenion**, a consultancy service advising public Life Sciences research institutions in all aspects of intellectual property asset management and finally the **Munich Business Plan Competition**, an open competition stimulating founders of innovative companies by promoting an innovation culture and network in Munich. Similar actions are set up also elsewhere, like in Dundee with its **Commercialisation awards** targeted to University researchers offering a non-recoverable grant from of around £25,000 to winners or the **Start cup** award realised in Milan.
Other Italian examples to be mentioned refer both to Milan Turin: the Bio Industry Park Canavese has been very active in tech transfer with initiatives as **Discovery**, supported by the Piedmont Region and aimed at selecting innovative entrepreneurial biotech ideas to be installed in the Park and possibly supported by Eporgen Venture (since launch in 2004 six start-ups have been incorporated and six more are in the process); in Milan, **Bioiniziativa** aimed at creating a data base of projects with possible entrepreneurial and industrial implications resulting in the selection of over ninety projects with high potential for being "translated" into the creation of new companies (five spin off established since its launch).
As for clusters in a more emerging stage of development, in the Czech Republic the CETI Cluster launched the **South Moravian Innovation Centre** coordinating summer internships for University students in cluster companies with the aim of facilitating recruiting. In Hungary the **South Plain Neurobiological Knowledge Centre** fosters tech transfer and establishment of spin-offs, through market researches, recommendation of services and information materials, as well as a series of seminars to stimulate entrepreneurship.

Technology transfer mechanisms prevail over the cases of actions aimed at entrepreneurial coaching of researchers. This bias is typical of the experience of more mature bioclusters. This is shown by the experience of Cambridge: before reaching its maturity the Cambridge cluster had a program of internship for researchers in companies with the aim of stimulating their entrepre-

Table 1 - Selection of practices aiming at supporting research activities

Practice name	Biocluster of origin
TMRC - Translational Medicine Research Collaboration	Dundee
Help for researchers' return	Genopole Ile-de-France

Source: NetBioCluE

Table 2 - Selection of practices aiming at fostering technology transfer and entrepreneurial coaching

Practice name	Biocluster name
Technology transfer	Biotech-region Munich
Commercialisation awards	Dundee
Discovery initiative	MI-TO Biotech (BIPCA)
Bioiniziativa	MI-TO Biotech (MI)
South Moravian Innovation centre	CETI cluster
Fostering tech-transfer	South Plain Neurobiological Knowledge Center

Source: NetBioCluE

neurial attitude. The result was that this training is not successful as it tends to divert the focus of researchers from research. It is better to set up effective technology transfer mechanisms for researchers and businessmen to talk to each other. In order to work, tech transfer should ensure commitment of researchers to turn their results into market-ready innovations and it should also look at the whole of the transfer chain down to the market and not focus only on the first steps.

4.4 Good practices to strengthen the support infrastructures

Practices aimed at improving infrastructures are identified with the blue arrow in *Figure 2*, and relate to incubators and science parks. They include both the "physical" creation of support infrastructures and the provision of additional services within them. An adequate space for emerging companies is a necessary pre-condition, however not sufficient to support the whole system. Therefore, in a systemic view, support infrastructures need to offer a larger range of added value services to the other actors, and in particular to biotech companies, especially in their early stage phase of development.

Table 3 presents a selection of the practices concerning infrastructures' support within NetBioCluE partners. Please refer to the appendix for the full list and the full details of these practices.

Table 3 - Sample of practices aiming at strengthening support infrastructures

Practice name	Biocluster name
Good support, installation of incubators-IZB	Biotech-region Munich
Dundee University incubator	Dundee
Bioindustry Park del Canavese	MI-TO Biotech (BIPCA)
Creating and operating an incubator for spin-offs	South Plain Neurobiological Knowledge Center

Source: NetBioCluE

Infrastructures characterise clusters at different stages of development, from mature to emerging ones. In Germany, Biotech-region Munich offers a functional and flexible infrastructure through its **Good support, installation of incubators-IZB** including an optimal mixture of established start-ups, biotech service firms in 14,700 sq.meters. equipped with offices and labs for a total investment of about €47 million. In the UK, the **Dundee University Incubator** helps with initial assessment of academic spin out proposition to agree on other specific services, ranging from best commercialisation route to market research, from development funding applications to business planning. In Italy **BioIndustry Park Canavese** and **Science Park Raf** in the MI-TO area provide biotech companies with research facilities and scientific services, together with a complete set of support services, such as technology transfer, patent support, tutoring/mentoring of start-ups and spin-offs, project management and financial advantages for location. As for clusters in a more initial phase, an example from Hungary is that of the **South Plain Neurobiological Knowledge Centre** with its incubator for spin-offs and support infrastructures close to the premises of Egis Pharmaceuticals one of the most significant pharmaceutical companies in Hungary.

With the only exception of Cambridge, support infrastructures are a key driver in the development of bioclusters, but they need large investments and time to be set up and work efficiently. Normally an important role for public investments emerge here, even more if acknowledging that services to be provided are not only office and space but also added value technological services ranging from location to business intelligence and access to technology platforms and skilled professionals. Support infrastructures are key but their role should be temporary in the biotech company evolution: companies should move out as they grow stronger. As a general comment, as any living organism, clusters should select new start-up ideas and technologies to keep ahead in the global innovation scenario and design the evolution of their supporting infrastructures accordingly.

4.5 Good practices to support biotech companies

These practices address biotech companies and large pharmaceutical firms. They range from actions supporting collaborations among companies (*Table 4*); to business support (*Table 5*), from provision of funds either directly or indirectly (*Table 6*) to activities aimed at the "involvement" of large companies in the biocluster.

Networking is key for biotechnology companies as biotechnology strives on knowledge, exchange and contacts: companies need to partner to enhance their business and research cooperation with other companies and research centres. Therefore all events arranged to enhance partnering for companies aimed at facilitating identification of the right partner are here included. One example of collaboration support in this sense is **Cambridge's ERBI three day annual conference**, where one full day is dedicated to partners' meeting. Another example is the partnering event always taking place at **Bioforum**, the annual biotech conference in Italy. A key factor for success is always the hard management work behind to ensure that partnering requests are handled quickly and effectively and that companies' needs are carefully taken into account.

Business support includes all services that can be offered to companies to grow, both by reducing costs or by taking advantage of specific consultancy services. **Biotechvalley** in Sweden has implemented **value chain coaching** with the aim of ensuring that small, R&D-intensive companies reach proof of concept for their products. This is done through an agent for individual business coaching and highly qualified consulting services (e.g. due diligence, second opinion). Biotechvalley has also engaged in **business intelligence and strategic support**, delivering reports on the industry and its trends thus allowing companies to set the global scene in which they act. Another high added value service provided is that of the MI-TO cluster aimed at protecting IP, a very valuable asset for investors through **Prior Art**, a practice supporting patenting of research results and co-financing necessary costs for first registration or extension of patents. Moving to the saving costs issue, given the fact that small biotech companies lack the purchasing power of pharmaceutical companies but often pay a significant amount for resources and services, in Cambridge ERBI has sought to significantly reduce those costs by launching a **purchasing scheme** through tenders from potential suppliers mainly for lab equipment.

Funding is one of the most critical and recurring problems for small research and innovation based companies. Actions to help in that may range from research grants to establishment of dedicated investment funds and remarkable examples have been collected throughout the analysis and referring mainly to mature and growing clusters. In France, Génopole has developed **Genopole 1er jour**, a dedicated pre-seed fund backed by private and institutional investors with first investments in the capital of a start-up from €50,000 to €100,000. In Scotland, **ITI Life Sciences** is a unique entrepreneurial innovation fund creating and managing early stage R&D programmes to generate market-focused intellectual assets for exploitation by existing and new companies. Another example from Milan-Turin is the **Next Fund** to finance companies in the early stage development. This is the first fund of funds and a co-investment fund dedicated to Venture Capital market and University spin-off. In Sweden the purpose of **Uppsala BIO-X** is to support ambitious, world-class research projects in the region by making available supplementary

Table 4 - A selection of practices aiming at supporting collaborations among companies

Practice name	Biocluster name
Partnering with Cambridge companies	Cambridge

Source: NetBioCluE

Table 5 - A selection of practices aiming at providing business support

Practice name	Biocluster name
Value chain coaching	Biotechvalley
Business intelligence and strategic support	Biotechvalley
Purchasing scheme for biotechnology companies	Cambridge
Prior Art	MI-TO Biotech (MI)

Source: NetBioCluE

Table 6 - A selection of practices aimed at providing funds

Practice name	Biocluster name
ITI Life Sciences	Dundee
Genopole 1er jour	Genopole Ile-de-France
Fondo Next	MI-TO Biotech (MI)
Uppsala BIO-X	Uppsala BIO
Heidelberg Gruender Team	Heidelberg BioCluster

Source: NetBioCluE

funding and resources, primarily to stimulate the formation of cross-disciplinary research teams. The aim of the effort is to create new business opportunities from collaborative research efforts between academia and industry. Another interesting initiative which has been able to pool local resources with a wider network is the **Heidelberg Gruender Team** initiated by a group of young entrepreneurs already successful founders of biotech and IT companies. The team collaborates with Heidelberg Technology Park as well as an international network of entrepreneurs, potential founders, investors, consultants and service providers from founders' consultation to development of business strategies, from contacts to potential customers or support in concrete negotiations.

The efficacy of these practices may vary widely according to the development stage of the cluster as critical mass, typical of more mature systems, is paramount for success. As for funding strategies, direct actions -providing funds to companies directly- seem more appropriate with smaller and younger systems, but should always involve outside investors, while indirect actions - related to external sources of funding- require a more sophisticated approach and heavily depend on the external market conditions. For instance, these have proven very dynamic in the UK and in the US, while private biotech investments still need increase in mainland Europe.

Involvement of large pharma companies

Large pharma companies are often the cornerstone of cluster development and of course the most cherished investors for many small start-ups. Their involvement and interest in clusters and start-ups has also grown intensely in the last decades because of the growing tendency to outsource most of the first stages of drug development until Phase II of clinical trials. Even though their involvement is important, it is difficult to be achieved for clusters at all stages of development. In some cases, it may be seen as harmful for very early stage clusters because large pharma companies could somehow prevent the further development of the cluster as such. As an example, in Hungary the Vaccine Therapy Cluster has been pooling infrastructures and research capability from several of the top Hungarian biomedical centres, Semmelweis Medical School of Budapest, University of Szeged, Chemical Research Institute, and involving local pharma companies to start production of vaccine therapies but without the direct involvement of large pharmas. Indeed, what would happen if a large pharma was involved and licensed the vaccine in its development phase? The cluster development would be significantly harmed. Nevertheless pharma companies remain an important asset for cluster development due to their interest in bringing forward the innovations of the small biotech companies.

4.6. Good practices to support bioclusters

These practices, identified with the red arrows in *Figure 2* above, refer to the bio-cluster as a whole, assuming a purely systemic approach. They
comprise actions aiming at creating **consciousness** of the system; at promoting the bio-cluster; at supporting **cross-cluster cooperation** which can be seen as composed of three moments in the same action: first the clusters' actors feel part of the system; then the cluster is made visible at international level and then clusters start cooperating with each other to improve their potential and work on complementarities

Table 7 - A selection of practices aiming for bioclusters support

Practice name	Biocluster name
Networking the biotechnology cluster (consciousness creation)	Cambridge
Biomilano (consciousness creation)	MI-TO Biotech (MI)
Visioning (consciousness creation)	Vaccine Therapy Biocluster (HU)
BioDundee (promotion)	Dundee
Gate2Biotech (promotion)	South Moravian Innovation Centre
Italian Biotechnology Directory (promotion)	MI-TO Biotech (MI)
TransAlpine BioCluster (Cross-cluster cooperation)	MI-TO Biotech (BIPCA)

Source: NetBioCluE

Creating consciousness is an activity which all clusters deal with notwithstanding their level of development, but with a close connection to their specific characteristics and origin: cluster consciousness, i.e. to make the actors feel part of the system, is even more necessary if the cluster emerged spontaneously than if it was created locally in a sort of "top down approach". The Cambridge cluster has proved very effective in creating consciousness through its networking initiatives deployed through **regular networking meetings** around a topic of interest to ➤➤

the biotech community. In Italy, in the MI-TO area, **Biomilano** is a network of local actors aimed at developing synergies, encouraging partnerships and sharing technological platforms, involving the main biotech operators in the area with leading-edge competences in basic and applied science, in the field of treatment of cancer, neurosciences, nanotech, proteomics, biochip, immunology, chemistry and agro food. Emerging clusters need to work on awareness raising even more and to put forward and share a **vision** among all actors - like in the **Vaccine Therapy Biocluster** - in order for the cluster to grow in a coherent way.

Moving on from internal cluster consciousness to external promotion, some examples might be mentioned. For example, in the UK, **BioDundee** has been enhancing local communications and networking within the local Life Sciences sector as well as internationalising activities including inward and outward trade development activities. Promotion is key for all clusters: in the Czech Republic, **Gate2-Biotech** has become the official internet portal for biotechnology created by the South Moravian Innovation Centre with support of the agency CzechInvest, offering a complete database of Czech biotechnology companies and research entities, searchable by specialization, offers and requests of collaboration or jobs, and current research projects as well as a range of events. A similar initiative is the **Italian Biotechnology Directory** started in 2003 in Milano but with a less cluster specific approach. This is the first online data bank of the Italian biotech market and very helpful in creating a network of relationships between public and private entities.

Once clusters have grown and are visible at international level, cross-cluster cooperation can be enhanced. An interesting case is the **TransAlpine BioCluster**, an initiative involving several different organisations like ADEBAG-France (the Association for Economic Development of Biotechnology and bio-industries in Grenoble Area); BioAlps-Switzerland (Lake Geneva Biocluster) and Bioindustry Park del Canavese-Italy with substantial links with the Milan area and towards the whole transalpine area to Austria and Germany. The aim is to create a transalpine cluster involving the three above mentioned territories, with the aim of federating the scientific resources and industrial expertise of the members, while boosting synergies and partnerships between them as well as contributing to the mobility of researchers and supporting the European development of companies. Cross-cluster cooperation activities are interesting examples for their evolving geometry that may vary consistently in time according to interests and new partners.

According to the metaphor of the "living" organism the three above sub-categories (creation of consciousness, promotion and cross-cluster cooperation) should be seen as steps of the same process. Creation of consciousness is a necessary step in all newly formed clusters and may require time to be shaped according to individuals and companies present in the cluster as all actors need to feel part of the system. The constitution of an efficient and well recognizable central figure, be it a coordinating agency or person, can be seen as crucial at this stage. As the organism evolves and gains mass, other practices can follow, like promotion of the cluster mainly with a specific marketing approach. Finally, as the cluster matures and is visible at international level, it is wise to look for links beyond its borders to expand its action and complement its areas of work. Cross-cluster cooperation represents the ultimate degree of network integration: besides the European cross cluster cooperation above mentioned, other cases of formal agreements across clusters exist, like between the cluster of Heidelberg and Asian bioclusters. These three kinds of actions sometimes may overlap when clusters in earlier stages decide to move to cross-cluster cooperation to expand their critical mass more rapidly and bringing forward cluster consciousness and promotion activities at the same time, with one reinforcing the other.

Conclusions: for success, go holistic

The analysis presented in this chapter has provided a number of examples of good practices for biocluster management. Before passing on to assessing their reproducibility in Chapter 5, it is worth summarising the ten take-away messages emerged so far and stressing that bioclusters are complex systems, similar to living organisms constituted of billions of cells. Thus managing a cluster, at all stages, requires a holistic approach taking into account that every cluster has its own specificities and peculiarities. The overall complexity of the system will also grow along with the evolution of the system with its scale and should be carefully managed. Last but not least, a cluster needs a "system integrator", i.e. an actor that is recognised by the members of the

cluster as being in charge for managing, or at least coordinating, the efforts of cluster management. If this actor can be identified in a clear way, this seems to help in the development of the cluster. Especially in its early stages, is it important to rely on the drive of a few key individuals and on the early engagement and development of key institutions. In any case a "one size fits all" approach does not work and local conditions must always be taken into account as well as the evolution of the cluster along its phases: from emergence to maturity. ■

Ten take-away messages for bioclusters' good practices

1. **Support to research activities**
   To be effective and worth the money spent, the activities carried out should involve a number of specialised professionals capable of evaluating the potentials for commercial exploitation of research projects, letting researchers do their job.
2. **Technology transfer and entrepreneurial coaching**
   Researchers should care about technology transfer activities and this should be incentivised through training programmes and financial aids. Technology transfer mechanisms should involve a network of potential entrepreneurs and of established companies for commercial exploitation of research results.
3. **Support infrastructures**
   Technological services should also be provided, allowing companies to reduce the cost of accessing leading-edge technological instruments; in any case support should remain a temporary solution (3 to 5 years) for companies with clear exit-strategies identified since the beginning.
4. **Support to collaboration**
   Strong competences in networking are required. An international high quality network should be set up and maintained to respond to the needs of companies in the cluster.
5. **Business support**
   Trust and commitment from the members of the cluster are critical here because the provision of high added value services implies the exchange of confidential and delicate business information.
6. **Funding - direct and indirect**
   Direct funding actions like public grants should focus on pre-seed and seed funding, leaving to specialised investors further rounds. Indirect funding actions should help achieve the required critical mass of resources through the involvement of a well functioning network of potential investors.
7. **Involvement of larger companies**
   Large pharma companies remain the cornerstone of biotech. They should be actively involved in the system as their role is crucial for cluster development.
8. **Creation of consciousness**
   A "focal" point of the cluster, i.e. a node of the system, should be identified so as to represent the preferred "entrance point" and "reference point" for the cluster.
9. **Promotion**
   A more articulated system of "representatives" of the different actors of the cluster should be set up in order to promote the cluster at local and international level in a coherent and co-ordinated way.
10. **Cross-cluster cooperation**
    Cooperation between focal points of different clusters should be preferable at the initial stages. The clusters' network of collaboration should lead to relationships among different actors of different clusters when the cluster reaches the growing and mature stages of development.

The cream of the crop

Exchange of good practices within bioclusters

Summary

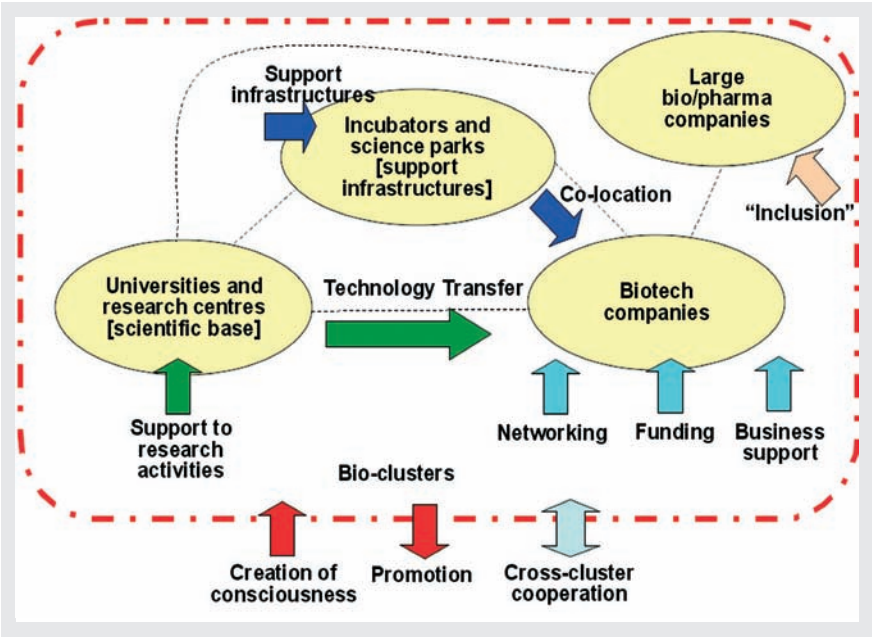
Theory and observations are valuable assets but only results on the ground are the actual proof of success. NetBioCluE has undertaken this task very seriously and produced an original and valuable piece of new work testing Europe wide observations for feasibility and applicability directly with local actors in the clusters. Thus, after tracing a conceptual framework and presenting data gathered directly in the observed clusters, the aim of this chapter is to assess the reproducibility of the good practices described in Chapter 4. This test is the result of an accurate and profound involvement of local actors from the observed clusters who have contributed in evaluating the identified practices comparing them with the actual situations and needs they experience on the ground. NetBioCluE has asked directly to the different actors of the bioclusters, with particular attention to companies, to set the relevance of the identified good practices and evaluate how to improve them and their transferability, with specific regards to their local cluster. This investigation resulted in 584 practice evaluation questionnaires completed by the different stakeholders of the bioclusters: academia, SMEs, big firms and cluster representatives. In this way NetBioCluE selected and tested twenty good practices among the sixty overall identified in Chapter 4.

Comments from local actors evaluating the twenty selected good practices are summarised and compared in the second part of this chapter and represent one of the most valuable contributions to NetBioCluE's work in elaborating policy recommendations. While Chapter 4 looked at characteristics, costs, pre-requirements for reproducibility of about sixty practices from the following bioclusters (Cambridge, Paris-Ile-de-France, Munich, Heidelberg, Milan-Turin, Dundee, Alsace Biovalley, Biotechvalley and Uppsala in Sweden, Aarhus, South Moravia, South Plain Neurobiological Knowledge Center (SNKO), Vaccine Therapy Cluster), Chapter 5 moves to testing and evaluating the possible implementation for the selected practices. The above practices were classed according to four main categories: 1) supporting science (support to research and to technology transfer); 2) supporting infrastructures 3) supporting companies (networking, business support, funding, involvement of large pharma companies) 4) supporting bioclusters (creation of cluster consciousness, promotion. The main categories of practices are summed up in the picture (*Picture 1*).

5.1 Selecting and ranking the good practices

Out of the sixty identified actions, each NetBioCluE partner selected twenty good practices scoring them for relevance and allowing for a final selection of the most interesting ones, and globally more significant to the partners in respect to their clusters. Once these twenty practices were selected on the basis of the specific characteristics and needs of each cluster, a more in depth analysis was carried out by involving a significant number of biotech operators in each cluster. The target consisted of several figures involved within the clusters at different levels: local SMEs' managers, key intermediaries, big firms, cluster managers and stakeholders. 584 questionnaires were returned for the evaluation of the practices.

Picture 1 - Good practices for cluster development - a systemic view



Source: NetBioCluE

Table 2 below shows the final ranking of the selection of good practices according to the three most significant indicators. All three indicators are expressed in a common and comparable score. The **adoption rate** reveals the overall degree of existence of a given practice throughout the clusters observed by NetBioCluE. A higher

Table 2 - Ranking of the 20 top good practices according to adoption rate, perceived need and reproducibility

	Good practice	Adoption rate	Perceived need	Reproducibility	Total
1	Value chain coaching - Sweden	20	20	17	57
2	Help for the researcher return - Genopole	19	16	20	55
3	Genopole 1er jour - Genopole	17	18	16	51
4	Heidelberger Gründer - Heidelberg	12	17	14	43
5	Special Interest - Cambridge	10	13	18	41
6	Translational Medicine Research Collaboration (TMRC) - Scotland - UK	18	12	6	36
7	Purchasing scheme for biotechnology companies - Cambridge	13	10	12	35
8	Business intelligence and strategic support - Sweden	11	14	9	34
9	Intermediate Technology Institute (ITI) Life Sciences - Scotland - UK	14	19	1	34
10	Mutualised business and competitive intelligence - Alsace Biovalley	15	8	11	34
11	Networking the biotechnology cluster - Cambridge	2	9	19	30
12	LIMA i-Tech Plat: interdisciplinary technology platform - Milan -Turin	16	5	8	29
13	Uppsala BIO-X - Sweden	8	15	5	28
14	Fostering the establishment of spin-offs- Hungary	4	7	13	24
15	Discovery - Milan-Turin (MI-TO)	9	11	3	23
16	Commercialisation - Scotland - UK	5	6	10	21
17	BioDundee - Scotland - UK	1	4	15	20
18	Fostering tech transfer - Hungary	7	1	7	15
19	Gründerverbund Heidelberg - Heidelberg	6	3	2	11
20	Italian Biotechnology Directory - Milan-Turin (MI-TO)	3	2	4	9

Source: NetBioCluE

adoption rate indicates that practice is adopted by more clusters.
The **perceived need** highlights the general interest for each practice. Higher figures indicate a high interest in the practice especially if it has not been adopted in the cluster yet.
Finally, **reproducibility** measures how easily the practice could be implemented in a cluster. The higher is the number, the easier is the adoption of the action.

The five most common kinds of practices come from categories such as cross-cluster co-operation, promotion of the cluster, creation of cluster consciousness and technology transfer. Business support and funding were perceived as the most interesting categories, as support to early-stage and commercial development are key. The interest is less evident for practices concerning the cluster awareness or the support infrastructures. The implementation level is quite low, thus meaning that obstacles to develop the practice are accurately perceived. Implementation could be easier only for a few practices concerning funding, support to research and business support.

On top of all, six good practices should be underlined: the top scoring five (**Value chain coaching, Help for the researchers' return, Genopole 1er jour, Heidelberg Gründer Team and Special Interest Groups**) as well as **Networking the biotechnology clusters** (n.11 in the top 20), which also received significant positive comments. These measures are not present in the majority of the clusters but present a high interest and a low possible reproducibility.
Four other practices appearing in the second half of the list (**Italian Biotechnology directory; LIMA i-Tech Plat; Gründerverbund Heidelberg** and **Fostering tech transfer**) show instead a relatively high adoption rate, whereas the perceived need of such practices is relatively low. This may mean that they refer to issues which may have already been dealt with in the cluster or that are potentially extremely relevant but very difficult to "reproduce". As reproducibility is very low, this confirms the latter option as the most likely.

5.2 Ranking of the categories of practices by typology of respondents

As *Table 3* below shows, a high variability in answers resulted in the analysis depending on the types of respondents: researchers from academia or public research centres; cluster representatives (managers, consultants and experts) and SMEs. For instance, "Networking the biotechnology cluster" ranked as very significant for the academic community and the SMEs but appears much less of a priority for cluster representatives.

Academic community, cluster representatives and companies do have different interests and stakes in cluster development and this is clearly reflected in the way in which they looked at the practices to be evaluated. As for the **academic community**, the smaller group, with little more than 40 answers, it seems that they are neither involved enough nor really committed to the development of bioclusters, especially if coming from Universities and public research centres. However, scientists seem very interested in practices aimed at supporting small R&D firms, ranging from "Value chain coaching" and "Networking the biotech clusters" to "Help for the researchers' return" which usually exist in the cluster. With more than 250 answers, **cluster representatives** were the bulk of respondents and were characterized by a very specific perception of the cluster. Their attention goes to three main practices. First of all "Help for the researchers' return", which is usually not implemented and is considered necessary, as well as "Special interest group" and "Genopole 1er jour" which are perceived as very necessary and quite replicable. On the other hand, two practices are perceived as not

Table 3 - Ranking based on the categories having a perceived need rate > 30% and a reproducibility rate > 10%

Academia	Cluster Representative	SMEs
• Creation of cluster consciousness	• Support to research activities	• Creation of cluster consciousness • Business support • Funding (indirect)
• Value Chain Coaching • Networking the biotechnology cluster	• Help for the researchers' return • Special Interest Groups • Genopole 1er jour	• Networking the biotechnology sector • Fostering the establishment of spin-offs • Value Chain Coaching • Special Interest Groups

Source: NetBioCluE

urgent, namely the "Italian Biotechnology directory" and "Fostering the establishment of spin-offs" possibly because these practices have been already implemented or they seem to be too complex to be reproduced.
Surprisingly, the practice "Networking the biotech cluster" aimed at creating cluster consciousness, is also seen as not necessary. The priorities of the SMEs, the other larger group of respondents, comparable in size with cluster representatives, is very different from the academia or the cluster representatives. Most of the practices, in their view, do not exist in their cluster and their need is not well perceived. In general, SMEs want a strong and visible organization, a recognizable leader, better funding, and seek more cooperation with labs and university. In their view, the most important actions were "Networking the biotech clusters" as for researchers, "Special interest groups", "Fostering the establishment of spin-offs" and the "Value chain coaching". The actions which were seen as relevant by the cluster or academia respondents were not seen as important by them.

5.3 The twenty good practices in detail

Here below is the list of the twenty highest scoring good practices selected, in order of ranking, together with a synthesis of the comments emerged on their value and applicability in the different clusters. Clearly local conditions were very important in how applicable and interesting a cluster may be for a specific practice. A general description of these practices has been provided in Chapter 4 (and its Appendix).

1. Value-chain coaching

Cluster: Biotechvalley - Sweden
Category: business support
Stage: growth/maturity

The practice aims at supporting small, R&D-intensive biotech firms to develop and commercialise their products more easily through a series of high added value services. Several respondents appreciated the practice and said that as "the cluster and the companies grow it will be possible to offer more and more specialised services"; others remarked "the practice does not fit with all kinds of clusters especially those influenced by the presence of large pharma companies". For effective and fruitful implementation this action seems to need a "strong industrial background and experience" and a solid internal organisation of the cluster with companies close to the market. One sensitive point being highlighted by respondents is the "protection of confidentiality and privacy", which is always an asset of great concern in biotechnology.

2. Help for researchers' return

Cluster: Paris-Ile de France
Category: support to research
Stage: maturity

The measure, conceived to help researchers to return to their home country after their research experience abroad so as to reverse brain drain is widely considered and practiced in European countries with different intensity. Comments have highlighted the need for "more organisations and funds" but also for strategies to integrate brains returning from abroad without sparking "belligerent" reactions that might create conflicts with researchers at home. However, funding researchers to return home is not enough to ignite cluster development and many interviewees underlined the need for a more sophisticated action to involve local SMEs so as to foster the overall economic attractiveness of the area and connect it to an international network.

3. Genopole 1er jour

Cluster: Paris-Ile de France
Category: funding (direct)
Stage: maturity

The programme provides early-stage funds for enterprise creation through a biotech dedicated pre-seed fund, with investments of € 30,000-100,000 each. Observers underlined that "such pre-seed funds are in general linked to a specific structure/organisation and it would probably be better to have a common and shared network between clusters. A promotion activity could also be organised in order to find potential investors and inform them about the biotech sector and its potential so as to organise a ➤➤

	network of potential pre-seed investors". Others have objected the available funding is not enough and the practice might be seen as "a waste of money" as a project should be strong from its beginning and then financed. One respondent said it would be "better to finance 3 projects with €500,000 each than 20 projects	with €50,000-100,000", while in a local economic development logical framework smaller financial support can help companies initiate their path towards the real financing rounds. Prerequisites for this action to be set up are clearly the availability of funds as well as the involvement of private and institutional investors.
4. Heidelberg Gründer Team **Cluster:** Heidelberg **Category:** funding (direct) **Stage:** maturity	This initiative, providing technological support and consultancy to companies, is based on the acknowledgement that a technology oriented start-up needs highly qualified scientists, strong competencies for marketing and sales and specialists in legal support for complex licensing and co-operation negotiations. To be better implemented at local level, the interviewees pointed out that this measure	could benefit from "more funding and support at the local level" as well as from involvement of "a panel of experts from academia and industry". However appreciated, the action does not seem to fit with the needs of some smaller clusters highlighting the existing competition in a cluster and in some cases the lack of highly qualified experts and funds which are a precondition for this activity.
5. Special Interest Groups **Cluster:** Cambridge - UK **Category:** business support **Stage:** maturity	ERBI developed Special Interest Groups to address specific areas of biotechnology function within companies, like business development, clinical development, corporate governance, facilities management, finance, being open to people with a specific function within biocompanies. The majority of comments were positive and underlined the possibility of an even more focused attention on themes like the market.	A minority discarded the measure as it would not fit with their cluster as being active on a huge geographical area where such events would be difficult to set up and manage. Critical mass, adequate financial resources and incentives to bring in new actors are unanimously quoted as requirements for the proper implementation of this measure in the clusters.
6. Translational Medicine Research Collaboration (TMRC) **Cluster:** Dundee - Scotland -UK **Category:** support to research **Stage:** growth	This measure, implying research co-operation among four Universities in Scotland and Wyeth Pharmaceuticals, was developed to overcome organisational boundaries between organisations specialising in basic research, commercialising R&D, and clinical research, to advance the speed of knowledge transfer and feed-back. A few positive comments stressed the importance of having more collaborations and partners to accelarate growth of the cluster. Some interviewees however, pointed out their skepticism in implementing the measure due to the insufficient size of the region or due to the fact that, when big pharma companies are involved, they have a right of first refusal that	could create an unfavourable climate for researchers who would not feel free to carry out their research. Moreover, if the industrial partner did not exercise that right, this would in any case delay the development of the idea up to six months, which might be critical for radical innovations to be achieved. In the opinion of respondents, preconditions to the successful introduction of this practice would be the companies knowing since the beginning the industrial partner bringing forward the product development and the cooperation among large pharmas and small biotech companies or research labs (notwithstanding the comment above).

7. Purchasing scheme for biotechnology companies

Cluster: Cambridge - UK

Category: business support

Stage: maturity

This action was conceived to contain costs of small biotechnology companies, which do not have the purchasing power of pharmaceutical companies and often pay a significant amount for resources and services. Reasons to improve the practice, when it already exists in the cluster, were identified as the possibility to apply the scheme to both labs and SMEs. The service could also be further improved automatising it to gain reactivity regarding the SMEs' needs and expanding the number of companies involved to cut costs even more. In some cases, however, the lack of critical mass of SMEs and contact with the labs prevents its implementation. Preconditions for its introduction are a sufficient number of companies and a strong and dedicated management of the cluster able to implement it effectively.

8. Business intelligence and strategic support

Cluster: Biotechvalley - Sweden

Category: business support

Stage: growth/maturity

The action was developed to provide relevant business intelligence for the biotech and pharma companies in the cluster. The measure is addressed to the whole cluster and the industry as a whole in Sweden. To make the practice even more effective, it was recommended to pool resources so as to attract more funding. A few respondents objected the practice does not fit with their needs as their cluster is still in an early stage and it does not show much difference from services offered from consultancy firms. Preconditions for its introduction are good cluster management, availability of public funds, although some comments also stressed the importance of ensuring confidentiality and privacy when sharing sensitive company and research data. Lack of cluster organisation and of a strong leader seem to be the main reasons for not introducing or not promoting its implementation in the cluster.

9. Intermediate Technology Institute (ITI) life sciences

Cluster: Dundee - Scotland - UK

Category: funding (direct)

Stage: growth

The practice is aimed at the generation of market-focused intellectual assets for exploitation by existing and new companies through a unique entrepreneurial innovation fund. The few who pointed out the practice does not fit with their cluster needs remark they have a different business plan or that venture capitalists and banks are already covering this task. However, it is a practice which has been positively evaluated by a wide number of respondents. Preconditions for implementation are a board capable of efficiently managing it and the presence of companies in a sufficiently advanced development stage. Projects in early stage require instead public funding and political support to mature. Lack of this would require a strong private financial support. Networking and attraction of foreign investors are also important premises for this action.

10. Business and competitive intelligence

Cluster: Alsace Biovalley

Category: business support

Stage: maturity

Market analysis support and related services for companies are included in this practice. Respondents highlighted the need for a dedicated full time person who could help in approaching investors, federating clusters and dealing with the development of collaboration agreements with lawyers and IP consultants. This action does not seem to fit with some mature cluster needs as respondents do not see its added value where it has been introduced. Biotech companies for their very specialised nature might in fact need more individual services that could be provided through different and more "tailored" approaches. However, some clusters seem to have implemented it on a demand basis for individual companies but not on a cluster scale. Prerequisites for introducing this action are a critical mass of SMEs and funds, as well as the right person to manage the practice, with the right expertise ➤➤

and capablility to talk to both the scientific and business community. Being close to the market and having access to a significant network of contacts and clusters are other important issues to be dealt with together with privacy and protection of company information.

11. Networking the biotechnology cluster

Cluster: Cambridge - UK

Category: cluster consciousness

Stage: maturity

This practice allows biotech companies to share know-how on business management, finance, science and company operations. It could be made more effective through a stronger economic support from local authorities, as well as through the launch of a series of events hosting foreign guests and experts on relevant topics. It is considered functional both in improving cluster consciousness as well as in communicating its activity to the outside.

This practice was in general considered very important. Respondents who did not find it suitable to their cluster, however, pointed at the great geographical spread of their organisations which makes it difficult to organise such events locally. Usual requirements, such as cluster consciousness and critical mass of SMEs apply, but it is worth noting the importance given, once more, to the identification of the right profile to manage this practice.

12. LIMA I-Tech Plat

Cluster: Milan-Turin

Category: support infrastructure

Stage: growth

The LIMA (Laboratorio Integrato di Metodologie Avanzate) is a lab reorganised as an interdisciplinary technology platform focused on the valorisation of scientific results. The practice appears more interesting for initial clusters while some which have reached maturity seem to be able to do without it. This activity could be even strengthened through the creation of a "network" between different technological platforms available in the cluster (particularly including those in universities) attempting to create a true critical mass and to exploit potential synergies and complementarities between existing platforms. A stronger selection of projects is seen as valuable, possibly through a panel of external visiting experts. Those who found the practice did not fit with their cluster pointed at an insufficient number of companies, and an overlap with what some incubators already do. Preconditions for its implementation are laboratories and strong scientific structures capable of evaluating results and R&D both from a scientific and R&D point of view.

13. Uppsala BIO-X

Cluster: Uppsala Bio - Sweden

Category: funding (direct)

Stage: growth/maturity

This practice, conceived to create new business opportunities from collaborative research efforts between academia and industry, is seen as very important by local operators and could be improved, in clusters where similar actions already exist, to secure a long term funding through connection with private investors and develop an active business incubator as well as to facilitate cooperation between universities and the industrial communities. Where the action is not implemented, it is not because it is not seen as suitable, but, once again, because there does not seem to be the right professional profile capable of managing it. However, some respondents raised the point that supporting private R&D activities of pharma companies with public funding could distort free competition. Some kinds of tax allowances are seen as preferable. Large pharma companies as well as other private investors as incubators and VCs are key for the implementation of this action.

14. Fostering the establishment of spin-offs

Cluster: SNKO - Hungary

Category: technology transfer & entrepreneurial coaching

Stage: initial

This practice, designed to support generation of spin-off companies, could be improved targeting more efficiently researchers so as to bring them closer to business issues through the creation of a strong network of senior people that already have a strong experience in business and could orientate the young entrepreneurs. This could be achieved through lectures and seminars but also through a more individual relationship with a successful businessman acting as a tutor to young scientists interested in becoming entrepreneurs. For some mature clusters this measure does not seem of interest as similar activities are already in place. Hurdles to the effective implementation of the action are seen in lack of funds and the intense working schedule of researchers that often does not allow them to attend all lectures.

15. Discovery initiative

Cluster: Milan-Turin

Category: technology transfer

Stage: growth

This initiative is aimed at scouting and incubating biotech companies with high potential providing them also with financial support through Eporgen venture. It could be improved offering a tutoring programme allowing researchers to talk with entrepreneurs and investors, as well as business consultancy and introduction of an incubator in the cluster. Where this practice does not exist, it is because other measures are addressing the same needs or because the cluster is perceived as not having to deal with these matters. To work effectively, prerequisites are the presence of experts capable of evaluating early stage projects as well as an investors' community committed to invest in hi-tech and hi-risk projects.

16. Commercialisation awards

Cluster: Dundee - Scotland - UK

Category: technology transfer & entrepreneurial coaching

Stage: growth

In order to help valorisation of research results and efficient technology transfer mechanisms, commercialisation awards were set up in Dundee to select the best projects. Similar actions are available for example also in Munich and Milan. To improve actions like this, it could be helpful to support researchers in understanding how companies function and to have a more extensive review from external experts. Some respondents also suggested to fund a dedicated agency that would take care of this action. Those not considering implementation of this action believe it is not the cluster's task to organise commercial awards and it would not be useful. Prerequisites for effective implementation are quite straightforwardly time and money as well as critical mass.

17. BioDundee

Cluster: Dundee - Scotland - UK

Category: cross-cluster cooperation

Stage: growth

Developed to stimulate the circulation of ideas as well as the sharing of business opportunities and external promotion, actions like BioDundee (but also like Bioforum or BIOTEC) could be improved through an even stronger support of local authorities as well as an intensification of foreign company attraction and outward marketing of the cluster. Prerequisites, that also explain why some initial clusters have not developed yet their activities with regards to this, are a well developed cluster consciousness and interest from the researchers as well as a consistent financial support.

18. Fostering tech-transfer

Cluster: SNKO - Hungary
Category: technology transfer & entr. coaching
Stage: initial

Technology transfer is key in biotech: fostering communication between science and business as well as translation of research results are actions aimed at that. Even in a cluster at an initial stage, the needs for raising the awareness and the public "image" of biotechnologies as well as the existing idea that launching a start up is as an "endeavour" make it even more important to strengthen these measures and expand them where already existing. Some interviewees pointed out that governments should pay for patents of small companies, as well as helping young firms with IP protection through consultancy services and competent advice for an effective help in fostering technology transfer.

19. Gruenderverbund Heidelberg

Cluster: Heidelberg
Category: funding (direct)
Stage: maturity

Consisting in the support of companies through funding related to consultancy and monitoring, according to respondents this practice could be strengthened by adding more details of services provided directly on the website and diversification in the funding levels (e.g. short-term temporary credits to prevent SMEs bankruptcy, and a long-term funding, by further development of public-private partnerships). Where it is not adopted or not perceived as highly relevant, it is because the cluster is not focused on funding and support of spin-offs, or the early stage companies and their related market are still too small or too far in the value chain in order to need those high added value services and support. Prerequisites are availability of funding, legal support, but also good scouting skills in spotting promising ideas.

20. Italian Biotechnology Directory

Cluster: Milan-Turin
Category: promotion
Stage: growth

Producing the major information tool for the biotech community in Italy, it is a marketing tool to promote Italian biotech clusters abroad as well as a tool to foster networking and knowledge exchange at Italian and international level. Some suggestions emerged when discussing with local biotech operators: to make it even more effective, a more detailed database on private financing could be of help together with the set up of a specific international biotech conference. Prerequisites for the development of this practice are the presence of adequate funding and of a neutral organisation to collect the data and to present the information in an aggregate and intelligible way.

5.4 Which practice do I apply and when?

Bioclusters have been compared to living organisms for their complexity and multiple interactions with internal as well as external factors. Clear trends for a given stage of development - initial, growing and mature- may seem hard to define, but this is because the factors determining the need for good practices are also strongly influenced by the model, the location and the regional dynamics of the cluster, which may vary widely in Europe. Thus, while some of the measures (all recapitulated in *Table 3*) remain typical of a given historical moment in the life of the system, every cluster, regardless of its stage of development, seems able to apply a range of good practices. In particular, an interesting result was that mature clusters seem to look at new actions developed by new systems in their initial stage for inspiration and suggestions on new tools. Uppsala BioX, for instance, aiming at cross-cluster collaboration, appeals to clusters of all different stages of development, while more sophisticated tools, as business intelligence and strategic support, seem typical only of the mature systems.

All the above considerations are consistent with the goals already outlined before, namely that the aim of practices should not be faster, but stronger and sounder growth of the cluster. It is also in line with the “holistic approach” stressed in Chapter 4 as every cluster should be considered as an eco-

system, more than a mechanical grouping of companies sharing the same location. Local conditions clearly play a significant role in the evaluation and choice of practices to implement as the ranking of practices clearly aims at strengthening critical points that a cluster may have in a specific area. Here below is a summary comparison of the most relevant practices with regards to the development stage in the analysed clusters.

Initial Stage

This is probably the most difficult stage as clusters have to struggle with several crucial issues at the same time. A common limiting factor is most usuallly funding, but a relevant hurdle for the younger clusters seems the ability to attract and secure a solid and experienced management team to guide them through the first steps of development. Feedback from the Vaccine therapy cluster in Hungary shows how funding can be a much limiting factor as actors from this cluster consider it one of the main reasons for not being able to apply any of the twenty best practices identified. Another limiting factor seems the management consideration that many of the outlined actions do not fit with the cluster model. A similar situation is that of SKNC cluster in Hungary, where only the BioDundee practice has been picked up as interesting and suitable with the aim to increase cross cluster cooperation and possibly internationalization. Quite differently, at the Innovation cluster centre in the Czech Republic, three actions aimed at the stimulation of entrepreneurial initiatives are of interest, namely BioDundee, support in the establishment of spin-offs and networking the biotech clusters. On the other hand, five practices do not awake any interest here (Italian Biotechnology directory, ITI life sciences, Mutualised business and competitive intelligence, Special interest groups and Uppsala Bio X). The reasons behind this are possibly the young age of the cluster which still needs some time to develop connections with labs, an incubator and a management team.

Growth Stage

This stage appears to be somewhat of a transition and can present clusters with very different conditions but confirms the importance of a sound and experienced management able to organize the more complex cluster activities. In Sweden, interviewees from Biotechvalley particularly appreciate those related to funding and business support as Business intelligence and strategic support, Uppsala BioX and Value chain coaching, practices coming from and applied in the area, while many of the other practices do not seem to fit with the business model of the cluster. In Dundee, UK, one of the most dynamic emerging western European clusters, most of the listed actions are considered interesting, but their implementation is perceived as complex, possibly also because of the cluster's self perception as being partly diverse and fragmented. A more articulated approach comes from the MI-TO cluster in Italy, where a number of different practices, from Special interest groups, TMRC, Uppsala BioX and Value chain coaching are considered as interesting, as they address some of the most sensitive issues for this cluster, namely business support and funding strategies. An interesting point here is that some of the actions are proposed through actors involved in the interregional cluster network without always involving cluster management directly as being in charge. Its small size is considered a criticality of the cluster as it lacks a critical mass of companies and partnerships and many of the companies would seem to need to feel more involved in the cluster itself.

Maturity Stage

Clusters having attained this stage of development have usually established a solid internal organization and normally look at fewer and more sophisticated practices concentrating on business development. Cambridge, for instance, appreciated and considered interesting to be implemented Heidelberg Gründer Team, Intermediate Technology Institute Life Sciences, Uppsala BioX and Value chain coaching, while most of the actions coming from initial clusters are considered out of scope. This is also due to Cambridge's private and very independent structure: feedback from the actors stressed the reduction of internal fragmentation as a priority. Heidelberg, in Germany, focuses on three good practices: Genopole 1st Day, Intermediate Technology Institute Life Sciences and Uppsala Bio-X. Quite differently from other clusters Genopole 1st Day and ITI were not considered too complex to implement. However, the cluster management underlined its being in touch with the business community and here the need for advice from the SMEs is strong and contact with banks and VC companies is well perceived. Coordination of activities and funding are not highlighted as the other clusters do. Munich and Paris cluster as mature clusters confirm the pattern of other mature clusters: they are interested in high added value services like Business intelligence and strategic support, Heidelberg Gründer Team and Help for the researchers' return. Again, while the majority of other practices is not considered relevant, Munich declares a need for economic experts, a political support and more investment. The Paris cluster's priority is instead a better communication with all its actors as the biocommunity is spread throughout a large geographical area.

Table 4 - Overall ranking of good practices

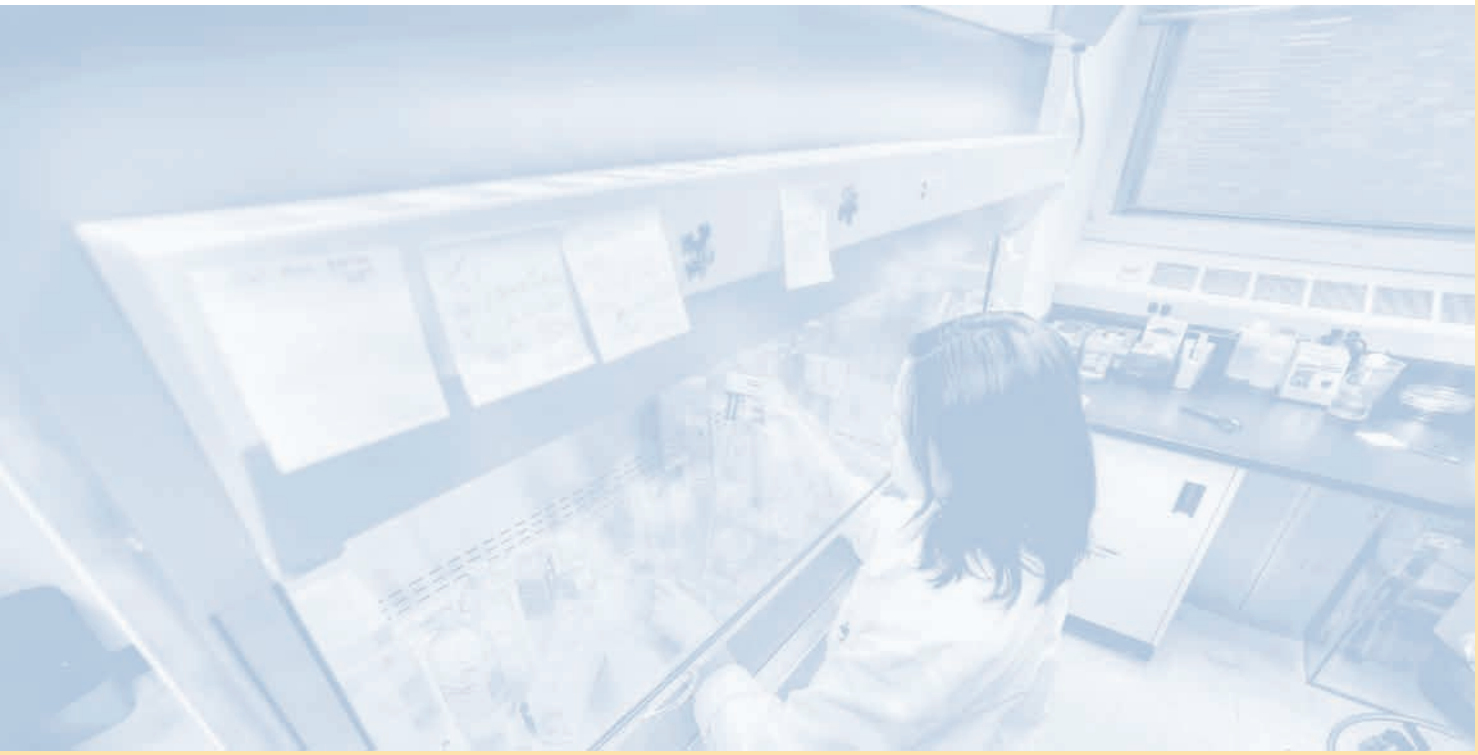
		Vaccine therapy	Trans Alpine	Inno cluster	SNKC	Aarhus	Biotech valley	CEITEC	Dundee	Uppsala Bio	MI-TO	Cambridge	Heidel-berg	Biotech Munich	Medicen
		initial	initial	initial	initial	initial	growth	growth	growth	growth	growth	maturity	maturity	maturity	maturity
Discovery Initiative	adoption rate	0,0	100,0	0,0	100,0		100,0	6,6	0,0	0,0	40,0	33,3	33,3	100,0	0,0
Initial	perceived need	0,0	0,0	100,0	0,0		0,0	0,0	50,0	0,0	60,0	0,0	33,3	0,0	0,0
	reproducibility	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Fostering	adoption rate	0,0	100,0	0,0	100,0		0,0	33,3	100,0	0,0	75,0	33,3	0,0		0,0
tech-transfer	perceived need	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0	0,0	0,0	66,6		0,0
Initial	reproducibility	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0	0,0	0,0	33,3		0,0
Fostering the	adoption rate	0,0	100,0	0,0	100,0	100,0	66,6	33,3	75,0	0,0	25,0	66,6	33,3		100,0
establishment of spin-offs	perceived need	0,0	0,0	100,0	0,0	0,0	0,0	0,0	25,0	0,0	25,0	33,3	33,3		0,0
Initial	reproducibility	0,0	0,0	100,0	0,0	0,0	0,0	0,0	25,0	0,0	0,0	0,0	33,3		0,0
LIMA i-Tech Plat: inter-	adoption rate	0,0	66,6	0,0	0,0		0,0	50,0	66,6	0,0	50,0	0,0	0,0		100,0
disciplinary technology	perceived need	0,0	33,3	0,0	0,0		0,0	0,0	0,0	0,0	25,0	0,0	33,3		0,0
platform - Initial	reproducibility	0,0	33,3	0,0	0,0		0,0	0,0	0,0	0,0	0,0	0,0	0,0		0,0
Bio Dundee	adoption rate	100,0	66,7	0,0	0,0	100,0	75,0	100,0	100,0	0,0	75,0	100,0	66,6	100,0	100,0
(networking partnership)	perceived need	0,0	0,0	100,0	100,0	0,0	0,0	0,0	0,0	0,0	25,	0,0	33,3	0,0	0,0
Growth	reproducibility	0,0	0,0	100,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	33,3	0,0	0,0
Biodirectory	adoption rate	0,0	100,0	100,0	100,0		0,0	66,6	100,0	0,0	100,0	100,0	0,0	33,3	0,0
Growth	perceived need	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0	0,0	0,0	33,3	33,3	100,0
	reproducibility	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Business intelligence	adoption rate	100,0	66,6	0,0	100,0	0,0	25,0	66,6	75,0	0,0	20,0	0,0	33,3	33,3	0,0
and strategic support	perceived need	0,0	0,0	0,0	0,0	100,0	75,0	0,0	0,0	0,0	60,0	0,0	33,3	66,7	100,0
Growth	reproducibility	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	33,3	0,0	100,0
Commercialisation	adoption rate	0,0	25,0	0,0	0,0		0,0	33,3	100,0	0,0	60,0	100,0	33,3		0,0
awards	perceived need	0,0	75,0	0,0	100,0		0,0	0,0	0,0	0,0	20,0	0,0	33,3		0,0
Growth	reproducibility	0,0	25,0	0,0	0,0		0,0	0,0	0,0	0,0	0,0	0,0	33,3		0,0
Intermediate Technology	adoption rate	0,0	66,6	100,0	100,0		0,0	33,3	100,0	0,0	20,0	0,0	0,0		0,0
Institute (ITI)	perceived need	0,0	66,7	0,0	0,0		0,0	0,0	0,0	0,0	80,0	100,0	66,6		100,0
Growth	reproducibility	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0	0,0	0,0	0,0		0,0
Translational Medicine	adoption rate	0,0	33,3	0,0	0,0		0,0	0,0	100,0	0,0	20,0	50,0	0,0		0,0
Research Collaboration	perceived need	0,0	0,0	0,0	100,0		0,0	0,0	0,0	0,0	60,0	50,0	66,6		100,0
(TMRC) - Growth	reproducibility	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0	0,0	50,0	0,0		0,0
Uppsala BIO-X	adoption rate	0,0	66,6	100,0	100,0	0,0	0,0	66,6	50,0	100,0	20,00	0,0	0,0		100,0
Growth	perceived need	0,0	33,3	0,0	0,0	100,0	75,0	0,0	50,0	0,0	60,0	100,0	33,3		0,0
	reproducibility	0,0	33,3	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0		0,0
Value chain coaching	adoption rate	0,0	0,0	0,0	0,0	0,0	0,0	66,6	50,0		0,0	0,0	33,3		0,0
Growth	perceived need	0,0	100,0	0,0	0,0	100,0	100,0	0,0	25,0		100,0	100,0	66,6		0,0
	reproducibility	0,0	33,3	0,0	0,0	0,0	0,0	0,0	0,0		20,0	100,0	33,3		0,0
Genopole 1st Day	adoption rate	0,0	75,0	0,0	100,0	0,0	0,0	0,0	50,0	100,0	0,0	0,0	0,0	50,0	100,0
Mature	perceived need	0,0	0,0	0,0	0,0	100,0	75,0	100,0	50,0	0,0	75,0	0,0	66,6	50,0	0,0
	reproducibility	0,0	0,0	0,0	0,0	0,0	0,0	100,0	0,0	0,0	25,0	0,0	66,6	0,0	0,0
Gründerverbund	adoption rate	0,0	66,6	0,0	0,0		0,0	33,3	75,0	0,0	50,0		100,0	50,0	100,0
Heidelberg	perceived need	0,0	0,0	0,0	0,0		0,0	33,3	25,0	0,0	25,0		0,0	0,0	0,0
Mature	reproducibility	0,0	0,0	0,0	0,0		0,0	0,0	0,0	0,0	0,0		0,0	0,0	0,0
Heidelberger Gründer	adoption rate	0,0	66,6	0,0	0,0	0,0	0,0	0,0	75,0	100,0	50,0	0,0	100,0	0,0	0,0
Team	perceived need	0,0	33,3	100,0	0,0	100,0	75,0	0,0	25,0	0,0	25,0	100,0	0,0	100,0	100,0
Mature	reproducibility	0,0	33,3	0,0	0,0	0,0	0,0	0,0	25,0	0,0	0,0	0,0	0,0	0,0	100,0
Help for research return	adoption rate	0,0	0,0	0,0	100,0		0,0	33,3	0,0	0,0	50,0	0,0	0,0	0,0	100,0
Mature	perceived need	0,0	66,7	0,0	0,0		0,0	66,7	100,0	0,0	25,0	0,0	33,3	100,0	0,0
	reproducibility	0,0	33,3	0,0	0,0		0,0	33,3	75,0	0,0	0,0	0,0	0,0	0,0	0,0
Mutualised business and	adoption rate	0,0	25,0	100,0	0,0		0,0	33,3	50,0	0,0	0,0	0,0	33,3		0,0
competitive intelligence	perceived need	0,0	50,0	0,0	0,0		0,0	0,0	25,0	0,0	60,0	0,0	33,3		0,0
Mature	reproducibility														
Networking the	adoption rate	0,0	0,0	0,0	0,0		75,0	100,0	100,0	100,0	40,0	100,0	66,6	100,0	0,0
biotechnology cluster	perceived need	0,0	100,0	100,0	0,0		0,0	0,0	0,0	0,0	60,0	0,0	33,3	0,0	0,0
Mature	reproducibility	0,0	66,7	100,0	0,0		0,0	0,0	0,0	0,0	20,0	0,0	33,3	0,0	0,0
Purchasing scheme for	adoption rate	0,0	66,6	0,0	0,0		0,0	33,3	0,0	0,0	60,0	100,0	33,3	33,3	0,0
biotechnology companies	perceived need	0,0	33,3	0,0	0,0		0,0	0,0	75,0	0,0	20,0	0,0	33,3	33,3	100,0
Mature	reproducibility	0,0	0,0	0,0	0,0		0,0	0,0	25,0	0,0	0,0	0,0	33,3	0,0	0,0
Special interest groups	adoption rate	0,0	0,0	100,0	0,0		0,0	33,3	75,0	0,0	20,0	100,0	66,6	100,0	0,0
Mature	perceived need	0,0	100,0	0,0	100,0		0,0	0,0	25,0	0,0	60,0	0,0	33,3	0,0	0,0
	reproducibility	0,0	66,7	0,0	0,0		0,0	0,0	25,0	0,0	0,0	0,0	33,3	0,0	0,0

Conclusions

This chapter has looked at the twenty good practices out of the sixty identified in Chapter 4 and has pointed out what comments and evaluations have emerged from a close and direct contact with various biotech operators in each cluster, looking at how "implementable" each practice is in a specific cluster.
The main findings already emerged in the chapter but a few points deserve to be underlined more precisely before proceeding to Chapter 6 and 7 where in an outward looking approach the policy recommendations from NetBioCluE will be provided.

The first remark is on the emergence of one recurrent need: the need for skilled professionals and experts able to manage the complex processes of clusters dealing with hi-tech and hi-risk R&D. This is a very interesting and valuable observation as it was gathered from direct confrontation with local managers and cluster actors, from scientists to SMEs' representatives. It portrays a profound need for an improvement in Europe's entrepreneurial culture and ways to stimulate the formation of new hi-tech companies, thus applying to clusters at all levels of development where a critical mass of companies - and a critical mass of expert people - is key.

The second remark is about the different perceptions of "what's in the cluster": SMEs and cluster representatives are concerned with different practices as well as with different categories of practices and do not look at possible implementation - with implications, difficulties, costs and benefits - in the same way. Both kinds of stakeholders are interested in cluster development, but they tend to look mainly at their specific needs and do not adopt a systemic approach, which is key for synergic development in the field. Just to remind it, SMEs are particularly interested in funding and financial support, both through direct and indirect funding mechanisms, while cluster actors are more keen in acquiring new tools to offer high added value services to all cluster companies as well as in offering new opportunities to strengthen cluster consciousness and promotion. This is due to specific interests and needs and is affected also by specific local conditions that make a measure very cluster specific and very dependent on specific characteristics. This is the reason why, besides the interesting comments and evaluations emerged, it is never possible to proceed with too general transfers or to "copy and paste" a practice: any action transferred from a cluster to another needs to be implemented taking into account the specific characteristics, assets and weaknesses of the area. In any case, looking at successful models applied elsewhere and proven to work in regions across Europe, from mature to newly formed clusters, allows for evaluation of how to expand support available to the local biotech companies in the cluster. ■



NetBioCluE in an outward-looking approach

A view from the outside: companies' and academia's take on clusters, their importance and their limits

Summary

Including ten among the major European Life Sciences clusters, NetBioCluE has been a vast and articulated network not only inward looking. Indeed, on top of the partners directly involved, the consortium has also relied on support from external experts and contributions from several private companies, which are among the main stakeholders of clusters.

The following chapter presents the experience and the considerations on bioclusters' importance as well as cooperation with other two Europe INNOVA networks with which NetBioCluE has been working: Gianluca Carenzo from ABCnet, the Europe INNOVA cluster network on agro-biotech and Olivier Kitten from AFIBIO, the Europe INNOVA finance network to foster access to finance in Life Sciences.

Areta international and GenOptics, the two companies involved directly in NetBioCluE, have pointed out their perspectives about clustering benefits for companies. NetBioCluE has also been able to get the valuable contribution of two external experts, Frederique Bariguian Revel and Sonia Martinez, bringing in their Science Park experiences, in Europe and China.

Their precious and independent comments underline the importance of bioclusters in helping to build networks and connect to the international and global market, the importance of the vision of cluster management as well as the need for several different tools for company and cluster development.

6.1 AFIBIO: new tools for smaller biotech companies

Atlanpole, Nantes, France
Olivier Kitten
www.atlanpole.fr

After holding several positions in academic research, pharma industry and a biotech start-up, Olivier Kitten is in charge of Life Sciences co-operation at Atlanpole, the regional technopole and incubator for Greater Nantes. As such, he is in charge of the management of the western France BioCluster, Atlantic Biotherapies, endorsed by the French Government as one of the French "Pôles de Compétitivité".
He manages the AFIBIO project, aimed at providing new insights for improved access to finance in the biotech sector, with partners covering the whole financial chain, from technology transfer (like Science Park RAF in Milan) to banks (European Investment Bank and European Investment Fund).

Can you briefly outline mission and characteristics of Atlanpole?

Atlantic Biotherapies (ABT) gathers 45 companies dedicated to Life Sciences and health, backed by some nine-hundred specialist researchers, two universities, two university hospitals, one veterinary school and Audencia, one of Europe's top ten business schools. ABT members share the ambition to bring more new biopharmaceuticals to the market with enhanced selectivity and efficacy, with specific areas of excellence: cell and gene therapy, immunology, biomaterials and radiopharmaceuticals. Five new biotech companies are incorporated every year, making the cluster one of France's fastest-growing biobusiness locations.
Each research unit director has founded at least one spin-out company, raising academic awareness of the commercial world and business creation. Several international successes spun out of Nantes' academic environment, such as Vivalis who recently succeeded its IPO, Eurofins Scientific - now an international leader in analytic services in pharmaceuticals, agro-food and environment, or TcLand, specialized in immuno-monitoring.

What are AFIBIO (Access to FInance in the BIOtech sector) main findings?

AFIBIO findings consist in consolidated studies about financing instruments at early and later stage devoted to biotechnology throughout Europe, and in providing new tools for companies in order to foster their fund-raising process. Namely, a comprehensive directory of private investors with a demonstrated experience in biotech investments is made available, as well as possible models and promising case studies throughout Europe.

How would you describe cooperation with NetBioCluE?

For ABT being part of a cluster was considered a strong asset, as confirmed by NetBioCluE findings. Any research or initiative aimed at developing biotechnology has to consider the Cluster effect. Conversely, access to finance is a major concern when developing or strengthening a cluster. Such consolidated environments often concentrate investments both from public bodies (such as the French "Pôles de Compétitivité" initiative) and private companies. Cooperation between AFIBIO and NetBioCluE helped consolidate the sector-specific findings from both networks, and will lead to a common conference promoting joint and specific policy recommendations.
Aside from AFIBIO and NetBioCluE research and activities, new areas of cooperation opened from the informal relations established within Europe INNOVA between biotech clusters. Specifically, a new project focusing on commercialization of IP, a common area of interest from both networks, is under construction, with an even more practical approach and deliverable.

6.2 ABCnet: clusters cooperation in agro-biotech

ABCnet
Gianluca Carenzo
Parco Tecnologico Padano, Lodi, Italy
www.tecnoparco.org

Gianluca Carenzo, representing Parco Tecnologico Padano (Italy), is coordinator of ABCnet, a Europe INNOVA project aimed at strengthening networking between existing and potential clusters focused on animal and vegetable biotechnologies applied to the agro-food sector. Carenzo illustrates the origin of ABCnet and its main findings for improving the promotion of green biotech start-ups.

Could you briefly outline the background of ABCnet (AgroBioClusters network)?

The idea of creating a European Agro-Biotech Meta-Cluster was launched at the end of 2003. It was conceived to overcome the limits of local clusters, competence poles, science parks or companies as insufficient to keep up with high levels of competitiveness on the global market. Since the agro-food is a wide-range sector, we selected those competence poles in which the introduction of truly innovative new technologies was liable to boost the agro and food sectors. The aim was to develop guidelines to help the development of each cluster project, in order to increase its positive impact in supporting economic players in agro-food. Accordingly, representatives of public entities at local and regional levels participated in the cluster working groups, as well as representatives from farmers and breeders associations and actors able to affect dynamics developing in the agro-food sector, from an institutional and entrepreneurial perspective.
We think that the creation of a "cluster consciouness" will be for the future one of the major results of this approach.

What are ABCnet main findings?

What emerged up to now from the work of ABCnet may be summarized in four main observations. 1. First of all, the national and trans-national cooperation between business and research players should be increased in order to improve competitiveness of European agrosystems. 2. Secondly, the European financial system is not particularly oriented towards the agricultural world and there are a few Equity and Venture Capital funds focused on agro-food businesses as well as on businesses which carry out R&D in the agro-food sector. 3. Moreover, the excellent technological and scientific competences potentially available within universities and research centres are unfortunately scarcely capitalized by the entrepreneurial sector. 4. Last but not least, European regulation is not effective in promoting the use of new technology in terms of food, livestock and crops traceability as well as disease resistance.
ABCnet policy recommendations addressed to the stakeholders move from these considerations and cover six "hot-topics" in the agro-biotech sector at the European, national and regional level.
ABCnet has also developed several "tools". Among these, a mentoring scheme for innovative start-ups and pilot actions in intellectual property and finance for helping new companies in the agro-biotech sector have proven effective. The network in an outward looking approach and in cooperation with the other networks like NetBioCluE is developing a second phase of this partnership among clusters transforming these "tools" into "innovation support services" routinely used in fostering the creation of new companies.

6.3 Bioclusters, force multipliers for smaller companies

Areta International, Milan, Italy
Maria Luisa Nolli
CEO
www.aretaint.com/

Areta International was founded, with totally private financial support, by Dr. Maria Luisa Nolli in autumn 1999 as a spin-off of cell biology Laboratories of Lepetit Research Center, part of multinational companies, where she had matured a twenty-years experience as scientist and team leader on R&D projects for the development of first generation recombinant proteins as therapeutics. Nolli, now CEO of the company, explains the next steps in Areta's development ad how belonging to a cluster is helping the company.

Areta International is an innovative biotech company specialized in cell cultures, whose core business is the research, development and production of new generation biodrugs (cell for cell therapy, monoclonal antibodies and recombinant proteins) operating in an ISO 9001 certified and cGMP compliant environment. Located in the outskirts of Milan in the Insubrias Biopark, Areta was born to cover the gap existing between the excellent basic research and the poor development of discoveries, with a view to help customers to transform research projects in new potential biodrugs.

I think the sense and benefits of being in a cluster depend on the extent and depth of interactions between constituent members, as a fully functioning cluster requires the existence of effective networks allowing for a rapid flow of information and able to engage the participation of all those with a stake in biotechnology. Efficient networks are those in which firms can have access to a large number of different nodes and sources of knowledge, where the cluster is active in lobbying, creating relationships between public and private entities, in spotting potential funding, facilitating collaborative agreements and addressing education and training needs.

I think that a very interesting objective would be the development of a network of clusters. This is one of the reasons why we have decided to be present at Toscana Life Sciences to collaborate on new vaccines and rare diseases with them. Areta took advantage also from BioIniziativa, one of the practices of the MI-TO cluster fostering technology transfer and entrepreneurial coaching, to create H.o.p.e., a spin-off of the University of Milan, developing a diagnostic kit for detection of human growth hormone and related molecules in biological fluids of athletes; the new kit will be used in the biomedical field mainly in antidoping tests. BioIniziativa has proved very useful to closely get to know and enhance the potential of research results like those deriving from the group of Professor Müller, an expert in the control of the hypophysis hormone secretion with particular attention to the HGH (human growth hormone). We decided to pay attention to its evident scientific value and application given the contiguity with the core business of Areta International: namely the study of immuno-diagnostic systems.

BioIniziativa helped us in evaluating the potentials of the "Müller proposal" and then assisting us throughout the drafting phase of the project, identification of needs and evaluation of investment and search for financing sources. In less than a year it was possible to prepare the project, present it to the Italian Ministry of University and Research and obtain their financing for the establishment of the academic spin off and give start to a research project.

Finally, participating in NetBioCluE brought the company visibility as well as an opportunity for a comparison with other European countries. I also believe the project offered several companies the chance to help cluster managers develop and identify good practices to be implemented at both local and European level to the benefit of biotech companies.

GenOptics Bio Interactions, Paris, France
Philippe Kerouredan
MSc, CEO
www.genoptics-spr.com

A biochemist graduated from the University of Paris VI Jussieu, Philippe Kerouredan has a thorough knowledge of the Life Sciences field and a broad international experience in management. He has held key positions in renowned companies such as Pharmacia, Gilson and Tecan. He led the development and commercialization of innovative products for academic, biotechnology, and pharmaceutical laboratories. Prior to joining GenOptics in 2004, he co-founded, in 1999, a biotech company to exploit innovative separation technology.

GenOptics is a French biotechnology company set up in 2001. The company designs, develops, and commercializes instruments and disposable based on an optical technology called Surface Plasmon Resonance imaging. The company addresses biosecurity and Life Sciences research market segments in developing bioarrays leading to subsequent applications in upstream diagnostic and drug discovery process. The company is composed of eight employees including four PhDs, two Engineers and one technician. A substantial part of the company's activity and resources is devoted to R&D activities directed towards improvements aimed at better to doo responding our customers' needs for complete solutions.

GenOptics is a member of the Paris area MEDICEN biocluster active in health and drug discovery R&D. Being a partner in MEDICEN is a good way for the company to get higher visibility and develop its network via cooperation with other local actors. Creating awareness of the existing network of key players in different disciplines opens also new opportunities for the future: common projects can then be more easily and efficiently set up gathering academic and private bodies. Our company is regularly participating to events organized by the cluster on different topics of interest such as for example new developments regarding cancer detection. Recently MEDICEN labelled one of our projects allowing the company to benefit from additional funding. In addition higher visibility is essential when it comes to develop partnerships or collaborations with the outside world. Being recognized as a world class cluster partner helps the company get a higher status in term of confidence level, which is essential when collaborating with companies or academia from abroad.

Usually, at the European level, larger companies are more active and better organized in pushing their views at their own benefit. On the contrary, smaller enterprises such as GenOptics do not often have the same opportunity to present their views. It was therefore an excellent opportunity to be able to do it as a partner of the NetBioCluE project. In addition, it is highly rewarding to talk to partners from different disciplines with the objective to create a base for common understanding. In the course of NetBioCluE, GenOptics had also the opportunity to participate to European events such as BioDundee in Scotland and BioExpo and generate direct contact for future R&D and business partnerships.

NetBioCluE was aimed at recommending policies to the European authorities. From our point of view, it was interesting to see all the experiences carried out in other countries as for cluster organisation. Those experiences are diverse and greatly dependent on the country size, business culture, and countries' grant policies, but it is likely that we will see some of them be shared by all clusters at the European level. We are eager to see the positive economic fall-out of this "cross-fertilization" experience.

6.4 S&T Parks as drivers of R&D in China and Europe

Frédérique Bariguian
PhD, biologist at Paris VI University permanent consultant for Shanghai Juke Biotech Park

Dr. Jiong Zhang
MD, PhD, director of Shanghai Juke Biotech Park, China

China is a rising power not only in manufacturing, but also in science and technology and is keenly investing in biotech, taking advantage of its excellent scientific base and low labour costs. As seen for the pharmaceutical industry in India, this is a phenomenon to be closely observed for European biotech cluster operators as it introduces new models and new competitors in a highly dynamic market. NetBioCluE asked two external experts, Frédérique Bariguian and Jiong Zhang to illustrate the evolution of Chinese biotech and comment on the lessons to be learned.

6.4.1 China, the rising of Eastern biotech

Today China health biotech development is slowed down by major obstacles, including poor IP rights protection for drug innovation, a lack of clarity concerning the business environment, a scarcity of cGMP-certified manufacturing plants and the paucity of investment exit mechanisms. This situation makes the international venture capital investors sceptical about China's health biotech industry and explains why health biotech mainly relies on government support and funds (National Natural Science funds, the Torch program, the "863" High Tech Program and the Five Year Plans). Despites the millions of renminbi (RMB) invested by the central power, the majority of Chinese biopharmaceutical companies are still selling biogeneric drugs and do not invest in innovative R&D. Looking at the data, however, a real breakthrough is coming out from China. The industry grew 30% annually to $3 billion and currently 15 health biotech products are approved for sale in China, and another 60 products (including 19 antibodies and 11 vaccines) are in the country's pipeline. In term of industry, about 500-1,000 SMEs active in the biotech sector are concentrated in more than 20 biotech parks throughout the country. The Shanghai Juke Biotech Park has completed nearly 40,000 sq. meters professional biotech R&D space and facilities and provides services, management training, technology training and funding application to 44 biotech start-ups.

Because of the relevant low cost in R&D, especially in the animal testing and clinical trials in China, and the significant size of the Chinese market many Western companies would like to move their R&D into China. However, Chinese biotech SMEs have to highly improve their standards in management and technology operation to meet the requests for international collaboration, which might be the only way to expand their capabilities in some modern technologies.

The key learning points for European clusters to compete with the Chinese are:

1. to take advantage of the huge Chinese market by setting up Joint Ventures with Chinese laboratory while managing the IP issue
2. secure the collaboration by going through trustable Chinese partners or intermediates
3. take advantage of the cost-efficiencies offered by the emerging biotech industries through out-sourcing of repetitive R&D
4. increase investment in automating labour-intensive biotech procedures in order to obtain cost and time-saving benefits
5. increase the attention given to effective collaboration between research institutions, biotech companies, pharmaceutical companies and the health-care systems of the home country in order to improve drug development efficiency.

Sonia Martínez Arca
www.pcb.ub.es

The Parc Científic de Barcelona (PCB) is a pioneering innovation system created 10 years ago by the University of Barcelona. Its mission is to boost quality research, to foster knowledge and technology transfer and to facilitate the creation of new, technology-based companies. Sonia Martínez Arca, head of PCB's Scientific Department explains the Parc's mission and advantages of clustering.

6.4.2 The Parc Cientific de Barcelona, Spain

The Parc Científic de Barcelona (PCB, Barcelona Science Park) is a cornerstone of the innovation system developed by the Universitat de Barcelona (UB, University of Barcelona), with the support of the Fundació Bosch i Gimpera (FBG, Bosch and Gimpera Foundation) and the Caixa Catalunya. The Park hosts research groups from both the public and private sectors and offers a wide range of technological facilities. The main focus of the PCB is biomedicine with a special interest in biotechnology: it houses over 46 companies, three large research centers and a Bioincubator, hosting at present 12 newly-created companies. These activities are located in a 24,000 sq. meters laboratory building which includes, in addition to core services, scientific and technical platforms such as fine and combinatorial chemistry, transcriptomics, proteomics, high through-put crystallography, biocomputing, NMR and nanotechnology.

PCB is therefore one of the main actors in the biotech field in Catalonia (Spain), hosting several of the success stories that emerged in the last years, as well as consolidated pharma and chemical companies, which, together with the excellent research centres, create an ideal environment for the development of this sector at an European level.

One of the strategic lines of the PCB, reflected in our Strategic Plan 2008-2012-, is our positioning as a reference instrument in knowledge transfer and promotion of entrepreneurship. For developing this strategic line, we've undertaken three main lines of activities. First consolidating an environment supporting new collaboration formulae, especially public-private partnerships. Secondly, supporting the creation of new technology-base companies, in collaboration with other instruments of the University. Third, strengthening the PCB, as a Bioincubation environment in our region, compatible with the different incubation steps, from identification of the business idea to the post-incubation phase. Due to the special environment of the PCB we work complementarily with other instruments of the University devoted to technology transfer. So we can make available to companies, institutions and society as a whole the R&D outcomes produced by the PCB and the university. We can also promote patent protection of the research carried out in this institution and its transfer to the productive sector and foster the creation of technology-based academic spin-off enterprises. Indeed, one third of the companies located in the PCB are spin-offs hosted by the park.

NetBioCluE, which aims at supporting networking, collaboration and knowledge transfer among the distinct European biotech actors, is a remarkable initiative for all stakeholders in this sector. Indeed, if we want to position biotechnology in Europe at comparable levels to biotechnology in the USA, we have to take advantage of those areas of activity in which we have already succeeded, analysing them and, when possible, promoting its transfer to other regions. In this sense, the NetBioCluE work plan focuses specifically in identifying good practices critical for correct cluster development, therefore with a very practical view which undoubtedly will improve its "on site" applicability.

Conclusions

The above contributions show the importance of transnational networks like NetBioCluE and others as AFIBIO and ABCnet in sharing resources of many different stakeholders in the European biotech sector. They prove helpful in attaining critical mass for funds and investment attraction, but also in exchanging practices and increasing the clusters' commitment as well as enhancing internationalisation with access to European events offering the chance to explore future R&D and business partnerships. The conclusion and recommendation that seems to emerge at the end of this chapter is therefore that these networking programmes could be strengthened across Europe and also across hi-tech sectors looking at existing synergies between Life Sciences and other sectors (like IT or nanotechnology). ■

A new set of policies for European biotechnology

Multi-level recommendations arising from NetBioCluE

Summary

The aim of this last chapter is to consolidate all NetBioCluE's findings illustrated in the publication, in a concise set of recommendations to be integrated in policies fostering the development of Europe's biotech clusters and industry. The added value of the recommendations is to be more than a headline. This should allow all policy makers at all levels to build them into their long-term strategies for the Life Sciences industry. Moreover, they are multi-level and look at integration among clusters and are complementary to other existing European projects for biotech like AFIBIO and ABCnet aimed at biotech, as well as other hi-tech sectors.

NetBioCluE's strength in tackling the task of formulating this new set of policy recommendations has been the Europe-wide dimension of the work providing the "big picture" of the biotech sector and allowing to elaborate a common vision of European clusters and how to stimulate their development through policies. This has been done by adding to the already existing figures and economic indicators a new set of 13 "soft" parameters especially developed by NetBioCluE during local and international workshops, in order to provide a more complete analysis of clusters according to their size, stage of development, internal dynamics and general environment.

In this perspective, NetBioCluE participants have concluded that the relevant model cluster for conceiving policy application should not be Cambridge or Heidelberg, but the sum of European biotech clusters to be considered as one large meta-cluster sharing common problems like access to capital and markets and technology transfer.

The work above, leading to a common vision and to policy recommendations, has been based on a source of valuable lessons on practice transfer and implementation. The work also highlighted the difficulties of forecasting in the medium and long term in a rapidly changing market such as biotech and identified some prominent European criticalities for this sector. Some cannot be directly addressed by policies (e.g. availability of private investment and competition from emerging markets), while others clearly are, namely the creation of an open market in Europe for investment, company operation and regulatory issues such as the European patent and licensing coordination among member countries. Europe still remains very fragmented on this front and while regional policy can help companies' competitiveness, without higher level policies, they will be limited in their growth and impact on national economies by a European market much less attractive than the US.

7.1 The vision

Clusters are first of all social organizations and NetBioCluE's results clearly reflect this consideration. The ideal cluster described by NetBioCluE stands out on four main levels: **people; flexible boundaries, convergence ability** and **rapid response**.

In more detail, the perfect cluster is one with a considerable asset of human resources, be them scientists or business professionals and experts. Although well identifiable, it also has **flexible boundaries** allowing it to expand its activities beyond biotech, for instance in contiguous and emerging sectors as nanotech and bioinformatics and to a wide variety of financing sources. It is also strong in its ability to **converge**, fully integrating tech transfer with innovation and market launch of products. Last but not least, the ideal cluster identified by NetBioCluE's participants in a time frame extending to the next 15-20 years, is able to **respond rapidly** to changes in the global economy adapting its structures and competences. It should be reminded that policies will not be the only forces directing biocluster's growth, but play a very relevant role in creating a talented and responsive environment for innovation and for attracting investors.

The way in which NetBioCluE has defined this ideal cluster and then moved to the policy actions which would help biocluster development takes account of the lessons learned from the best practice collection and transfer, as explained in Chapter 5. For example, based on experience and in a bottom-up approach, some guidelines for policy recommendations development imply that, in developing policies, it may be wise to target the more specific recommendations to clusters by size or maturity. This would ensure that those policies would not target the wrong audience, as clusters at different stages of development have different needs and different local conditions. To this aim, in some cases framework recommendations or suggestions could help so that a cluster could pick up a validated mechanism for implementing a policy and fit the implementation of several differing policies into that mechanism (e.g. coaching, networking, training). At a more general level this would require general guidelines for the "translation" of the general scheme into a more cluster-specific application.

This fourfold vision of a cluster has also led NetBioCluE to outline actions summarised in *Table 1* with 21 actions to achieve the next step for cluster development so as to get closer to the elaborate vision of cluster development. As Europe aspires to become the world's first knowledge economy, these actions should be implemented across the board, far beyond the infrastructure of healthcare biotechnology and with significant emphasis on crossing all technology sectors, funding mechanisms, organisation types, ➤➤

Table 1 - Actions planned to achieve an integrated vision

People	Flexible boundaries	Convergence	Rapid response
1. Exchange of cluster actors (graduates, cluster managers, company founders) **2.** Immersion of new businesses in mature clusters **3.** Take experience to newer clusters	**4.** Making existing barriers more permeable e.g. flow of people between academia-industry-academia, not one way travel **5.** Enabling organisations of any type to apply for relevant funding **6.** Move technology transfer closer to the end market - more commercial pull, not only academic push **7.** Competitive tendering for solutions	**8.** Collaboration of cluster managers **9.** Collaboration across sectors **10.** Cross-sector collaboration through embedding labs in different sectors **11.** Create infrastructures shared by different sectors **12.** Rotate tenancy of multi-sector infrastructure with global teams **13.** Joint technology Chairs **14.** Expand ambassador programmes **15.** Smooth the way for international business development	**16.** Accelerating speed of funding **17.** Maximise understanding of the market **18.** Faster policy changes to enable different company behaviour **19.** Reading early signals **20.** Rapid response across Europe to create solutions **21.** Radar/observatory in Europe for early detection of new directions and stimuli.

Source: NetBioCluE

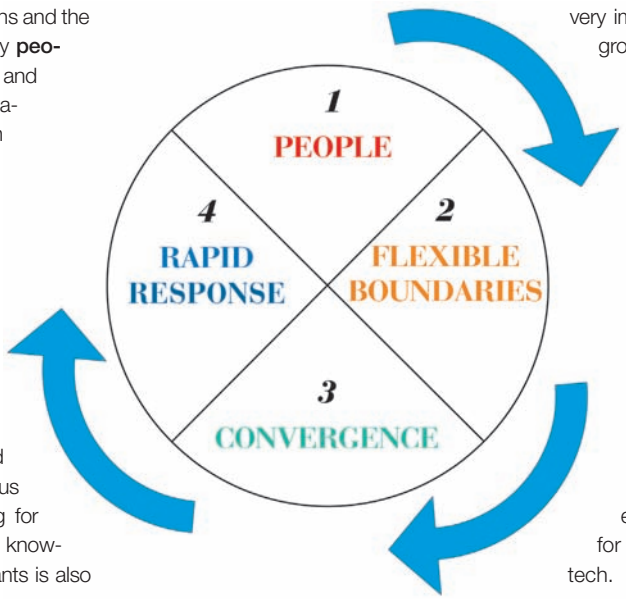
geographical boundaries or political understandings. How these actions should be undertaken to obtain the maximum benefit from policies will be illustrated below.
Moreover, the process of good practices' collection and evaluation of actions leading to policy recommendations has also produced relevant advice for transferring practices and defining policies at the European and cluster level, summarised as lessons learned at the end of this chapter.

The 21 actions identified above had as starting point an elaboration of the analysis of the good practices presented in Chapter 5 and partially tested with a move towards the way in which cluster's vision may be better achieved. As an example, the first action (Exchange of cluster actors), clearly refers to existing practices as Genopole's researchers' exchange programmes but, at the same time, goes further and envisions the need for policy actions helping cluster managers and company managers to make a qualified experience outside the milieu they originally belong to.
The most suitable actions to get closer to the vision for each cluster may take place at either European or cluster level. As for the European level, the actions identified as most beneficial by NetBioCluE are those fostering trans-cluster collaboration and those aiming at the creation of a European database of biotech companies by leveraging existing region-driven efforts; other initiatives to be carried out at this level would include exchange programs for CEOs as well as improvement of the ones for researchers across Europe together with the support in the creation of "hot spots" within regions for different types of research/activities. Another action would include the potential for harmonization of IP and other legal and taxation issues. These last actions are far above the scope of NetBioCluE, even though the importance of such harmonization would greatly help the development of a truly European biotech industry.
At a cluster level, first of all, the translation of the above EU level actions into local measures could be foreseen, taking into account specific local conditions. The local level actions range from establishing governance systems able to speed up the decision making process to fostering technology transfer from universities; from greater fiscal incentives to establish new start-ups fostering collective action by companies in specific areas (e.g. special interest groups), just to name a few.

7.2 Integrating vision and policies

Once the actions to be undertaken are identified, deciding the right sequence of policy application is extremely important to maximise its benefits. NetBioCluE identified a precise and reasoned time sequence for applying cluster development policies, summarising them in the graphics of *Picture 1*.
The relative relevance of policies tends to decrease as a cluster progresses through different stages of development as most of the actions become self-sustaining together with an always growing mix of policies to be imple-

Picture 1 - Timing of policy application



1. Clusters are social organisations and the first step for intervention is clearly **people** because technical, scientific and business skills are at the foundation of any cluster, and even more important, new successful biotech ventures can only originate where there is a strong entrepreneurial spirit.

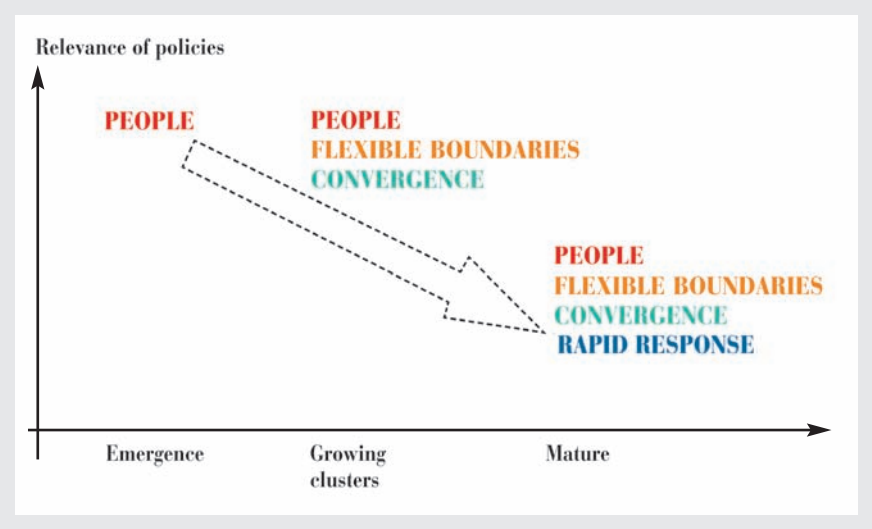
2. Companies can receive tremendous benefits from clusters if these are able to manage **flexible boundaries**, particularly in technology transfer between academia and companies. The result is a virtuous circle within the cluster allowing for the circulation of people and knowledge. Access to capital and grants is also very important here to ensure constant growth of companies.

3. Convergence is the third step, sustaining the creation of national and international cluster networks to exchange knowledge and establish collaborations.

4. Rapid response, while being the last stage, is probably also the most important one in the long term as it allows a cluster and its companies to quickly react to changes in the global economy. This is very important for such a globalised sector as biotech.

mented. This brings-on an important consideration on the timing and calibration of policy actions described graphically in *Picture 2*.
In the first stages of cluster development, policy actions are critical, but need to be very topic-specific. Once the cluster progresses in its lifecycle, interventions become more complex while their relative weight and influence on the cluster's development declines. In the more mature stages policies could be then progressively substituted by the actions of cluster managers. This is not to say that policies become irrelevant, but only that they diminish in relative weight as a consequence of cluster development and growth that make the system more receptive to different sets of actions as it ages. As it develops, rather than to finance support policies directly, for instance, the cluster will react more promptly to actions dealing with technology transfer, competence building and exchange of high-level professionals thus also defining a system in which a network of investors is more likely to intervene. Therefore it is the right mix of policies that becomes even more critical.

Picture 2 - Timing and relevance of policies



7.3 NetBioCluE's recommended policies

Actions need to translate into policies to be applied across Europe and benefit the entire European biotech sector which, as previously explained, can be considered as a large meta-cluster. The actions presented in the previous sections have been distilled into policy 'headlines' which can be seen as a sum of several policy activities. The timing and presentation of NetBioCluE's recommended policies follow the order already illustrated from actions aimed at people to those aimed at stimulating rapid reaction ability.

1. People

Aimed at enabling a cluster emerge and grow through skilled and experienced scientists, business developers, entrepreneurs and innovation facilitators

1a. Policy headline: Enabling international transfer of commercial biotechnology business experience

Appropriate actions:

1. *Exchange of business staff*
2. *Immersion in developed clusters*
3. *Taking experience to the regions*
4. *Short-term skills access combined with development of long-term skills development*

Increasing human resources mobility within the cluster and between different clusters, through social networks across key people from all actors (universities, research centres, companies) would suit this need. This critical aspect clearly goes back to the importance for actors to feel part of the cluster as illustrated in cluster consciousness practices in Chapter 4 and 5. The action suggested would foster a better organisation of social networks within the cluster itself, with positive effects on the "health" of the cluster which could become a more favourable environment to work in. The positive impact of that would be that companies in the cluster would have access to a large pool of individuals with both scientific and industry experience and that the existence of a dense social network could also persuade talented people coming from outside to establish in the cluster. Policy makers (at regional, national and European level) could then introduce a favourable environment for companies so as to increase the critical mass of companies and therefore the flexibility or at least the mobility of the system. A view to proximity in transcluster ➤➤

activities and cooperation could help in facilitating those mobility actions. With a specific reference to taking experience to the regions, a further recommendation based on experience and on the need for companies to be global since the day of their establishment, would be that of supporting the set up of International Partner Ports located in innovative clusters. They should provide companies with service platforms to get access to international innovation resources including capital, technology, information and talented people and to make full use of them.

1b. Policy headline: Support for researchers' retention

Appropriate actions:

1. *Retention of external early stage scientists within clusters*

The prerequisite for researchers' retention is a critical mass in research activities. The exchange of scientists is of great relevance, particularly allowing scientists from early stage clusters to improve their expertise by working for some time in research centres and universities in more mature clusters. This targeted action could be seen as reinforcing existing initiatives like the Marie Curie actions or practices undertaken in clusters such as the help for researchers' return from Genopole. As a side result, the international network of contacts of researchers from both sides (early stage and mature clusters) would benefit from this action.

2. Flexible boundaries

Aimed at allowing a cluster to expand its activities beyond biotech, for instance in contiguous and emerging sectors as nanotech and bioinformatics and to a wide variety of financing sources.

2a. Policy headline: Enabling access to funding for all organisation types throughout the value chain

Appropriate actions:

1. *Enabling organisations of any type to apply for relevant funding*
2. *Competitive tendering for solutions*

Managing innovation in the global value chain is the real challenge Europe is facing nowadays. In particular the issue for national/regional policy makers is how public support measures can facilitate innovation processes in clusters active at global level.
The experience shows that a relevant part of development and innovation takes place in clusters of companies based on the production value chains (i.e. supplier-customer relations).
When the value chain systems were national (i.e. they did not extend outside national borders), R&D financing and supporting initiatives could be set up on a national basis as well.
Nowadays, a joint cross-cluster fund could be set up: based on the experience of different clusters, like Genopole premier jour pre-seed fund, this would help to raise the total amount of resources available to be invested in biotech clusters, an important part of which could be clusters at their early stages of development.
It would also let the more mature clusters invest in areas with a great potential thus allocating resources in the best possible way. Furthermore, an approach through tenders could help in the effective use of public funds and could facilitate a further injection of private funds available thus increasing the business and commercial side of results.

2b. Policy headline: Enabling a "dual ladder" career path for academics

Appropriate actions:

1. *Making existing barriers more permeable to allow people to move back and forth from academia-industry-academia.*

In several countries, academic and industry careers are highly separated, while it would be of interest to have a real "dual ladder" system, allowing academics to leave their positions to start or join a business venture and eventually come back later on. The other path should also be possible, where industry researchers or managers are allowed to join academia for a certain period leveraging their academic experience later on when coming back to industry. The increased mobility of researchers and of managers represents a clear opportunity but also a challenge, mainly because of "logistics" issues. Some specific recommendations apply to supporting exchange of managers and scientists across clusters. Namely, to work on: avoiding excessive differences in salaries between clusters; supporting researchers transferring from one cluster to another; the overall attractiveness of a cluster also from social and way of living perspectives.

2c. Policy headline: support for closer commercial/closer to market involvement in technology transfer from research

Appropriate actions:

1. *Move technology transfer closer to the end market - commercial pull, not academic push*

The aim is to make technology transfer more effective. The message to policy makers would be that of designing a Technology Transfer twinning programme which could:

- Make a thoughtful effort to consider if the Technology Transfer twinning programme is feasible
- Make a list of Technology Transfer organizations which are considered to be the best in Europe
- Design financial programmes supporting long term (3-5 years) cooperation between two organizations (the suggestion would be: one from the list of experienced Technology Transfer professionals and one from the new member countries)

The reasoning behind this is to help the development of effective technology transfer, covering not only the scouting of research projects but also ensuring an actual potential for transferability of research results to the industry. Experiences in this are, for instance, the creation of a network of potential entrepreneurs in Cambridge as detailed in Chapter 4 and 5. Technology transfer mechanisms need to be related to a clearly identifiable organisation (a dedicated office within a university or, even better, an independent organisation focused on the task) to ensure the creation of a network of contacts and trust relationships with the technology transfer organisation. The mid-term result should be a virtuous circle of input improvement - new ideas from universities and research centres - and output - new nodes of the network.

3. Convergence

Aiming at fully integrating tech transfer with innovation and market launch of products and commercial development.

3a. Policy headline: support for communication without barriers between all organisations linked to biotechnology

Appropriate actions:

1. *Cluster managers collaborate*
2. *Collaboration across sectors*

The main message NetBioCluE aims to bring to the attention of policy makers is transclustering collaboration as a step to develop open innovation in Europe. Open Innovation, involving world-wide relationships, will increasingly be also the driving force for biotech development. Trans-clustering collaboration should then be structured in a way that better connects emerging and growing clusters in more complex support systems. The move to make should be from inside the bioclusters to a more structured Europe-wide network of partners, working together in open systems to share knowledge, experiences and ideas. In this way, leading clusters would be joined with partnering regions in a satellite system. New centres of excellence would then be created: the driving clusters would collaborate with other places of excellence, without leaving their partner behind. The implementation of this satellite structure of collaboration could be promoted by benefits, offered by funding schemes on regional or national level and co-funding programmes of the Commission on a long-term base, thus helping the achievement of the needed critical mass for European biotechnology.

3b. Policy headline: support for cross- sector research infrastructures integrating research to research and research to application

Appropriate actions:

1. *Create environment for cross sector collaboration by embedding labs in different sectors*
2. *Create infrastructure shared by different sectors*
3. *Rotate tenancy of multi-sector infrastructures with global teams*
4. *Joint technology Chairs*

Biotech and Life Sciences represent strongly internationalised sectors that need to benefit from multi-regional and multi-national cooperation activities. European regional policies do contribute to the development of innovative and often specialised Life Sciences "hubs" but these systems should be open to innovation and ideas coming from outside. The proposed actions are aimed at the creation of synergies, at the exchange of good practices and at facilitating access to resources, scientific expertise and high-tech equipment, bringing together different actors, both from science and business. The combination of knowledge coming from different fields has demonstrated to ➤➤

be very fruitful in terms of generation of new breakthrough innovations. In this sense cooperation between centres of excellence and areas of excellence in specific fields should be encouraged through "converging technologies" research projects.
In order to allow for the completion of the path from research to application, support infrastructures should also provide hosted companies with technological and business services. Moreover, support infrastructures should focus on those disciplines where there is a great potential for a joint use by companies belonging to related industries and sectors. Particularly in emerging clusters, this solution should be encouraged by public funding as it ensures a quicker and easier reach of the critical mass needed to efficiently use the premises of the incubator or science park. The possibility of cross-fertilisation and networking of people working in different industries would be a plus.

4. Rapid response

Aiming at enabling all stages and actors in biotechnology to respond quickly to global market changes

4a. Policy headline: support for rapid assessment and award of funding

Appropriate actions:
1. *Accelerating speed of funding*

This action is related to the one above on "Enabling access to funding for all organisation types" but with a closer attention to timing. More flexible procedures for submission and the option to require advance payment (even under a strict control) could represent a key pre-requisite for SMEs participating in research and/or development projects funded in particular by the European Commission. To help in that, for example, Genopole has recently developed a dedicated office for small companies willing to participate in FP7 European programmes. The same support is provided also in other clusters like Milan. The aim of the office is to make the process of writing a proposal and submitting it to the Commission both easier and faster. Similar services, even if on a private-private basis, are quite developed in Cambridge, where a number of dedicated professionals offer their services to companies willing to apply for funds at national and European level.

4b. Policy headline: support for Europe-wide access to market dynamic information

Appropriate actions:
1. *Maximise understanding of the market*
2. *Radar/observatory in Europe for early detection of new directions and stimuli*
3. *Reading early signals*

A way in which this issue could be addressed is the creation of a "European biotechnology directory", set up by people with the required expertise to manage and create such a web based system. This tool is already existing at cluster level and at national level (see in particular the Italian Biotechnology directory) and it could be set at European level, so as to integrate the benefits existing at the other levels and related to reaching a critical mass and fostering the promotion of the European biotechnology sector as a whole through a single platform but allowing for the stressing of specificities and excellence areas of the different clusters.
A competition could be set based on expertise and results achieved for the realisation of the system. The competition could identify, on the basis of CVs and previous experience, the actors to realise and manage the IT system and define funds for a period of at least five years to support the establishment and the activities of the tool.

4c. Policy headline: support for faster policy and regulation response to market changes

Appropriate actions:
1. *Faster policy changes to enable different company behaviours*

In each cluster there is a need for a "system integrator", i.e. an actor (either an organisation or even a single person) that is recognised by the members of the cluster as being in charge for managing, or at least coordinating, the efforts of cluster management. A competition could be set for the creation of a networking hub established in regions with relevant institutional and commercial capabilities in the biotechnology sector. It could also define funds for a period of at least five years to support the establishment and the activities of the selected hub.

7.4 Challenges in elaborating multi-level policy recommendations

The policy headlines detailed in the previous section should not be considered as recipes to apply individually, but rather as a set of tools targeting different levels of the biotech sector and for this reason to be implemented jointly in order to ensure that each of them brings the maximum support to all clusters. Examples of differing levels having arisen during NetBioCluE's observations are illustrated below.

Cross-cluster collaboration

Collaboration and networking are the life-blood of bioclusters and Europe must move from being a collection of individual clusters to being a fluid community of researchers, companies and talents extending to relationships outside Europe as well. Policy in this field should be implemented at the European level and enforced through international and national levels primarily. Examples of successful practices in this area are those referring to networking described in Section 4.6, like BioDundee, Gate2Biotech or the Transalpine Biocluster, and looking at the biocluster in a systemic approach: first the clusters' actors feel part of the system; then the cluster is made visible at international level and afterwards clusters start cooperating with each other to improve their potential and work on complementarities. A further step would be that of feeling as part of one single cluster.

Building cluster skills

Cluster skills vary significantly throughout Europe, with some clusters such as Cambridge holding an almost complete portfolio of companies and research skills while many of the newer clusters have limited access to commercial or investment experience. Policy in this area should be linked to cluster size/maturity and implemented on a cluster level. There will be a significant element of this that requires international collaboration to build cluster skills and this should be built into both regional policy and the European policy level mentioned above. Another significant aspect for policy recommendations is the local environment: many of the good practices identified and analysed in Chapters 4 and 5, for instance seed and public VC funds, required significant investment over the long term, making them unsustainable for many regions. Where implementation of costly key actions is decided, it should be funded at the European level to enable every region to participate. Genopole 1er jour (G1J), for instance, is a regional seed fund that requires € 1.3 million per year for investment and is showing effective results as illustrated in Chapter 4. It is a useful tool in assisting regional companies but could not be a policy to be implemented at regional level across Europe as the budget of many development agencies cannot sustain such an expenditure. The region should have the skills to implement such a policy effectively: a seed fund applied without a significant commercial or investment experience would be unlikely to bring any benefit. The existing practices collected throughout Europe provide valuable experience of what is needed and what could be improved.

7.5 The 13 parameters behind NetBioCluE's policy recommendations

To frame a more accurate picture of the bioclusters observed, NetBioCluE developed a set of 13 "soft" parameters based on the study of all clusters and on the evaluation of good practices, but taking Cambridge as a model. The Cambridge case is widely acknowledged in the literature (e.g. Ernst&Young and Burrill reports on world biotech) as the most mature biocluster in Europe and with possibly the most comprehensive biotechnology environment, with the exception of high levels of public spending in cluster support or development. Parameters reflected all activities that are viewed as beneficial to cluster growth and function and a measure of how 'complete' a cluster is. The issue for each cluster is to define whether the parameters placed each cluster as a small, medium or large (i.e. emerging, growing or mature), based on its characteristics and number of companies. The motivation for this is that biotechnology companies can often be hard to define in their discovery or service profile. Moreover, a region could also tend to overstate the number of its biocompanies including not services and connected businesses. Therefore, the parameters selected below should convey a more accurate measure of a cluster beyond the recognised number of biotech companies. Policy makers and cluster managers

Table 2 - Parameters to define clusters

N°	Parameter	Cluster definition
1	Number of dedicated biocompanies	A dedicated biotech is one that either operates a platform technology or therapeutic pipeline or offers highly specialised technical services to drug discovery or development Small: less than 25 companies - Medium: 25-75 companies - Large: More than 75 companies
2	Sites hosting biocompanies inside cluster	This helps understand how a cluster is structured. Small clusters tend to be sited within one or two designated areas, while larger clusters, pushed for space, will expand to fill all available space. Larger clusters also attract commercial developers and out of town sites will start to emerge. The dynamics of a cluster start to change once it expands from its original or founding site and the services that it requires change alongside this as people become more widely distributed. Small: 1 site - Medium: 1-3 sites - Large: More than 3 sites
3	Biocompanies from inside the cluster with sites outside the cluster	This parameter tends to reflect the maturity of companies within a cluster. For example, an SME that has expanded through merger or acquisition as this is so often the case rather than an organic growth, will tend to have multiple sites and it is an indication of the nature of the cluster and the longevity of the companies within it. Small: less than 2 - Medium: 2-10 - Large: more than 10
4	Listed companies within cluster	This is often a measure to evaluate when the cluster developed: in the initial funding boom for biotech in the late 1990s, many biotechs became publicly quoted as their primary exit strategy; growing clusters cannot say the same as few companies can use IPO as their investment exit. Small: Less than 5 - Medium: 5-15 - Large: More than 15
5	Biotechnology companies attracted to cluster from outside the cluster	This is a measure of the critical mass of a cluster as once it reaches a certain number of biotechs and their associated support services, it becomes an active consideration point for companies seeking to relocate or expand. This is due to the perceived stability of the local environment and easier access to many of the essential ingredients such as skilled staff, services and finance.
6	Pharmaceutical company presence within or near cluster geography	Pharmaceutical presence has played a role in the development of many clusters across Europe for a wide variety of reasons, whether the pharma stays within the region or indeed closes. These include: • Release of skilled scientists and managers • Release of technologies and new start ups • Use of regional biotech services • Attraction of service providers to the region • Large scale facilities available when pharma companies's sites closed • Pharma research centres embedded within the cluster • Access to finance through partneships The presence of pharma near a cluster can be an indication that the cluster has some of the tools and resources potentially at hand to help grow. Pharma presence can be measured as a research centre to a full scale site. Small cluster: 0-2 - Medium: 2-4 - Large: more than 4
7	Big biotech/pharma locating research units within cluster (either by acquisition or new site)	This parameter can be used as a measure of research and commercial critical mass and significance of a region or cluster and has essentially replaced the model of attracting an entire pharma site to a region. Small: less than 2 - Medium: 2-5 - Large: more than 5
8	Number of commercial biotechnology dedicated service providers, professional and technical	This parameter reflects the critical mass of a cluster. As biotechnology plays an increasing role in a region, specialist service providers, whether business or technical, will invest in dedicated teams to serve the area. Small: less than 25 - Medium: 25-75 - Large: more than 75
9	Presence of experienced non-executive directors within cluster	This is defined as a person having directorships in more than one company in cluster or beyond. It is a simple measure of the management skills present within a cluster and an absolutely critical parameter to focus on as companies most likely to start up and survive will be those with significant international business experience involved in management. It reflects the sustainability of a cluster. Small: 0-2 - Medium: few - Large: many
10	Venture capital presence[1]	Understanding the nature of VC within a cluster tells many things about the maturity of such a cluster. The more mature clusters tend to attract private investors to create a base within the cluster, while younger clusters of those with critical mass tend to have smaller publicly funded seed funds. • No VC presence • VC presence of public money • VC presence including private money
11	Level of public investment in cluster	The amount of public regional or national support for biotechnology clusters varies significantly across Europe and is central to the implementation of policy, particularly large scale intervention. This factor is important to understand as funding is linked to a number of factors including status of the region for European Development and Social funds and National priority - the amount of money dedicated to biotechnology does not tend to reflect the size or maturity or otherwise of a cluster. Need is to look at the general level of public investment for their cluster, not quantified but indicated by the scale of support projects undertaken.
12	Technical skills base in cluster	This is a prerequisite for a successful cluster
13	Research institute or university embedded within cluster geography with research directly relevant to the cluster	This parameter again is critical to the success of any cluster and it is important to look at how many research centres were linked to the commercial side of their cluster.

[1] No specific number has been placed on this parameter as it is difficult to measure but cluster drivers will have a good understanding of the level of experienced directors within clusters

Source: NetBioCluE

should find the 13 parameters listed in *Table 2* a useful tool for calibrating the implementation of NetBioCluE's recommended actions defined in Section 7.4.

The data gathered from each cluster allow to see where the weak or under developed areas are in cluster foundations and how the strengths of other clusters can help policy makers and regional cluster drivers to foster European clusters' development. Looking at the parameters, it is possible to see whether a cluster tended to have characteristics of the size that it is perceived to be or whether it had clear deviations. The same analysis was performed for NetBioCluE's clusters: many of the expected characteristics from each cluster were found as predicted. However there were surprisingly few major deviations from characteristics typical from the cluster's perceived size: Dundee cluster understands that it is small but it has a strategy of acting above its size by pulling in resources from the wider Scottish biotechnology community such as business support services that are present in Edinburgh and Glasgow. The South- Plain Neurobiological Knowledge Center is a small emerging cluster as expected, but it had some interesting non-small cluster characteristics, particularly its ability to attract companies from outside the region which may be due to little biotech infrastructure elsewhere but is certainly a strength. The Paris cluster is large and near to its maturity by most parameter measurements, with particularly high pharma presence; however it has the profile of a small cluster with regard to biotech companies publicly quoted thus showing that the cluster achieved its size relatively recently with respect to other older clusters.
The conclusions of the parameter analysis may be summarised in **three key findings** which could be helpful when looking at specific policy recommendations:

Strong science base. All clusters have the foundations of good research and technical skills upon which to build and help feed a commercial biotechnology cluster. This means that there is no chance to create a biotech cluster if there is a lack of such research and technical skills in the field, i.e. biotech clusters can not be created "from scratch".

Lack of enterpreneurship. Small clusters uniformly lack the business experience to help found a cluster and make it viable – something that is a critical differentiation between them and the larger clusters. Larger clusters developed within a significant existing commercial and entrepreneurial environment and further skilled managers were released into the cluster through pharma consolidation. This means that, besides research and technical skills, there is no clusters without a proper managerial and business expertise.

Evolution. Today the mix of assets available for building a cluster are very different from before: in particular substantial early stage funding and exit strategies such as IPO that allowed many of the larger clusters to reach critical mass cannot be applied today to young clusters. This means that there are no recipes that can be "copied" by the past, but there is a lot of good practices that have to be interpreted and adapted to current situation to sustain the growth of biotech clusters.

The good practices collected and organised within NetBioCluE revealed regions of different stages of maturity and size. When looking at policies recommendations, it is a great challenge to attempt policy 'clustering' according to either size or maturity: there are various sets of variables that dictate how the local environment will respond or be able to implement policy targeted at its perceived needs. The parameters identified above provide indicators to look at when a cluster manager or a policy maker is going to implement a specific policy and adapt it to the local conditions. Furthermore, the actions identified above distinguish between the European and the cluster level and this helps further in clarifying the way in which the policy message should be approached: for example technology transfer gets higher priority at policy level in the younger clusters, with the more mature clusters accepting that they have such a mechanism in place. However, it has long been recognised that technology transfer mechanisms are weak across Europe regardless of university of cluster maturity and it would be important to continuously improve technology transfer policy. This means that along the life cycle of cluster development (as well as in a living organism) the relative weight of policies targeted to different actors of the systems changes. Understanding this is crucial in designing a systemic approach for policies addressing the development of clusters.

7.6 Local workshops' results and outcomes

To help policy makers understand the depth and significance of the policy recommendation messages elaborated by NetBioCluE it is worth illustrating the process leading to this final result. NetBioCluE conducted extensive groundwork elaborating data gathered from a sample of sixteen clusters with 600 product-oriented biotech companies (mostly engaged in clinical or preclinical work) and 450 technology- oriented biotech companies. This study and the identification of critical business development areas was followed by the collection of good practices (Chapter 4) then tested and ranked by biotech operators in all clusters (Chapter 5). This allowed for the development of local cluster workshops for the specific evaluation of implementation of practices and development of policy recommendation messages related to support mechanisms. It is worth looking at the characteristics and the vision of each clusters, which both were tools used for the identification of policy actions mentioned above as core result of the overall activity.

Defining characteristics

When cluster characteristics were studied (see the paragraph about cluster parameters), very few differences were determined. Just to name a few of the identified differences: *Cambridge* defines itself as a centre for young companies with high level of innovation. This might be said of almost any cluster but Cambridge has not followed the expected line of companies maturing and growing and reaching later stages with their technologies. Despite being the largest cluster in Europe, it has few late stage companies and those it does have, have been acquired by large pharma companies. The cluster profile, therefore, stays young and early stage. *Hungary, Paris and Heidelberg* clusters have a defined technology focus, decided partly on a political level and based on research strengths in the region. *Milan-Turin*, due to the geographical proximity, works as an interregional cluster network, building on traditional commercial links between the regions. NetBioCluE's analysis showed the differences among clusters characters are quite subtle. This was confirmed through comparing Europe with the US. The key clusters in the US (Cambridge- Massachusetts and San Diego) have developed very distinct characteristics and the conclusion was drawn that clusters in Europe are too young to have developed specific characters. These clusters are like organisms: they are focusing on the vital organs at this stage to stay alive. This claims for two remarks: the first one is that it is important to assign a "label" to the cluster in terms of stage of development, the second concerns the fact that to assign this label requires a careful investigation and it cannot be based only on the "age" of the cluster (but it is important to look, e.g at the list of parameters above).

Defining visions

In analysing the visions that each cluster has for its development, no major differences emerged: all clusters have similar visions aiming at surviving and growing in the medium-long term.
No cluster has identified or put forward a specific strategy for developing key cluster characteristics or focused on one technology over another.
Therefore what NetBioCluE has implied is that the concept of a successful cluster on a local level is not sustainable - none of the clusters in Europe are large or mature enough to be considered a cluster on a global level (with perhaps the exception of Cambridge but even this lags far behind the US in terms of size sustainability and revenue generation). It is therefore due to this implication that it might be better if we talked about Europe as a single biotech cluster to be improved, by means of activities both at European and at local level as mentioned above where the policy actions have been identified.

Conclusions

Good policies by themselves cannot ensure market success for European biotechnology, but are essential not only in creating a favourable environment where companies can succeed but also in stimulating entrepreneurship, original research and ensuring IP protection in an extremely globalized and highly competitive sector such as the Life Sciences industry.
Clusters cannot be created from scratch and parachuted into local economies but need a strong local base both on the scientific and business level. Regional development agencies and policy makers have a pivotal role in identifying regional strengths, the needs of a cluster and making sure that the cluster stakeholders are fully engaged with and supportive of its initiatives. By the same token, the European Commission can help by bringing cluster organisations

and cluster managers closer together as well as innovation and regional agencies that manage cluster programmes.
NetBioCluE's key strength in the generation of policy recommendations has been the accumulation of knowledge about all aspects of cluster origination, local environment, current support and future potential. The analysis carried out provided the 'big picture' of how Europe's biotechnology sector is constructed so as to facilitate its understanding, as it cannot be compared against any other, with factors such as high risk products, long exit times making it unique in the business world. The identification of critical aspects for companies and clusters development in the field also helped in framing the picture. The foundation of policy recommendations was helped by collecting examples of practices that work at the local level in clusters across Europe and how transferable they are. Looking at good practice transfer, by a comprehensive survey of partner regions to understand how good practices developed elsewhere might meet the needs of clusters across Europe, allowed to identify the issues that surround the introduction of an activity developed outside the region. Various lessons have been learned for the development of policy recommendations, from identification of the right target, to implementation of general frameworks then detailed through more specific measures.
On the basis of this all, the present chapter has presented the main policy messages that NetBioCluE intends to provide to policy makers and cluster managers. The ideal cluster needs to look at four main levels of action dealing with people; flexible boundaries, convergence ability and rapid response. Among the messages emerged, key issues include the internationalisation of clusters to be fostered through a satellite system of bioclusters funded by European schemes, support of "closer - to - market" technology transfer mechanisms, actions enabling transfer of business experience in different forms, from exchange of staff or immersion in clusters and cross sectorial integration of research activities, just to name a few. With a view to cluster maturity and intervention, the first step to make clear refers to people, who, as human resources, are the asset of any biocluster at European or international level.

NetBioCluE's results should not be viewed independently as they are closely linked with a wide number of policy-development initiatives and should be considered alongside all of these to build coherent policy that supports all elements affecting biotechnology cluster development. In particular it is linked to its fellow project also funded by the Europe INNOVA scheme, AFIBIO, aiming to improve financing of biotechnology in Europe. This linkage is critical: NetBioCluE can help in defining the context and the framework in which funding should be undertaken to help biotech cluster development, while AFIBIO has been looking at the specific tools in there. For example, NetBioCluE looked at transclustering collaboration through initial funding offered to pioneers and to European cooperation networks that stimulate, initiate and moderate the process of trans-cluster collaboration in biotechnology. The technicalities of the funding as well as possible new tools for access to finance for biotechnology companies at their earlier and later stages have been looked at by AFIBIO in a complementary and cooperative way.
As pointed out at the beginning of this publication by Reinhard Büscher, Head of Unit for Support for Innovation at DG Enterprise and Industry, Europe's cluster policies appear to be at a historical turning point. Action and attention should not focus anymore on exchange of good practices and on networking, but more on development of common actions and joint action plans. NetBioCluE seems to have already moved into this direction by providing tools to look at bioclusters' development with a European scope. ■

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For more information about NetBioCluE or this publication, please contact any of the above contributors (contact details in the appendix), who can also make available additional copies of the publication.

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Summarising profiles have been assembled for each cluster from the data and information gathered by way of the interviews and use of secondary sources.

Table 1: Analysis of clusters - localities and host country

Cluster	Country
Cambridge	UK
Dundee	UK
Essonne/Evry/Paris	FR
Grenoble	FR
Heidelberg	DE
Munich	DE
Milan-Turin	IT
Strangnas (greater Stockholm region)	SE
Uppsala	SE
Aarhus	DK
South Moravia	CZ
Szeged	HU

Source: NetBioCluE

COUNTRY: ENGLAND, UK CLUSTER: CAMBRIDGE

CONTEXT:	
International	Life sciences research and biotech industry grows strongly in USA from 1980's. Large pharma companies merging and becoming global. Increasing out-sourcing of early stage discovery biotech R&D. Venture capital industry expands rapidly, until collapse of boom in 2000.
Country	Pharmaceutical industry of key importance as export industry to UK economy. UK Pharma R&D is largely located in SE England. Key regulating bodies are located in SE England. London is major financial centre and is encouraged to be entrepreneurial. Govt. industry stance from 1980s is "hands off". Pharmaceutical industry in UK follows the US model. US style pharma-mergers throughout period. US VC financing innovation model emulated. Oxford and Cambridge Universities are established world-class centres of research excellence. Public funding of life sciences increases and favours research at 'world-class' research centres.
Region	Cambridge University is a premier multi-centre research institute. Good proximity to London for financial, legal services, access to central government. Pharma R&D units in region. Biocluster of companies is largest in Europe (160+) and was early emergent (from 1980s).
Sequence of evolution	1. Long-established large-scale knowledge infrastructure with leading research expertise, plus a well-established pharmaceutical R&D presence. 2. Cambridge Science Park established. 3. 1980's some start-ups, and in1995-99 rapid increase in start-up of product-based biotech enterprises. Both academic and industry spin-outs. Rich individuals investing in start-up, plus pioneering role of Barclay's as the biotechs' bank. Emergence of domestic and international VC investment in biotech enterprises. A biotech cluster emerges. 4. ERBI established to provide a networking and cluster promotion role. 5. Later 1990's, growth DBFs going through IPO, or being acquired by pharmas and larger biotech companies. Evidence of such exit routes encourages investment albeit this fluctuates as biotech industry is poorly understood by investor community. 6. Infrastructure development in new research parks fuelled by developer confidence in economic growth of Cambridge sub-region. 7. 2000, collapse of investor confidence in USA tech industries prompts withdrawal of VC interest in new biotech enterprises in UK. VCs opt for a survival strategy to bring already-invested biotech companies forward. 8. Post 2001, Cambridge matures as a strong and expanding biotech cluster. (160 + DBFs)
LEARNING POINTS:	
Observations	Cambridge is a main UK centre for bio-research and bio-innovation. Although Cambridge for business support purposes lies within a regional agency territory, Cambridge University may be better understood as being linked with the national innovation system mediated by Central UK Government. • The Cambridge cluster has a life sciences research cluster and a cluster of biotech enterprises. Both clusters have major scale. The research cluster is essentially public-funded and related to the demonstration of research excellence. Cambridge University has concentrated on the development of the research cluster. • The Cambridge bio-cluster was not the outcome of planned central or local public policy. Although the development of the research base was most certainly intentional, being the coincidence of the research-interest institutions of the University and the UK Government. • From a systemic perspective, it can be seen that Cambridge has had the geographic location and knowledge resource base that can support a biotech cluster. • The UK Government significantly changed its economic policy stance in the 1980's and continued an essentially ➤➤

market-led approach through the 1990's. "Support infrastructure" models from the US were tried out in many institutional sectors (venture finance, the creation of AIMS, technology park property development). Cambridge provided an attractive location for their application.)

- The biotech company cluster has successfully attracted private capital funding. The presence of commercialising industry (pharmas and large biotech companies) as both sources of new bio entrepreneurs and as buyers of the biotech product and often the biotech business has given private investment the confidence to invest.
- The relatively local scale of Cambridge allows operational networks (companies - VCs etc.) to form and operate within Cambridge. ERBI is a very useful networking node in this regard.
- Two interviewed companies are fairly representative of the Cambridge cluster; that is established R&D DBFs in 20+ staff range.

COUNTRY: SCOTLAND, UK CLUSTER: DUNDEE

CONTEXT:	
International	Medical biotech industry dependent on life sciences research. Rapid industry development in USA.
Country	Scotland, part of the UK, but with a range of powers devolved to Scottish level including regional economic development. A relatively compact 'national' region with four cities (Edinburgh, Glasgow, Dundee, Aberdeen) each housing medical research hospitals and life science research universities. Public research funding through UK research councils although funding health and universities are devolved to Scottish level. Scottish research-led universities have excellence in medical research, but there is no major pharmaceutical R&D presence in Scotland. Scotland evolves a regional VC community during 1990's.
Region	Dundee, a relatively small (150,000) post-industrial city on the East coast of Scotland has developed as a leading medical life science research centre and has created a small cluster of medical biotech companies, most of which are academic spin-offs.
Sequence of evolution	1. Expansion of medical life sciences prioritised as explicitly resourced strategy of University of Dundee in early 1980's. 2. Early success (1987), Axis-Shield, pioneers spin-out model. Diagnostics development and production. (The company now employs over 150 in Dundee.) 3. By early 1990's Dundee life scientists gain world reputation. The University commits to major development of life science research facilities and expands research numbers. 4. Dundee adopts logo of "City of Discovery" and sets about city industrial transformation. Major tech park investment committed. 5. 1997, BioDundee created to encourage local networking and give external visibility to Dundee's life sciences. 6. 1997, Cyclacel (drug discovery DBF) founded by leading Dundee scientists teamed with USA industry experienced MD. Receives major support from Scottish Enterprise (development agency), occupies entire accommodation of new bio-incubator, levers major private VC funding. Creates a network of R&D services sub-contractors. Essentially a flagship biotech R&D company is created by concerted public institutional initiative. 7. 1998, research collaboration with a consortium of global pharmas commences. Upstate, US inward investment locates in Dundee to exploit reagents developed at the University. Upstate builds up to 100+ employees. 8. 2001, CXR founded (using the now proven linkage of academic scientist, experienced CEO, and a package of public and private funding). 9. 2004, ITI Life Sciences (public-funded contractor of market-led LS R&D) located in Dundee. Strengthens the institutional base and focuses on market fore-sighting to direct funding of biotech company R&D (addressing the 'funding gap' and limitations of "technology push"). 10. 2005, Cyclacel acquires US company to gain NASDAQ entry. 11. Increasing attention paid post 2000 to linking local cluster development with the development of the Scottish (regional level) Bio-Cluster. 12. 2006, Wyeth (global USA Pharma) partners with four Scottish life science University and Scottish National Health Service as translational research consortium. Lead office and labs are located in Dundee.
LEARNING POINTS:	
Context	Prioritisation of University resources for medical life sciences research as a deliberate institutional policy coincided with requirement to pursue a new technology economic development strategy for the city's regeneration. Public funding for the "support infrastructure" has been able to match public funding for the research centres. A "Triple Helix" approach was led locally throughout the 1990's. Post 2000, Scottish Enterprise has aimed at supporting policy initiatives applying at Scottish-level.
Observations	1. Development of the "knowledge infrastructure" base in Dundee has been a vital pre-requisite. 2. Economic crisis in late 1980's in Dundee resulting from closure of manufacturing plants necessitated direction of regional economic policy towards creating regeneration. Multi-strand strategy adopted backed by public funds. 3. Recognition of the critical importance of re-positioning a Dundee as "City of Discovery" served both University and city interests. Economic development support of academic scientists' aspirations to see their research applied stimulated a series of spin-outs. Start-up process was 'fast-tracked', with close support by way of public-funding of business planning, etc. A strong "support infrastructure" was established. 4. Cyclacell intentionally adopted as a 'flagship' start-up (cancer drug development), becomes a major vehicle for levering large-scale private VC investment alongside public con-investment. 5. University scientists forge multi-partner basic research collaboration with group of international pharmas, A spin-off is the attraction of the US inward investment, Upstate, to utilise re-agents created by the partnership. 6. Post 2000, Scottish Enterprise (economic development agency) adapts life science industry development in favour of Scottish-level industry initiatives. 7. Trick for Dundee institutions has been to 'capture' local benefits from such initiatives. HQ offices for ITI Life Sciences company and Translational Medicine Research Consortium (Wyeth) have been located in Dundee. In essence the local "Triple Helix" has been augmented by the development of Scottish-level "Triple Helix" networks.

COUNTRY: FRANCE	CLUSTER: ESSONNE/EVRY/PARIS
CONTEXT:	
International	US biotech research and biotech industry gains lead during 1990's. France lags in development of biotech companies.
Country	Long established public funded research institutions. Strong French state and national industry champions. But institutions are insular. No biotech companies before 1997. French innovation system transformation starts in 1999 with national competition of grants for tech. start-ups. Flow of DBFs commences largely reliant on public funding. Post-2001 public research funding channelled through ANR and favours specialised "research poles". 2005 new legislation to stimulate VC industry (SUIR).
Region	Essone/Evry, one of a number of technology environments ringing Paris and selected by Central Govt. in early 1990's for development as an "innovation pole". 1998, Genopole created
Sequence of evolution	1. Creation of new University D'Evry at Essone. 1990, Genethon established at Evry mapping human genome. Specialisation in genetics develops. Genethon research expands during 1990's. 2. 1998 Creation of Genopole association at Evry. Incubator created. Increasing attention to stimulating DBFs start-up. 3. 1999, National innovation competition to stimulate tech. start-ups 4. Public research funding continues to favour "research poles" 5. Medicen network formed in 2005 operating at Paris level. Lobbying and coordinating at project level.
LEARNING POINTS:	
	French Govt. reforms public funding of research to favour centres of excellence. Directs regional economic development policy in favour of technical poles in proximity of research centres of excellence. Seeks to stimulate tech transfer into formation of biotech companies.
Observations	1. Biotech at Essone/Evry is the result of public policy and spending to create an innovation "pole" for medical life sciences R&D in proximity to the greater Paris cluster of research centres and pharma industry. 2. The cluster is the outcome of regional economic policy implemented from early 1990s and the transformation of the French public research funding into a competitive system reinforcing the "Innovation pole" model. The French "innovation pole" model has a set of common characteristics. The policy provides incentives in the form of infrastructure and grants for spin-outs and start-ups, and this is paralleled by increased direction of public research funding favouring specialisation in centres of excellence located within innovation poles. Essentially the model is supply driven. 3. "Triple helix" collaboration to develop innovation poles is encouraged by the French Govt. adopting the German BioRegion style of competition to provide incentive for local collaboration-based plans. 4. Medicen is a mega-cluster institution, not a local cluster provision, is aimed by persuasion of powerful institutions and industry at transforming the institutional culture in favour of biotech entrepreneurship in the Greater Paris region.

COUNTRY: FRANCE	CLUSTER: GRENOBLE
CONTEXT:	
International	USA leads in exploitation of biotechnology.
Country	France, reforms public funding of research in favour of prioritising centres of excellence in favoured technopoles. Regional development support directed toward technolopoles.
Locality	Grenoble, long-established research base. Strong population growth in last two decades. A technopole location.
Sequence of evolution	Strong research base of universities and research centres. Strength in nano-bio science. 1. 1999 Grenobles Alpes Incubations (GRAIN) established. 2. 2000 ADEBAG (Association for the development of biotechnologies in the Grenobles conurbation) established. "Triple Helix" type membership. Provides close support to selected start-ups. Only 1 biotech company established before 2000. By 2002, 10 biotech companies established. 2005 tri-national cluster agreement formally agree with Canavese Science Park (Italy) and Swiss association to promote trans-alps bio-network. Organise Bio-Alpine Convention, 2006 focused on neuroscience. 2006 Biopolis complex established in close proximity to university. Providing incubation and support. By 2006 20 biotech companies established.
LEARNING POINTS:	
Innovation context	Grenoble has a strong science infrastructure, but had failed to develop spin-outs until 2000.
Observations	4. "Triple Helix" partnership between public authorities, research institutes and industry established support infrastructure necessary for spin-outs.

COUNTRY: GERMANY	CLUSTER: HEIDELBERG
CONTEXT:	
International	Biotech industry growing strongly in the USA up to 2001. Major research universities embrace industry support and commercial tech transfer. Start-up finance readily gained from inexperienced but enthusiastic VC industry. Large pharma companies partnering with biotech companies to support discovery-stage R&D. Post 2001 VC finance withdraws from 1st round funding of DBF start-ups.
Country	German economy stagnant throughout 1990's. Low formation of new biotech companies. Concern for competitiveness of biotech sector relative to USA success. 1996, Federal Govt. initiates BioRegion Competition to stimulate 'triple helix' collaboration in regions with target of creating new biotechs. Post-BioRegion Competition, Federal Govt. continues to sustain basic life sciences research and encourage 'triple helix' configuration to gain regional development benefits from tech transfer.
Cluster	Located within the Rhine-Neckar Triangle. An area of 40 sq. kilometres. A major concentration of leading life science research institutes. Production and R&D facilities of large pharma companies. 80+ DBFs.
Sequence of evolution **LEARNING POINTS:**	1. Heidelberg region has strong knowledge infrastructure (universities and research institutes) plus commercialising companies (pharmas) in place prior to BioRegion Competition. 2. 1985, Heidelberg economic development has already established Heidelberg Technology Park (HTP) site. 3. Coordinating actor (HTP) well-positioned (neutrality, credibility, flexibility, capability) to forge Rhine Beckar BioRegion collaboration plan (1996) responding to BioRegion Competition call. 4. Appropriate biotech start-up provisions developed and promoted (lab space, EMBLEM and EMBL) paralleled by sharp increase in biotech start-ups. 5. Post 2000, Rhine Beckar BioRegion collaboration sustained by on-going initiatives promoted by HTP. Also brings links and good practice into RB BioRegion by maintaining wider networks.
Innovation context	German life sciences research institutions and German pharmaceutical industries are long established, but insular. Lagging competitive performance of biotechnology national innovation system prompts Federal Govt. industry development initiative (BioRegion Competition)
Observations	1. Rhine Beckar BioRegion has the sufficient mass of research (supply) and pharmaceutical (demand) infrastructures to sustain a cluster of DBFs. 2. Country level initiative and development funding (Bio-Regio Competition) signals importance of concerted local action. New Federal funds provide incentive for local cooperation. 3. Two prime achievements of HTP: a. HTP provides the leadership required to forge development-directed relationships between the key stakeholders (the 'triple helix' configuration). b. HTP has assembled the support system elements that enable DBF creation. c. Companies in the Heidelberg cluster will supply the pharma industry in the regional technology system and have access through HTP to international partners.

COUNTRY: GERMANY	CLUSTER: MUNICH
CONTEXT:	
International	Life sciences research and biotech industry grows strongly in USA from 1980's. Large pharma companies merging and becoming global. Increasing out-sourcing of early stage discovery biotech R&D. USA venture capital industry expands rapidly, until collapse of boom in 2000.
Country	Germany has long-established science base and large pharmaceuticals with speciality chemicals pedigree. Little VC activity and no high-tech stock market. By mid 1990's Germany lagging USA in biotech application. National policy initiatives to promote tech transfer, innovation and new firm formation as from mid-1990's. 1995 Bio-Regio Competition providing Federal funds for tech transfer services, incubators & science parks, soft loans for start-ups to competition winning regions who coordinate a "Triple Helix" bio-tech development economic development strategy between public authorities, universities & research institutes & industry. 1997 Nuer stock market established.
Region	Munich, large city, the centre of Bavaria region. Has both strong bio-science centres and presence of large pharmas. An important finance centre.
Sequence of evolution **LEARNING POINTS:**	1. 1995, IBZ incubator established. 2. 1996, Munich Region wins Bio-Regio Competition. 3. 1997, BioM established to coordinate support for Munich bio-cluster (provides consultancy services, seed capital and VC funding (Bayern Kapital). 4. 2000, new incubator premises for IZB. Bayern Patent founded to provide for tech transfer from Bavarian universities. 5. Late 1990's rapid expansion of number of new biotech firms (100+). 6. 2002, VC industry grows in Munich. Multiple VC funds.
Observations	1. Munich has outstanding life science research institutions and has large pharma presence. Research centres a key source of spin-outs. Pharmas in case of TRION pharma and Suppremol are sources of partnering. High quality biotech companies developing. 2. Bio Regio Competition provides impetus for "Triple Helix" collaboration of state/city authorities, research centres, and pharma industry. 3. Incubator provides essential start-up accommodation. BioM (coordinator) support infrastructure is vital catalyst link for support services and link to VC. 4. VC industry is awake and available for high quality biotech ventures, but only when proof of concept and scientific and business team is demonstrated. 5. Munich is a large-scale bio-cluster with all necessary elements in place and well-coordinated at strategic and operational levels.

COUNTRY: ITALY	CLUSTER: LOMBARDY-PIEDMONT (MILAN-TURIN)
CONTEXT:	
International	Acquisition and merger activities of large pharmas adversely affected the industry in Italy during 1990s. Now lower-cost Asian competitors threaten surviving lower-tech chemistry-based survivors.
Country	Large-scale rationalisation closed much of the industry during 1900s. However management buy-outs were supported by former parent corporations and these international companies remain key customers of the larger biotech/chemist-based companies. Government spending on life sciences research lacks consistency. There is no significant VC industry so far.
Region	The Greater region Lombardy-Piedmont has six research universities, five science parks, and 50% of Italian biotech companies. The public authorities of Milan, Lombardy, and of Turin recognise the importance of biotech as a growth sector, but face pressures to give attention from established industries facing steep decline on account of Asian competition. Developing the common concept of an inter-regional cluster emerged as a key point for ensuring the future development of the biotech industry in the area;
Sequence of evolution	1. At the end of the 1970's the first biotechnological activities were undertaken in Lombardy by public research centres; 2. The first dedicated biotech firm was founded in Milan in 1987 and in the early 1990's, following the crisis of the chemical and pharmaceutical sectors in Italy, biotechnology activities were carried out by a restricted number of researcher-entrepreneurs focusing on the development of biotech-related services and technologies; 3. In the late 1990's, with the crisis of the pharmaceutical industry a properly named biotech cluster appears in the area near Milan as a result of the first Management Buy-Out Operations and the creation of the first science parks and incubator (Science Park Raf) in the area; 4. In 1996, the Bioindustry Park del Canavese was founded, paving the way to the development of a biotech cluster in the area around the city of Turin; 5. In the years 2000-2005 the two biotech clusters grew significantly and tight relationships began to be developed at different levels. Companies began to cooperate given their closeness in terms of both low geographical distances (even more lowered by a long tradition of commercial and business exchanges among the two cities of Milan and Turin) and of their fields of application; 6. Regional authorities (Province and Region) began to join efforts – even if only at the level of common guidelines - to support the development of the biotech sector; 7. National government recognised the development of the biotech sector in the area as a relevant factor for enhancing the competitiveness of the regions; 8. In the year 2005, the Bioindustry Park del Canavese was appointed as regional system integrator (in the EuroBioCluster South Initiative) for the biotech development of the Piedmont region, thus becoming one of the promoters of a closer integration among the actors of the cluster. 9. In 2006 inter-regional cluster agreements are being signed at national level (Turin, Milan, Siena, Trieste).
LEARNING POINTS:	
Observations	1. The Lombardy-Piedmont interregional cluster network represents the main centre of medical biotech in Italy. 2. The area has a suitable "knowledge infrastructure". 3. The area offers a mix of biotech development models: • Survival by way of management buy-outs of rationalised established firms. • "Discovery Initiative" and "Bioiniziativa" as important prevision for developing start-ups. • Laissez-faire assistance for academic spin-outs • Institution-level association-forming in the form of BioMilano to "do things together." 4. However, this variety of model indicates weaknesses particularly of the "support infrastructure" of the regional innovation system: a. Public-funding of academic spin-outs covers the range of provision thinly. There are business planning and seed capital services for the academics but the ventures reviewed in the case studies are distant from customers. How have these ventures been selected for public support? Are they the outstanding prospects? They are essentially at the "learning by experience" stage whilst engaged on public-funded collaborative projects providing survival support. This cannot realise early product/services results. b. Public funding appears not to have been available for industry spin-offs. These firms now face severe competition from Asian competitors and their survival likely depends on how quickly they can realise through R&D higher value products and services. Will public funding be available? c. There is no significant VC provision. Without this there can be no substantial development of the biotech industry. d. Bioindustry Park a major public initiative which has transformed the R&D capabilities of the area. Similar range of functions as at San Raffaele Science Park, but public funding. e. The San Raffaele Science Park model is both professional and effective. But it is self-contained and essentially the value-adding business unit of a remarkable private corporate foundation. Has it been duplicated in the other science park ventures? f. The medical biotech sector in the area appears still fragmented. There are numerous institutional actors and BioMilano appears a very necessary structure to network these key institutions. However, the initiatives that must flow from this networking will have to be much bolder than the essentially sign-posting and international promotion that is visible. The tie-in of the "knowledge infrastructure" with the "support infrastructure" will require to be establishes around "hard" initiatives which develop (and commit more funding from public and private sources) the support infrastructure. Further emulation of the San Raffaele Science Park model would appear to be an appropriate start.

COUNTRY: SWEDEN	CLUSTER: UPPSALA BIO (UPPSALA, PART OF GREATER STOCKHOLM REGION)
CONTEXT:	
International	International pharmaceutical companies involved in merger activity throughout 1980's and 1990's creating global companies with choice between R&D and production facility locations.
Country	Sweden, an export-led economy of high-value products, has a developed strength in the pharmaceutical industry with national champions. Merger activity (Pharmacia & Upjohn) made these companies part of international companies. Recession in early 1990's. Sweden joins EU in 1995. Economy recovers but VC sector remains cautious of investing in new ventures.
Region: Uppsala (part of Stockholm Region)	Well-established research/institute structure, clinical research established in key hospitals, plus large-scale pharmaceutical company research presence. Medical Product Agency (Swedish authorising agency) located in region. Uppsala has reputation as "most biotech concentrated city". Close proximity to Stockholm and to BioValley (Strangnas).
Sequence of evolution	1. 1985 recognition of importance of life science research for regional development (STUNS formed by universities and public authorities). 2. Progressive development of a comprehensive public-funded structure of institutions and centres covering basic research, innovation discovery, tools development, documentation and registration, scaling up, and clinical trials. National agencies as well as regional players involved. 3. 1996 rapid increase in spin-off biotech companies in part a response to restructuring of Pharmacia. 50 + biotech company network. 4. 2002, Uppsala Science Park confirms importance of accommodating the industry (150 companies on Park). 5. 2003, long-run funding for Uppsala Bio vision from Swedish Innovation Agency. 6. 2004, concerted pipe-line for new company creation and development includes: Uppsala Bio-X (multi-disciplinary research mission "tools for life science" / Uppsala Innovation Centre (business incubator)
LEARNING POINTS:	
Observations	Uppsala is a mature biocluster. A regional part of a well-integrated national innovation system. Long established fruitful regional collaboration between industry, 'world-class' research universities (Karolinska) and public healthcare system. 1. Uppsala-Stockholm regional corridor is crucial for successful development of Swedish biotech industry. 2. The knowledge infrastructure is world-class and has long established links with the pharmaceutical industry in the sub-region. 3. Major pharmaceutical R&D facilities located in the sub-region and are major source of R&D spend with demand for specialised biotech suppliers. 4. Uppsala has achieved a sustained and successful development of a support infrastructure of specialised institutions which loosen dependence upon the pharmaceutical champion. 5. Entrepreneurial biotech spin-offs have been important source of new DBFs and have retained established links with the knowledge infrastructure. 6. Innovation support structures to optimise business initiatives based on biotech research and provide initial funds are well-developed. 7. Clarity of strategic understanding and communication in the Uppsala Bio system is evident. The multi-player regional "Triple Helix" innovation system is effectively signposted and supported. 8. International visibility is achieved and international linkage of biotech companies is supported.

COUNTRY: SWEDEN	CLUSTER: BIOTECHVALLEY (STRANGNAS), PART OF GREATER STOCKHOLM REGION
CONTEXT:	
International	Large pharmaceutical companies engage in merger activity throughout 1990s creating global companies with choice between R&D and production facility locations.
Country	Sweden, an export-led economy of high-value products, has a developed strength in the pharmaceutical industry with national champions. Merger activity made these companies part of international companies. Recession in early 1990's, Sweden joins EU in 1995. Economy recovers but VC sector remains cautious to support new starts.
Region: Uppsala (part of Stockholm Region)	Well-established research university/institute structure, plus large-scale pharmaceutical production presence. Significantly emphasis was given to bio-pharma production processes, not to basic life science research.
Sequence of evolution	1. Key knowledge infrastructure and pharmaceutical presence already present. County Council recognises the development importance and acts. 2. The Biotech Centre (1999) provides the means to form development partnership of university/public authority/industry and national interests developing a 'triple helix' innovation model (innovation labs and services) to lead the creation of new DBFs to form a local biotech supply chain. 3. The Biotech Centre proves its value by developing networks of specialist competences to support emerging DBFs. 4. Biotechvalley NU (2002) builds on this alliance to coordinate key individuals from the strategically important interests to present a competitive case to Pfizer for its investment in new production plant. 5. Biotechvalley NU (2004) adds further impetus to creating DBFs
LEARNING POINTS:	
Observations	The challenges at Strangnas were to stimulate new company development, and to ensure that its bio-pharma production facilities were not down-graded in the event of Pharmacia passing into the ownership of a global pharma. This risk came to pass with the merger with Pfizer which by 'concerted local action' was effectively addressed. Strangas is now established as a mature bio-cluster, with effective local institutional cooperation, well-integrated into the national innovation system.

	1. Knowledge infrastructure is world-class. Has experienced technology transfer capability. 2. Established pharmaceutical presence with developed links with University. Focus on process R&D. 3. Strategic understanding of Strangnas industry dependence and concerted institutional "Triple Helix" leadership to build on strengths. 4. Biotech Centre provides critical business transformation function. 5. Large pharma willing to acquire successful R&D enterprises. 6. Weak VC support in Sweden.

COUNTRY: DENMARK	**CLUSTER: AARHUS**
CONTEXT:	
International	Changes in international pharmaceutical industry provide both opportunities and threats for Danish pharmas and its emerging biotech industry.
Country	Denmark is a small, relatively compact, export-led country with a well-developed pharmaceutical industry and excellent life science research universities. Medical biotech in Denmark is largely concentrated upon the Copenhagen region where the pharma company R&D and production facilities are located. National policies for start-ups (pre-seed and seed capital, incubators) have been taken up vigorously by Aarhus.
Region: Uppsala (part of Stockholm Region)	Aarhus, a city-region of 630,000, is located in Jutland, West Denmark two hours distance from Copenhagen, the principal science and commercial centre. The Aarhus region lacks a large pharma presence. Aarhus University and Teaching Hospital are corner-stones of cluster development.
Sequence of evolution	1. Aarhus knowledge infrastructure comprises Aarhus University and Teaching Hospital. Long-standing experience of collaborating with industry. 2. 1986. Science Park Aarhus created 3. 1998, Aarhus take advantage of Danish Govt. provision of funding for innovation centres and established East Jutland Innovation (a private company). Latter to provide pre-seed and seed capital for new tech. start-ups. 4. 1998-2001, 19 start-ups formed (mainly academic spin-outs). All remain small. Most adopting a 'services' model. 5. 2001 Bio Medico Forum (365 member association) established to undertake regional, national, international networking. 6. 2001 Incuba, dedicated VC fund established in Aarhus. 7. 2003, Biomedical Science Park established adjacent to Skejby Hospital (part of Aarhus University Hospitals), included incubator facilities
LEARNING POINTS:	
Observations	1. Relative to the 'magnet' status of Copenhagen, Aarhus is a second-tier location. 2. Aarhus knowledge infrastructure: The cluster is built around academic spin-outs. Growth in this route depends upon development and scaling-up of the knowledge infrastructure. 3. The emergence of the cluster has been highly reliant on concerted partnering of the local authorities and the University making good use of capital funds and innovation funding. It demonstrates a small biotech cluster built on sustained "Triple Helix" institutional collaboration. A supporting infrastructure for business start-ups has been established. 4. Aarhus remains a small cluster of mostly 'services-based' DBFs. These have access to experienced business support and most have adopted sustainable business models. May now be constrained by lack of pharmaceutical presence and distance from medical bio-concentration around Copenhagen

COUNTRY: CZECH REPUBLIC CLUSTER: SOUTH MORAVIA REGION

CONTEXT:	
International	USA leadership in biotechnology. Europe lagging in innovation. Soviet system collapses in Central Europe in late 1980s.
Country	Collapse of soviet regime in 1989. Restructuring on Western democratic and market models. Czech Republic formed in 1993. Development of national innovation system (NIS) between 1994-98 along EU country model. 2004, Czech Rep. becomes full EU member. Inward investment strongly favoured by fiscal incentives.
Cluster	South Moravia has research base of universities. In long-established universities, but has fragmented research governance. Regional development activity organised as from 1997 beginning with deployment of EC Phare funds.
Sequence of evolution	1. Czech Republic has long-tradition of progressive engineering. State investment in electronics, chemistry and pharmaceuticals during 1980s. 2. 1989-1993, period of experimentation in democratic and market-based institution-building. 3. 1994-1998, NIS developed favouring inward investment. 4. 1997, Regional Development Agency (South Moravia) established. 2003 South Moravian Centre for Innovation established. 5. By 2005, university system has strong life science student flow and research base is active.
LEARNING POINTS:	
Context	Czech NIS model established in late 1990's after ten years of transition. Regional development (RIS) encouraged but national agencies for science and industry remain central (a small country).
Observations	1. South Moravia cannot yet be said to have a functioning bio-cluster. 2. Universities and research base has very substantial student flows. Less is certain about the research leadership and potential for knowledge spil-over. 3. The support infrastructure is being assembled and the "Triple Helix" relationships are consolidating in particular aligning with the CETI R&D infrastructure project. 4. SMR and SM Innovation Centre (both public funded and closely tied) are essentially driving the development of the cluster, which is in a critical institution-building stage.

COUNTRY: HUNGARY CLUSTER: SZEGED

CONTEXT:	
International	Global pharmaceutical industry seeking sources of lower-cost biotech R&D
Country	Hungary, population of 10 million, progressively moving to market economy, becomes EU member in 2004. Remains a favourable cost base. A distribution of universities with close-by industrial parks.
Region	Szegad, main centre of South Plains Region. University of Szegad as key research centre.
Sequence of evolution	1. Peter Pazmany Programme launched by National Office for Research and Technology invites calls for establishing Regional Knowledge Centres as centres of research excellence to exploit R&D in close cooperation with industry. Programme will provide 4 years funding. 2. 2004, DNT Consortium established involving University of Szeged and industrial partners. Research focus upon neurodegenerative disease (Szeged Neurobiological Knowledge Centre). 3. South Plain Bio Innovation Centre (DABIC) supported by local public authorities with mission to link research and industry. 4. Research incubator (RCIB) opens on University campus accommodates labs of participating companies but also used for student education. 5. Academic spin-out companies established, plus research cooperation and contract research.
LEARNING POINTS:	
Observations	1. Szeged is a small embryonic bio-cluster of very recent origin. However there is an established base of university research expertise, but of a modest scale. 2. The further development of the "knowledge infrastructure" is prioritised by the national programme to created research centres of excellence. However there is a clear emphasis on industrially applicable research. Research 3. A "Triple Helix" relationship has been a condition of gaining public funding from the Peter Pazmany Programme. The DNT Consortium appears well-rooted. Practical "support infrastructure" has been developed (incubator and labs). 4. Private VC finance is absent, and growth of companies may depend on "buy-in" by established industry. 5. The potential pool of latent academic entrepreneurs may be limited. Inward investment may be necessary to expand the scale of the bio-medical related industry.

ALSACE BIOVALLEY (FR)
"INTELLIGENCE ECONOMIQUE MUTUALISEE" (BUSINESS SUPPORT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
- Alsace Biovalley
- Alsace region
- DRIRE (Regional Direction of Industry, Research and Environment)
- A consultant specialized in business and competitive intelligence

Contents

To give access for the SMEs to a business and competitive intelligence service:
- Known competitors, markets, patents, fairs
- Use of free information, available on Internet (usually time and money consuming for the SMEs)

Intended recipients

SMEs of the French part of cluster (next, the German and Swiss SMEs will have access to it).

Expected results
- Participation of 15 SMEs to the programme in 2006
- Use/consultation of the web database by the SMEs

Costs

Fund for 2006: €30,000 software + consultant); a full-time person + occasionally a trainee.

REPRODUCIBILITY

Requirements
- Presence of local actor close to the SMEs
- Demand from the SMEs
- Awareness of the importance of economic intelligence.
- Knowledge of the different softwares, capacity to implement them

Time
- Time for implementation: around 9 months
- No limit to duration

Sector specificity

Possible application to every sector (no specificity).

RESULTS

Results

15 SMEs using the service.

Deviations from stated objectives

No real deviation.

Other actors involved
- CCI of Colmar Sud Alsace has written down an awareness booklet; help for dissemination
- Support from COGITO (local programme for developing Economic Intelligence)

BIOTECHVALLEY (SE)
VALUE CHAIN COACHING (BUSINESS SUPPORT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge

The whole cluster

Contents
- To be an agent for individual business coaching and highly qualified consulting services (e.g. due diligence, second opinion), for technical consulting services and suppliers of strategic input goods
- To provide resources for process development including laboratory capacity
- The aim is to secure that small, R&D-intensive DBFs more easily can reach proof of concept for their products

Intended recipients

The intended recipients are SMEs, basically in Sweden.

Expected results

Expected results are that more research-based SMEs get better opportunities to take their innovations/products to clinical testing, phase 2.

Costs

The cluster organisation has a turnover of aprox €270,000. Aprox 40 % are targeted at value chain coaching.

REPRODUCIBILITY

Requirements
- The existence of a full cluster organisation
- Links and relations to all necessary competences, incubators, providers of capital, laboratory facilities

Time

Impossible to define

Sector specificity

Activities are sector specific

RESULTS

Results

So far a number of firms have received help.

Deviations from stated objectives

Among the factors contributing to the success, there are:
- cutting edge knowledge infrastructures with experience in TT
- established large pharmas willing to acquire successful R&D enterprises
- support firms in finding.

Other actors involved

Among the most important are Mälardalen University, Royal Institute of Technology (KTH), the Karolinska Institute, Uppsala University and Linköping University.

BIOTECHVALLEY (SE)
BUSINESS INTELLIGENCE AND STRATEGIC SUPPORT (BUSINESS SUPPORT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge

The whole cluster.

Contents
- Enhance the interest in and knowledge of the process and production parts of the biotech sector in Sweden
- Perform marketing analyses and analyses of the world around in order to meet changes in the needs of competences
- Actively look after and act as an intermediary in view of changes in the regulations

Intended recipients

The cluster, the geographical milieu of the cluster and the industry as a whole in Sweden.

Expected results

A deeper knowledge of the changes within the industry plus strategic support concerning statistics, FDI, industry needs as concerns competence etc.

Costs

The cluster organisation has a turnover of aprox €270,000. Aprox 20 % are targeted at business intelligence and strategic support.

REPRODUCIBILITY

Requirements

Links and relations to amongst other things competent analysts within in the public (academia) and private (consultancy firms) sector.

Time

n.a.

Sector specificity

Exclusively sector specific but also targeted at regional and economic developers, policy makers on a local, regional and national level, academia etc.

RESULTS

Results
- Competence support.
- Business intelligence/analyses delivered to Nutek and being part of an international OECD-project
- Strategic support in initiating and implementing the new regional organisation "The tockholm-Uppsala Bioregion Association" and other project/initiatives like Pegasus (a localization project of a new production facility promoted and managed by the region together with Pfizer)

Deviations from stated objectives
- Cutting edge knowledge infrastructures, a broad scope of competences
- Established pharmas presence with developed links with University.
- Strategic understanding of Strangnas industry. The Strängnäs milieu also needs to be connected to the wider cluster in the greater Mälar region.
- A brand of success

Other actors involved

Universities (Mälardalen University, Royal Institute of Technology (KTH), the Karolinska Institute, Uppsala University and Linköping University).

CAMBRIDGE (UK)
PURCHASING SCHEME FOR BIOTECHNOLOGY COMPANIES (BUSINESS SUPPORT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge

ERBI Ltd

Contents
- SMEs don't have the purchasing power of big pharmas and often pay a significant amount for resources and services.
- ERBI has sought to reduce the cost of company operation through a purchasing scheme.

Intended recipients

Biotechnology companies.

Expected results
- Significant savings on all cost areas within scheme
- Improved customer service through dedicated accounts
- Network of companies sharing company operation and cost saving good practice

Costs

ERBI pays a dedicated Purchasing Manager to manage and expand the purchasing scheme.

REPRODUCIBILITY

Requirements

A minimum number of companies and a dedicated Purchasing Manager.

Time

A Purchasing Scheme would take approximately 6 months to develop and launch It should be planned to run continuously.

Sector specificity

Not only biotech but all high tech sectors.

RESULTS

Results
- The Purchasing Scheme now turns over - € 8 million pa
- The average cost saving is between 20-40%

Deviations from stated objectives
- Key factors contributing to success are:
- A full time Purchasing Manager
- Supplier partnership - with suppliers taking an active role in administering accounts and developing new accounts
- Member commitment – the Purchasing scheme is a key reason to be an ERBI Member and all Full Members are encouraged to participate - the more Members take part, the better the deals from suppliers

Other actors involved

All the suppliers.

CAMBRIDGE (UK
SPECIAL INTEREST GROUPS (BUSINESS SUPPORT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
ERBI Ltd

Contents
- ERBI developed Special Interest Groups (SIGs) open to people with a specific function within biotechnology companies, with the aim to to discuss issues and solutions concerning the cluster
- Each Group meet regularly in a confidential forum allowing specialist roles such as Head of Facilities etc. to meet peers and share experiences
- The SIGs are very successful and have created a range of new ERBI services

Intended recipients
Biotechnology companies

Expected results
Biotechnology companies are launched, operated and expanded more effectively and cost effectively.

Costs
- ERBI personnel time involved
- External costs such as meetings
- Expert advice

REPRODUCIBILITY

Requirements
- Enough biotechnology people to allow meetings
- Exclusion of commercial service providers
- A SIG Manager to oversee all activities

Time
A SIG can be very quick to start up - it could take as little as one month to assess interest and sign up interested parties

Sector specificity
Not only biotech but all high tech sectors

RESULTS

Results
- ERBI SIGs have generated a significant number of new ERBI services including a Training portfolio that runs 5-6 courses multiple times per year
- An estimated 25 SIG meetings are held per year across all SIGs
- ERBI now has over 60 Full Members participating in SIGs

Deviations from stated objectives
The success of each SIG depends on the following:
- An active SIG Manager
- Enough SIG members to make meetings feasible
- A direct practical benefit to biotechnology operation

Other actors involved
ERBI is the primary actor within this scheme, however additional actors include: Expert advisers e.g. lawyers, accountants, Security professionals to provide professional advice on key issues within each SIG.

GENOPOLE (FR)
EQUIPMENT MUTUALISATION (BUSINESS SUPPORT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Genopole together with experts (15 members from industry, academy and SMEs)

Contents
- Some companies or laboratories receive money from Genopole to buy materials they aren't able to buy by theirselves. To this aim a call for proposal is published
- Some companies have access to services to business that can't pay alone
- Availability of technological platforms

Intended recipients
Companies of the biocluster

Expected results
Better cooperation between the companies, more synergy.

Costs
- 5 to €50,000 by investment.
- Salaries of the mutualized human resources.
- Technological platforms co-financed by Research Ministry, Regional Council, AFM, DRIRE, local university…)

REPRODUCIBILITY

Requirements
- Geographical proximity of the companies
- Companies "ready" to share equipment
- Network for funders
- New companies arriving in Genopole ready to share their own equipment

Time
No limit for availability.

Sector specificity
Companies concerned work in the same sector.

RESULTS

Results
- Cooperation between companies
- Growth in the use of shared facilities

Deviations from stated objectives
No important deviation.

Other actors involved
No

MI-TO BIOTECH (IT) -
SUPPORT OF EUROPEAN AND INTERNATIONAL PATENTING PROCESS

OBJECTIVES AND CHARACTERISTICS

Actors in charge
- Province of Milan (for the first round)
- Province of Milan, Lombardy Region and Chamber of Commerce of Milan (in all following rounds)

Contents
Supporting SMEs based in the Province of Milan that apply for the European or other international patents.

Intended recipients
For the first round are accepted:
- SMEs and private research centres.
- Universities, and their consortia, research centres.

For the second and third:
- SMEs (also in consortium form)
- Private research centres (if established in SME form)

Expected results
The aim is to enhance the vocation of SMEs to apply for European or other international patents.

Costs
- €2,115,000 – First round (max €15,000for every project)
- €1,000,000 - Second round (max €10,000 a firm, €20,000 with two or more applications)
- €1,300,000 - Third round (max €10,000 a firm, €20,000 with two or more applications)

REPRODUCIBILITY

Requirements
- A clear engagement of institutions and strong links among them
- Interesting R&D results by research centres

Time
- First round decided in September 2002 and proclaimed in October 2002
- Second round started in October 2003
- Third round proclaimed in May 2005

Sector specificity
No

RESULTS

Results
First round: - Over 200 requests - 52 projects from Universities financed - 176 projects from SMEs financed
Second round: - 237 requests (for a total of 113 SMEs) - 231 requests financed (for a total of 108 SMEs)
Third round: - 234 requests - 211 requests financed

Deviations from stated objectives
None

Other actors involved
Finlombarda

MI-TO BIOTECH (IT)
PRIOR ART (BUSINESS SUPPORT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Chamber of Commerce of Milan-Innovhub

Contents
Prior Art is a practice aiming at protecting intellectual property through the valorisation of research results. Supporting patenting of research results and co-financing necessary costs for first registration or extension of patents are the main tasks of this practice.

Intended recipients
Italian biotech companies/ research centres within Province of Milan.

Expected results
Funding patenting of Italian biotech companies. No specific number of patents to achieve is set.

Costs
So far the practice has cost €36,403 €

REPRODUCIBILITY

Requirements
Biotech companies generating new research results.

Time
After the first Bioniziativa.

Sector specificity
Biotechnology

RESULTS

Results
- During the first 13 months of the practice, 14 patents have been evaluated, by which 4 are new patents and 10 are extensions of already existing ones.
- The results were that 12 of these were financed while the other 2 were cancelled by the inventors
- The service has obtained extremely positive feedback

Deviations from stated objectives
No

Other actors involved
Patent firms and legal advisors.

CAMBRIDGE (UK)
NETWORKING THE BIOTECHNOLOGY CLUSTER (CREATION OF CONSCIOUSNESS)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
ERBI Ltd

Contents
- Regular networking meetings around a topic of interest to the biotech community
- These meetings are held every 6-8 weeks, usually in the evening
- The format is approximately 1 hour of talks followed by a buffet supper and networking

Intended recipients
Biotechnology companies and technical and business services providers.

Expected results
These meetings are not measured using quantitative outputs. It is a more general support mechanism to network the cluster.

Costs
- The event is cost neutral in terms of physical outlay.
- Meetings are sponsored to cover the cost of venue hire and food

REPRODUCIBILITY

Requirements
A venue for meetings and staff to coordinate networking on a wider scale.

Time
- ERBI generally launches each meeting 1 month before the date
- ERBI has run these meetings since its inception,10 years ago

Sector specificity
The action is sector specific

RESULTS

Results
Results have consistently been achieved against objectives.

Deviations from stated objectives
The key deviations are choosing meeting topic - some topics are less popular than others and possibly more suited to a Special Interest Group meeting.

Other actors involved
Nobody else.

AARHUS BIOCLUSTER (DK)
HIRING OF A "FIERY SOUL" (CREATION OF CONSCIOUSNESS)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Local government/authorities

Contents
- A 3 year economical guarantee was given to the management and development of the embryonic cluster
- A Manager with international experience within the Bio Sector was identified and hired

Intended recipients
Universities, entrepreneurs, small companies and the sector in general.

Expected results
Boosting of the activity level in the cluster as well as in the companies.

Costs
3 years of economical guarantee form the local government.

RESULTS

Results
The results, measured on the stated objectives, actually achieved (or under achievement) by the implementation of the action.
- Very poor or limited results!
- The fiasco was mainly due to the fact that the wrong person was hired to the job
- No local background
- Too high personal ambitions
- Not enough drive and enthusiasm

Deviations from stated objectives
It has to be explained what factors contributed to the success or the failure of the practice, depending whether the results are above or below the expectations.
- Soon the activity level dried out. and today 4 years later there are no activities and management left
- BioMedicoForum is now closed as an organisation

Other actors involved
The board consisted of actors.

MI-TO BIOTECH (MI)
BIOMILANO (CREATION OF CONSCIOUSNESS)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
The Province of Milan as responsible for the organisation and the other 18 partners.

Contents
BioMilano is a network of actors (universities, research centres, science parks and hospitals) within the biotechnology industry in Milan with the aim to enhance the biotech sector, by developing synergies, encouraging partnerships, sharing technological platforms, favouring business of new companies, spotting potential funding, promoting marketing communication.The network also plays a major role to coordinate local and international initiatives to enhance biotech in Milan.

Intended recipients
Mainly biotech companies located in Milan but also other parts of Italy to increase partnering visibility and cooperation.

Expected results
Increase innovation, cooperation, research etc within the biotech sector in Italy and to increase international visibility and cooperation.

Costs
na

REPRODUCIBILITY

Requirements
Integration of synergies and competences.

Time
Periodical action.

Sector specificity
Biotechnology

RESULTS

Results
Increased cooperation within the biotech industry.

Deviations from stated objectives
None

Other actors involved
19 partners involved among which there are: Assobiotec, Assotec, Biopolo, Bresso, Innohub, IFOM, Genopolis, parco tecnologico padano, University of Milan etc...

THE VACCINE THERAPY CLUSTER (HU)
VISIONING (CREATION OF CLUSTER CONSCIOUSNESS)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Cluster management

Contents
- The VTC' s mission is to become the centre of the vaccine therapy sector with a view to build a whole new industrial sector
- Its strategy consists in developing and coordinating the intellectual, infrastructural and financial background to attract every connecting knowledge

Intended recipients
Cluster members.

Expected results
A vision clear for all partners within the cluster that can take the cluster from one phase to another.

Costs
No cost required to prepare a vision.

REPRODUCIBILITY

Requirements
The visioning requires the presence of a common interest and common goals that all partners agree to accomplish. Also it needs to be understood and accepted by all partners.

Time
- The action does not require time to get it started because it should be prepared right at the beginning
- In terms of duration, the vision is continuously taking into account throughout the process of realization

Sector specificity
Not sector specific, all tech sectors.

RESULTS

Results
The strategy is stated and clear to every partner:
- Research and development
- Clinical trials
- Production
- Business development

Deviations from stated objectives
Stating and understanding the vision contributes to the research results proceed to next level of development.

Other actors involved

THE VACCINE THERAPY CLUSTER (HU)
DEVELOPING A BIOTECH CLUSTER

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Cluster management

Contents
Developing the cluster required to find suitable partners and to establish clear development directions. This was achieved by brain storming of specialist from different areas. Other requirements were financial resources and a cooperation approach based on personal contacts besides professional qualities.

Intended recipients
Members of the cluster.

Expected results
To build and develop the biotech cluster.

REPRODUCIBILITY

Requirements
Forming a cluster presumes different pre- conditions. The first step is to find the suitable partners to the project aim. Then the partners need to recognise the common interest and add together the special knowledge.

Time
It took a year to find the suitable partners, recognise the common interest, motivation and add together the special knowledge.

Sector specificity
Not only biotech but all high tech sectors

RESULTS

Results
The cluster has been formed and is operating with success. The common goals are accepted by the partners, they have applied for and gained the financial support for the realization and the clinical testing and examinations have started in 2006.

Deviations from stated objectives
Finding and getting the required financial source for the realization made it possible to achieve the expected results.

Other actors involved
No

MI-TO BIOTECH (IT)
K.I.T.E INITIATIVE - (CREATION OF CLUSTER CONSCIOUSNESS)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Bioindustry Park Canavese

Contents
Scientists, working in the park, have the possibility to express their different cultural passions attending conferences on non-scientific subject. KITE (Knowledge, Innovation, Technology, Entertainment) stimulates creativity and support interactions not only between new entrepreneurs and scientists but also with the surrounding area.
The participation by the young entrepreneurs selected through Discovery Initiative and by young scientist testifies that the entrepreneurial spirit is frequently linked to the willingness to identify new cultural and social development paths. KITE represents an appealing occasion to bring the external community inside the park and stimulate general discussions on scientific topics, bioethics and their economic implications.

Intended recipients
Scientists, entrepreneurs.

Expected results
To bring the external community inside the park and stimulate general discussions on scientific topics, bioethics and their economic implications.

Costs
- CRT Foundation: € 5,000
- Bioindustry Park del Canavese + Eporgen Venture spa + Creabilis Therapeutics spa + Serono Symposia + Merck-Serono – RBM: total € 22,000

REPRODUCIBILITY

Requirements
- The Science Park system permits to have, in the same place and in the same time different know-how together
- Knowledge of how to set-up and deliver cultural events is a key factor
- Links with the territory
- It is necessary to build the right network with all different actors

Sector specificity
No, since K.I.T.E. is related to every sector where research and creativity are the engine of innovation and the new economic development, biotech sector first of all.

RESULTS

Deviations from stated objectives
None

Other actors involved
None

MI-TO BIOTECH (IT)
THE TRANSALPINE BIOCLUSTER (CROSS-CLUSTER COOPERATION)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
ADEBAG-France (Grenoble); BioAlps-Switzerland (Lake Geneva Biocluster) and Bioindustry Park of Canavese-Italy.

Contents
The cluster is a network of universities, research centres, local public institutions and economic actors, born to facilitate innovative projects and stimulate the creation of new companies through support services and the promotion of international partnerships in the biotech sector.

Intended recipients
The BioCluster collaborates with all local, regional and national drivers in the sector.

Expected results
Organisation of a tech transfer and cooperation event (the BioAlpine Convention) every year.

Costs
Around € 25,000 year in average. A budget of € 50,000 year each 3 years for the organizer.

REPRODUCIBILITY

Requirements
Geographical proximity; complementarities of scientific and industrial know-how; critical mass of Universities and Companies, the will to federate local networks building synergies.

Time
From 2 to 3 years for the implementation. It's a long term initiative.

Sector specificity
Only related to the sectors of Bio- and Medical Technologies.

RESULTS

Results
The thematic chosen for the 2006 edition, "Neuroscience", has provoked the will to continue a cooperation on this topic by creating the NeuroAlpine network. The second edition took place on 6th and 7th of November, 2007.

Deviations from stated objectives
Strong effort in collaboration and communication between the partners.

Other actors involved
IRC network and local IRCs.

DUNDEE (UK)
SET TAYSIDE LIFE SCIENCES TEAM (DIRECT & INDIRECT FUNDING)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Life sciences Team of Scottish Enterprise Tayside (SET), the public-funded economic and business development agency within Tayside region.

Contents
The LS is focused on supporting the development of LS and commercialisation activities in Dundee and Tayside, providing a a "single door" local service (support to universities, research centres, and companies in relation to the development of economic opportunities.)

Intended recipients
Generally all Actors operating within the Life Sciences sector in the Dundee/Tayside region.

Expected results
The LS unit's performance targets related to job creation and economic growth of LS sector in Tayside.

Costs
- € 100,000 per annum on team salaries
- € 1m towards company support, etc.

REPRODUCIBILITY

Requirements
Willingness of LS actors to participate.

Time
Unit has operated since 1994.

Sector specificity
Life Sciences sector (but not health services providers).

RESULTS

Results
- Employment in LS sector in Dundee/Tayside has highly increased over the last 10 years
- Number of core (dbf) companies have increased from 7 to 24, about 242% increase

Deviations from stated objectives
- Emphasis of LS unit's activity has broadened into all life science sectors for example; drug discovery, agricultural science, environmental science
- Team, initially split, now works on a cross-sector basis

Other actors involved
- TT offices; local authorities' economic development units, business angels and tech fund operators, all private and public actors involved
- The SENational organisation and its international and financial operations

AARHUS BIOCLUSTER (DK)
PRE SEED VENTURE CAPITAL (FUNDING - DIRECT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Østjysl Innovation A/S

Contents
- Provide access to pre seed money in the order of € 200,000. The money are given as a loan against ownership of 25 % of the new company. The loan is risk free for the Entrepreneur
- Together with the loan the new company is supported by experts from the Østjysk Innovation network

Intended recipients
Entrepreneurs within the biotech sector.

Expected results
During the 5 years of existence more than 30 companies have been established. Half of them are still alive and app. 5 have obtained substantial access to further investment or funding.

REPRODUCIBILITY

Requirements
The service was established by means of public money from the government.

Sector specificity
In total more than 75 companies from different sectors have been established.

BIOTECH-REGION MUNICH (DE)
VENTURE-CAPITAL-FONDS (FUNDING - DIRECT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
- Bio M:
- BioM Venture Capital GmbH & Co. Fonds KG

Contents
The BioM Venture Capital GmbH & Co. Fonds KG invests in enterprises concerned with Life Sciences and able to present an economically as well as scientifically substantiated business idea.

Intended recipients
BioM Venture Capital GmbH & Co. Fonds KG invests mainly in early-stage-enterprises.

Expected results
By helping young companies to bring forward their proof-of-concept and secure their patents, the practice aims to develop the BioTech-Region Munich into one of the leading biotech centres of Europe.

REPRODUCIBILITY

Requirements
- The presence of an incubator, a pre-condition for the installing of the VC-fonds, since it fosters the start-up of new companies
- Knowledge base

Time
Two years for the project's implementation.

Sector specificity
Only biotech sector.

RESULTS

Results
Investment of VC-fonds in three enterprises, the Bio Ms seed-portfolio comprises 18 enterprises.

Deviations from stated objectives
- Most of the business ideas and plans still need experimental verification of the underlying ideas before they have a chance to get financed
- Problem: lack of investment into start-up companies, not only at the moment they are founded, but especially also in the first one or two financing rounds

Other actors involved
- Fiery soul and cluster speaker, Prof. Dr. Horst Domdey, the manager of the BioM AG and managing director of the BioM Biotech Cluster Development GmbH
- Shareholders are the state of Bavaria (76%), Planegg local authority (6%), the administrative district of Munich (6%), the city of Freising (6%) and the administrative district of Freising (6%)

DUNDEE (UK)
INTERMEDIATE TECHNOLOGY INSTITUTE (ITI) LIFE SCIENCES

OBJECTIVES AND CHARACTERISTICS

Actors in charge
ITI Life Sciences

Contents
ITI Life Sciences is a innovation fund which creates and manages early stage research and development programmes to generate market-focused intellectual assets for exploitation by existing and new companies.

Intended recipients
Collaborating in TR&D projects with Scottish and international members from industry, academia and the financial community, ITI aims to create new commercialisable technologies and stimulate biotech growth in Scotland.

Expected results
To generate market-focused intellectual assets for exploitation by existing and new companies.

Costs
€ 450 million over 10 years in the parent company (ITI Scotland Ltd), of which ITI Life Science is one of three sector divisions. Annual commitment around € 40 M.

REPRODUCIBILITY

Requirements
- Identifiable market opportunities
- Competent actors willing to commit to its exploitation
- Possibility to build, protect and defend valuable IP
- Ability to manage and control the resulting intellectual assets for commercial success

Time
Programmes typically last from 2 to 3 years.

Sector specificity
Biotech sector.

RESULTS

Results
Numerous patents leading to commercial exploitation generated.

Deviations from stated objectives
- Success factors include
- Availability of funds
- Skilled staff guided by the valuable input of scientific advisers, individuals drawn from international business and academia
- Commitment of all actors

Other actors involved
Scottish Enterprise (national public economic development agency).

GENOPOLE (FR)
GENOPOLE 1ER JOUR (G1J) (FUNDING - DIRECT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
- Genopole
- Caisse des Dépôts et Consignations

Contents
Biotech dedicated pre-seed fund; 1st investment in the capital of a start-up from 50 to € 100,000

Intended recipients
16 private investors.

Expected results
Positive ROI for the companies.

Costs
2000 to 2005, invest of € 1.3 M in 25 participations.

REPRODUCIBILITY

Requirements
- Presence of private investors, aware of the specific conditions of biotech developments
- Existence of a cluster, and a "favourable" environment (e.g. incubator)

Time
5 years after the beginning of the operations, creation of the 1st company, Gene Signal.

Sector specificity
Investments in long term, no short return (1-2 years).

RESULTS

Results
- Since 1999, investment in the creation of 25 companies (investments ranging from 30 to € 100,000)
- 14 companies have found € 66 M post G1J; creation of 154 employments in 21 companies; 35 products in development between 8 companies
- Raise € 70 M in equity (seed finance, in 1st, 2nd and 3rd round)
- 2005: Seed funding raised by G1J companies: € 6,41 M; funds invested by G1J: € 1,32 M
- Funds raised by companies financed by G1J: € 61,07 M

Deviations from stated objectives
No important deviation.

Other actors involved
Nobody else.

HEIDELBERG BIOCLUSTER (DE)
GRÜNDERVERBUND HEIDELBERG (FUNDING - DIRECT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
- DKFZ - German Cancer Research Center
- EMBLEM - European Molecular Biology Laboratory Enterprise Managemnt GmbH
- Heidelberg Ruprecht Carl University
- Heidelberg Technology Park
- University of Applied Sciences - Founder Center

Contents
- The association supports the founding of enterprises out of the scientific research institutes in Heidelberg. Support is provided by consultancy and financially by grants up to € 20,000 per project
- The initiative is coordinated by the university of Heidelberg

Intended recipients
To all post-docs, profs and any other potential founders in universities or research institutes.

Expected results
The funding of 10 companies at least, guiding projects from their status of research objects to companies or if this comes out of the process of due diligence keeping them as project until they become more mature.

Costs
Each project will be funded with € 20,000 max.

REPRODUCIBILITY

Requirements
- Availability of space for enterprise incubation
- TT departments of research institutes or companies exist in the region

Time
The working initiative started in January 2007.

Sector specificity
Not only biotech but all high tech sectors.

RESULTS

Results
In the process of foundation or already founded:
- 3 projects from university
- 1 project from EMBL
- 2 projects from Technology Park
- 1 project from DKFZ

Deviations from stated objectives
Still in progress, no deviations so far.

Other actors involved
Chamber of industry and commerce is involved because of their expertise in accompanying founding processes on all subjects (beyond biotech).

MI-TO BIOTECH (IT) - FOR PROMOTING EXCELLENCE IN INDUSTRIAL META-CLUSTERS IN LOMBARDY (FUNDING - DIRECT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Lombardy Region

Contents
- Evaluation of the proposal (technical, financial and economic feasibility of the project, the project team quality and the impact of the innovation on bio meta-cluster)
- Financial support for costs as personnel, equipments, facilities, patent filing and approval.
  Percentage of contribution from 35% up to the maximum contribution of 50%, according to project score

Intended recipients
SMEs (independently or together with universities and research centres), established in the Lombardy meta-clusters. Both R&D or I&I projects are accepted.

Expected results
The project aims to:
- Sustain the economic development of region
- Favour the establishment of closer links, particularly between Industry, Universities and Research Centres

Costs
Total contribution from Finlombarda (as lost-found financing):
- € 25,000,000 - Call 1 2004
- € 5,000,000 - Call 2 2005 (only ICT sector)
- € 18,000,000 - Call 3 2005
- € 20,000,000 - Call 4 2007

REPRODUCIBILITY

Requirements
Specific cluster-targeted development policies

Time
- First call required approximately 1 year
- Second and third call started in 2005
- Fourth call started in January 2007

Sector specificity
Not only biotech but all high tech sectors.

RESULTS

Other actors involved
- Ministry for economic development
- Finlombarda
- Kilometro Rosso (Scientific Park in Bergamo)

MI-TO BIOTECH (IT)
FONDO NEXT (FUNDING - DIRECT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
- Lombardy Region
- Finlombarda Spa

Contents
- Fondo Next is the first fund of funds and a co-investment fund dedicated to Venture Capital market and university spin-off. It uses market instruments without transfers of public resources.
- The aim of Fondo Next is to finance companies in the early stage development, innovation, research etc.

Intended recipients
Italian biotech companies.

Expected results
Increase innovation in Lombardy Region, fund research and enable the creation of spin-offs.

Costs
So far the practice has cost € 37 million.

REPRODUCIBILITY

Requirements
Innovative companies, research centres and universities in the Lombardy Region.

Sector specificity
No specific sector (25% of the funding has been dedicated to the biotech sector).

RESULTS

Results
Spin off support in the field.

Deviations from stated objectives
None

Other actors involved

MI-TO BIOTECH (IT)
FOR INNOVATION AND COMPETITIVENESS (FUNDING - DIRECT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
- The Province of Milan
- Lombardy Region
- Chamber of Commerce of Milan

Contents
The call for proposal for innovation and competitiveness is to support micro, small and medium sized enterprises in the Lombardy Region.
In particular, the aim is to:
- Realize plans of technological and organizational innovation in the production, products and businesses
- To increase the collaboration and the relationships with universities and the research centres in order to favour the technological transfer and the scientific research
- To realize jointly plans of research, development, reorganization, acquisition and distribution of services

Intended recipients
Companies located in the Lombardy region.

Expected results
Increase innovation and supporting research and researcher in Lombardy.

Costs
€ 2 M

REPRODUCIBILITY

Requirements
Availability of funding.

Sector specificity
No specific sector.

RESULTS

Results
Financed 48 businesses, of which 18.75 % are in the biotech sector.

Deviations from stated objectives
none

Other actors involved
none

MI-TO BIOTECH (IT) - SUPPORTING FOR NEW CREATIVE AND INNOVATIVE ENTERPRISES (FUNDING - DIRECT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
- The Province of Milan
- Chamber of Commerce of Milan

Contents
The call for proposal for new creative and innovative enterprises is to favour the birth and development of new companies. The following are the economic fields of the call:
- R&D
- Radio, TV, cinema, music and shows
- Design and architecture
- Publicity
- Fashion
- Art
- Games and videogames

Intended recipients
Companies located in the Lombardy region.

Expected results
Supporting start ups.

Costs
€35,000

REPRODUCIBILITY

Requirements
Availability of funding.

Time

Sector specificity
No specific sector.

RESULTS

Results
Financed the creation of 68 new innovative companies of which 22% are in the biotech sector.

Deviations from stated objectives
None

Other actors involved
None

PARIS ILE-DE-FRANCE REGION (FR) "PÔLES DE COMPÉTITIVITÉ" (FUNDING - DIRECT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
- French government, local actors
- Partners: national agencies (ANR, AII)

Contents
An industrial policy to bring together firms, SMEs, laboratories, RTD performers, university to develop innovative projects and partnerships.

Intended recipients
- Big Industrial Firms - SMEs - Laboratories - RTD performers - Universities - Local authorities

Expected results
- To share resources
- To facilitate development of new research teams
- To cooperate with abroad RTD performers
- To develop a strategic vision of the sector to create new industries
- International visibility
- Partnership between stakeholders
- RTD synergies
- Project labellization

Costs
€1.5 billion from 2006 to 2008

REPRODUCIBILITY

Requirements
- Specific policy - involvement of local and national stakeholders
- Nothing done before/sector - increase of global competition

Time
- Approximately a year
- Duration: 1st financing period: 2 years

Sector specificity
No specificity.

RESULTS

Results
- Dreation of 66 clusters (16 clusters with a worldwide exposure)
- Development of sectorial projects, RTD and non-RTD; 13 projects in 2005-06 (> €29 M, 43 biotech companies involved)

Deviations from stated objectives
- It's difficult to evaluate the deviations from the plan.
- Studies from private companies and academic research groups should be available soon

Other actors involved
Regional and national policy drivers, independent experts, SMEs, development agencies, big firms and research institutions.

SOUTH- PLAIN NEUROBIOLOGICAL KNOWLEDGE CENTER (HU) FUNDING MECHANISMS (FUNDING - DIRECT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
DNT management

Contents
- The SNKC, established with the support of the National Office for R&D, is planned to be self- sustaining by letting out facilities and merchandising methods and services.
- The SNKC will be integrated in the biotechnology and health - care conception of Szeged and the South- Plain region through connections to Szeged Pólus Public Company which results in a future sustainability.

Intended recipients
The consortium partners.

Expected results
The SNKC will be self- sustaining.

Costs
The own- contribution to the projects applied for.

REPRODUCIBILITY

Requirements
The existence of the consortium, the presence of competences in the area of IPR and researcher potential.

Time
Not relevant.

Sector specificity
The sector determines the type of funds available although the mechanism is almost the same.

RESULTS

Results
It is predictable that after the funding runs out the SNKC will be self- sustaining, due to the industrial partners and enterprises contribution and the availability of EU and national sources of funding.

Deviations from stated objectives
The industrial partners accessing to the partnership results in a more market oriented approach to research and development activities.

Other actors involved
Industrial actors interested in the research results, methods and services.

UPPSALA BIO – THE LIFE SCIENCE INITIATIVE (SE) UPPSALA BIO-X (FUNDING - DIRECT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Uppsala BIO

Contents
The purpose is to create new business opportunities by supporting research projects in Uppsala focused on transferring research results to the product concept.

Intended recipients
- Researchers/ projects with commercial potential in an early stage of development.
- The regional biotech industry members of the cluster lend their support by providing an industrial approach to the research effort

Expected results
- To run 3-4 research projects annually, and have totally 6-8 high quality projects running since the start
- Identify about 20 new potential research initiatives
- To achieve a ratio of one successful exit per 5 projects

Costs
Uppsala BIO funds the BIO-X effort with €500,000 annually and the industrial and academia members of the cluster co-fund with the same amount.

REPRODUCIBILITY

Requirements
A strong research base support from regional development agencies/institutions.

Time
The Uppsala BIO-X started in 2002 and its planned to run until 2010.

Sector specificity
The action is directly aimed targeted to the Biotech sector.

RESULTS

Results
- About 20 senior researchers from local universities engaged
- The set up of a scientific advisory board for the evaluation and supervision of the projects
- Industrial and academic meeting to discuss concrete research issues and research strategies.
- Three projects in the works

Deviations from stated objectives
So far no evaluation of the BIO-X effort has been conducted.

Other actors involved
Universities/research centres (constituting the science base), private companies.

AARHUS BIOCLUSTER (DK)
BUSINESS ANGEL NETWORK (FUNDING - INDIRECT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Østjysk innovation A/S

Contents
- A number of business angels have been identified.
- A network has been established and frequently meetings are held where new ideas and opportunities within the sector is presented to the network.

Intended recipients
Entrepreneurs and business angels.

Expected results
For the mutual benefit in presenting entrepreneurial ideas for possible investors.

REPRODUCIBILITY

Requirements
A body has to be the initiator of the action and to maintain the activity level.

Sector specificity
Not necessarily just oriented towards the bio sector.

RESULTS

Results
Investments and the involvement of external resources experts in the companies.

EVRY CLUSTER (FR) - PÔLE PROJETS EUROPÉENS - EUROPEAN PROJECTS OFFICE (FUNDING - INDIRECT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Chamber of Commerce & industry of Essonne, in partnership with Genopole for health thematic

Contents
To help SMEs to participate to the European projects of the FP7

Intended recipients
- Firms (mainly SMEs) - Laboratories - Universities

Expected results
One Year expectations:
- SMEs informed/helped: 100
- Participation in FP7 projects: 20
- Coordination of FP7 projects: 3

Costs
3 full-time as members of the CCI + travel and logistics costs
Total: € 175,000 year.

REPRODUCIBILITY

Requirements
- Presence of a local actor close to the SMEs (CCI)
- Competences: People who know FP7 & European projects / participate to projects
- Presence of industrial/innovative SMEs
- Presence of laboratories / business incubators
- A European network
- Coordination with local, regional, national and European actors to avoid any overlapping.

Time
- Time of implementation --> 8 months
- The action should be available for the entire duration of the FP7

Sector specificity
No specificity.

RESULTS

Results
- After 6 months
- SMEs informed/helped: 50
- Participation in FP7 projects: Data not available at this time
- Coordination of FP7 projects: Data not available at this time

Deviations from stated objectives
At this stage, there is no deviation.

Other actors involved
- CCI: localisation of the PPE - South Paris network: information relay
- Information Relay Centre - Genopole
- Nurseries, incubators, TTO, and federations

HEIDELBERG BIOCLUSTER (DE)
HEIDELBERGER GRÜNDER TEAM (FUNDING - INDIRECT)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
- Heidelberg Technology Park
- Heidelberger Gründer Team
- High Tech Founders' Fund of Federal Ministry of Science and Education
- DKFZ – German Cancer Research Center
- EMBL – European Molecular Biology Laboratory
- Heidelberg University

Contents
The Heidelberger Gründer-Team is an initiative of successful young entrepreneurs in biotech which deliver a number of business services with a view to establish new companies.

Intended recipients
To all post-docs, profs and any other potential founders in universities or research institutes.

Expected results
- Possibility of founding new companies due to the initiative high tech founders' fund
- Moreover newly founded companies due to other private equity investments

Costs
So far: about € 12.000 for Heidelberg Technology Park.

REPRODUCIBILITY

Requirements
- Incubator available
- TT departments or companies exist in the region
- The two consultants had to be accredited by the High Tech Founders' Fund organisation

Time
Estimated time of duration: about 2 - 3 years.

Sector specificity
Dedicated to biotech.

RESULTS

Results
- After 1 year: 9 projects in progress
- 6.5 Mio € raised for companies' funding
- Another 6 Mio € to be to decide

Deviations from stated objectives
Results are very good. Business plans and strategies seem to have high quality format - due to the excellent research in the institutes and the competent evaluation and choice of projects to follow up for foundation in comparison to those which should somehow continue "incubation" in research institutes for some more time.

Other actors involved
All the actors already mentioned.

THE VACCINE THERAPY CLUSTER (HU)
SETTING UP THE CLUSTER (INCLUSION)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Cluster management

Contents
Relationship among universities, research institutes, SMEs and the Semmelweis Medical School of Budapest are at the basis of the cluster start up.

Intended recipients
Future members of the cluster.

Expected results
To establish a cluster where the most important task is the development of new vaccine products containing plasmid DNA as the active ingredient.

Costs
Setting up a cluster did not require special costs, but the realization of the common goals.

REPRODUCIBILITY

Requirements
Main requirements are:
- Recognising a common interest
- Motivation
- Willingness to put together the special knowledge
- Low level of bureaucracy
- Information technology
- International project experiences

Time
After establishing the leader company it took a year to find the suitable partners, recognise the common interest, add together the knowledge and to apply for funds for the realization process.

Sector specificity
Only biotech sector

RESULTS

Results
The most suitable partners have been found and they agreed on a common goal. Together they have been able to apply for funds for the realization. The new AIDS vaccine therapy method has been developed, and now they are in clinical trial phase.

Deviations from stated objectives
Lack of financial assets is a general Hungarian problem, especially for SMEs in starting phase. The problem is not simply the lack of money but also the lack of due diligence in Hungarian venture capital companies.

MI-TO BIOTECH (IT)
PIEMONTE LIFE SCIENCES (PROMOTION)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Biondustry Park del Canavese, Regione Piemonte, ITP - Invest in Turin and Piedmont

Contents
Piemonte Life Sciences is the Internet portal of life sciences in Piedmont. Main contents:
- Strategic and market documents
- News
- Directory of organisations, research centres, research groups and University projects
- Directory of researchers with an informatic tool able to find their main publications (from Pubmed) and their registered patents (from Espacenet database)

Intended recipients
Companies, investors, local authorities, Chambers of commerce and everybody interested in getting information about life sciences in Piedmont.

Expected results
Information initiative, no specific and measurable results are expected.

Costs
Average of 35.000 euro/year.

REPRODUCIBILITY

Requirements
- Expertise on the territory
- Willingness to promote the sector and the territory as a unique element
- Specific web-based and research tools

Time
- Start and preparation: 6 months
- Duration: years. And still growing

Sector specificity
Life sciences only.

RESULTS

Results
- Data base with more of 769 scientists of 3 different universities
- Data base with more of 100 companies
- Socio-economic analisys
- Internet Platform

Deviations from stated objectives
n.a

Other actors involved
- Piedmont and ITP: financing and supporting
- Transalpine Biocluster: benefited from the actions put in place

MI-TO BIOTECH (IT)
ITALIAN BIOTECHNOLOGY DIRECTORY (PROMOTION)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Biopolo s.c.r.l

Contents
The Italian Biotechnology Directory is the first data bank on line useful to know biotech Italian market and to create a network of relationships between public and private entities.

Intended recipients
- Companies
- Academic
- Found/Assoc
- Institutions
- Investors
- Patents
- Parks

Expected results
The goal of this initiative is to provide a free and accurate gateway to the Italian bioworld.

Costs
Over € 120,000 per year.

REPRODUCIBILITY

Requirements
Good network, IT facilities and tools, high quality management.

Time
Years for proper development.

Sector specificity
Very sector specific.

RESULTS

Results
The Italian Biotechnology Directory is intended to be a major information tool for people who wanted to understand the Italian context and make business with Italian biotech organizations. With more than 1.000 page views per day, and over than 4.000 visitors per month the directory is a success and the trend shows a continuous growth.

Deviations from stated objectives
No deviations

Other actors involved
- City of Milano
- Province of Turin
- Province of Siena
- Assobiotec
- IFOM
- Milan Chamber of Commerce

MI-TO BIOTECH (IT)
BIOFORUM - CONFERENCE (PROMOTION)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
ITER (Innovation: Technologies, Experience and Research)

Contents
Bioforum is an Expo-Conference within biotechnologies that brings together science and business. Seminars are held, exhibitors have the opportunity to meet other actors and research centres and universities have the opportunity to set up one-to-one meetings with potential foreign technology and commercial partners.

Intended recipients
The practice is devoted to Italian biotech firms and international biotech actors interested in the Italian biotech industry.

Expected results
- To be a meeting place for science and business
- Increase international awareness of the Italian biotech industry and increase cooperation with international biotech actors

Costs
na

REPRODUCIBILITY

Requirements
Biotech companies interested to cooperate with foreign actors. International actors interested in the Italian biotech industry. An event planner and sponsors. Influential speakers to hold seminars.

Time
- 4th edition in 2007
- 5th edition planned for 1-2 October 2008

Sector specificity
Biotechnology

RESULTS

Results
Bioforum 2006 generated the following results:
- 1.340 participants, for totally more than 1.700 presences
- 200 Companies and Research Agencies involved
- More than 100 qualified speakers
- 25 specialized conference sessions
- Visitors evaluation: 96% good or total satisfaction
- Exhibitors evaluation: 98% good or total satisfaction

Deviations from stated objectives
Growth year after year of the number of attendants and internationalisation of the event itself.

Other actors involved
- Province of Milan
- Lombardy Region
- Chamber of Commerce of Milan
- City of Milan

SOUTH MORAVIAN INNOVATION CENTRE (CZ)
CZECH BIOTECH REPORT - CD - ROM (PROMOTION)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
South Moravian Innovation Centre

Contents
Czech Biotech Report is a CD-ROM containing complete database of Czech biotechnology companies and research entities, with the latest statistical data about Czech biotechnology sector.

Intended recipients
Czech and foreign biotechnology companies and research entities, their suppliers and customers, support organisations, Czech and foreign governmental and non-governmental organisations.

Expected results
- Providing comprehensive information about Czech biotech sector
- Facilitating mutual connection among Czech biotech organizations
- Fostering collaboration between Czech biotech companies and other Czech and foreign partners

Costs
€ 2,100 (500 copies)

REPRODUCIBILITY

Requirements
- Developing infrastructure in the biotech field
- Know-how of the South Moravian innovation Centre in the biotechnology field

Time
3 months

Sector specificity
Biotechnology

RESULTS

Results
- Number of CDs produced: 200 copies (distributed at the international convention BIO 2007 in Boston)
- Another 300 copies will be produced in order to obtain another sponsorships

Deviations from stated objectives
- Fulfils expectations to its full
- Valuable as a promotional item

SOUTH MORAVIAN INNOVATION CENTRE (CZ)
GATE2BIOTECH (PROMOTION)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
- South Moravian Innovation Centre - Provider
- CzechInvest - General Partner

Contents
- Gate2Biotech is the official internet portal for Czech biotechnology which has been created by the South Moravian Innovation Centre with support of the agency CzechInvest
- The portal contains a complete database of Czech biotechnology companies and research entities. Through the portal companies can easily search facilities or other partners to help them solve various technology problems and present their services to potential partners from the Czech Republic and abroad

Intended recipients
Biotechnology companies, suppliers, investors, institutions, students, public.

Expected results
- To become one of the most visited national portal in the Central Europe dedicated to biotechnology
- To be entirely self-financed

Costs
29 000 €/year

REPRODUCIBILITY

Requirements
Cooperation with biotech companies, research institutes and students.

Time
- Time required for the action to start: 1 year (2005)
- The project is continuous

Sector specificity
Biotechnology

RESULTS

Results
- The users of the portal are located in more than 50 countries around the World
- The portal is visited by more than 4000 users every week.
- The portal contains more than 4000 data records
- The number of registered users: 900
- The portal is 50% self-financed.

Deviations from stated objectives
The portal is expected to be entirely self-financed.

Other actors involved
- Partner organisations - barter deals, sponsorship
- University students - contributors to the portal content

MI-TO BIOTECH (IT)
SUPPORTING INTERNATIONALIZATION OF LOMBARDY FIRMS

OBJECTIVES AND CHARACTERISTICS

Actors in charge
- Lombardy region
- Lombardy Chamber of Commerce

Contents
- The main activity is financing companies through voucher, that can be used into one of the entities which implement the actions of this notice
- The financings are allocated by an area division

Intended recipients
The practice is devoted to firms located in Lombardy, especially to:
- SMEs with registered office in Lombardy and in writing on Companies Register of Chamber of Commerce
- Craft Companies having registered office in Lombardy and in writing on Craft Companies Register of Chamber of Commerce Patent protected ideas

Expected results
The aims of the voucher are:
- Participation in international fairs in foreign countries. For each company the voucher value is about €3,000 for fairs placed in Europe and in Mediterranean fields and about €4,500 for other kind of fairs
- Research of foreign partners to support the development of contacts between Lombardy and foreign companies. The voucher value is about €2,500
- Promotion for foreign commercial structures. The voucher value is about €5,000

Costs
€7,000,000 so divided:
- 3.5 milion financed by Chamber of Commerce system
- 3.5 milion financed by Lombardy Region

REPRODUCIBILITY

Requirements
Agreement between Lombardy Region and Chamber of Commerce system.

Time
- November, 30 2006 / March, 31 2008
- September 2006 / December 2007

Sector specificity
No specificity

RESULTS

Results
956 applications

SOUTH MORAVIAN INNOVATION CENTRE (CZ)
BIOTEC (PROMOTION)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
South Moravian Innovation Centre –Trade Fairs Brno - South Moravian Region - CzechInvest - International Clinical Research Center - Central European Technology Institute

Contents
BIOTEC is an annual convention held as an integral part of the International HOSPIMedica Fair at the Brno Exhibition Centre.

Intended recipients
Biotechnology and biomedical companies, universities, researchers and general public.

Expected results
The aim of BIOTEC is to raise awareness of the latest discoveries in biomedical and biotechnology research and present the results of this research to companies, university students, researchers and other subjects interested in this field.

Costs
- Trade Fairs Brno: 15 000 EUR
- South Moravian Innovation Centre: 4 500 EUR
- Staff involvement: 3 people

REPRODUCIBILITY

Requirements
- Collaboration with the International Clinical Research Center
- Know-how of the South Moravian Innovation Centre
- Collaboration with the Trade Fairs Brno in organizing the event

Time
- Time required for the action to start: 3,5 months
- Duration of the conference Gate2Biotech: 1day
- Duration of the Show Incubator: 4 days

Sector specificity
BIOTEC is focused mainly on biotechnology and biomedical research and its implementation into practice.

RESULTS

Results
- Number of participants of the conference Gate2Biotech: 150
- Number of exhibitors at Show Incubator: 14
- Presentation of the event on www.gate2biotech.com, in international magazine BioWorld Europe, etc.

Deviations from stated objectives
Lower number of participants of the conference Gate2Biotech than expected - the number of registered participants was 180.

SOUTH- PLAIN NEUROBIOLOGICAL KNOWLEDGE CENTER (HU)
NETWORKING AND INTERNATIONALISATION (PROMOTION)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
DNT marketing management

Contents
- International partnerships are very requested due to the lack of funding for R&D from local pharmas
- The main ways of promoting the cluster is through taking part in international exhibitions and partner-search events
- The connection network of the researchers is also a key element because it provides each other with confidence and trust

Intended recipients
- SNKC partners
- International actors in Biotechnology sector

Expected results
The expected results are:
- Finding international partners
- To acquire a good reputation abroad
- To sell novel methods and services

Costs
Wage costs of management
Costs of taking part to the events

REPRODUCIBILITY

Requirements
- Biotech related thematic events are organized and SNKC can participate
- Also the financial resources and the human infrastructure has to be present

Time
- No actual time is needed to prepare for the action
- As for the duration it should be continuous

Sector specificity
Not only biotech but all high tech sectors.

RESULTS

Results
The expectations are met. The communication with international partners (e.g. Cedars- Sinai, NUMICO) has started.

Deviations from stated objectives
Communicating with international partners requires confidence and trust which takes time to achieve.

Other actors involved
Cluster management and researchers.

DUNDEE (UK)
BIO DUNDEE (PROMOTION)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Public/private and academic sectors active in the Dundee area.

Contents
Bio Dundee was established in 1998 as a voluntary partnership between all actors involved in the biotech industry to enhance local communications and networking within the life sciences sector in Dundee and to promote the recognition of Dundee as a centre of life sciences and biotech internationally renown.

Intended recipients
Bio-cluster within Dundee.

Expected results
- To foster networking among actors in Dundee life sciences
- To make Dundee an environment where continuous learning, improvement, innovation and shared experiences can take place
- Also aims to foster international awareness of Bio-Dundee

Costs
Approximately €90,000 pa. Dundee City Council and Scottish Enterprise Tayside as main contributors. ERDF funding for approx. 50%.

REPRODUCIBILITY

Requirements
Must be stakeholders in the Dundee life sciences sector.

Time
BioDundee - ongoing since 1998.

Sector specificity
Life Sciences

RESULTS

Results
- Established BioDundee as an internationally recognised brand for Dundee life sciences.
- Developed local networking between public/private and academic sectors.
- Developed local biotech front-line team supervisors

Deviations from stated objectives
BioDundee has operated flexibly responding to changing conditions and opportunities.

Other actors involved
Scottish Enterprise and IRC Scotland, a partner with BioDundee in partnering of SMEs.

BIOTECH-REGION MUNICH (DE)
SUPPORT THROUGH INCUBATORS

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Martinsried Innovation and Incubator Center (IZB).

Contents
- IZB offers a functional and flexible infrastructure. IZB considers it very important that the choice of tenants includes an optimal mixture of established start-ups, biotech service firms, new start-ups, as well as several international companies, to promote progress and cooperation at the IZB
- Further advantages: Close contacts to the VC scene, active location marketing, close network of science, research and link minded institutions, day care center.
- New Internet portal should improve communication between neighbouring scientists and companies in residence.

Intended recipients
Start-ups and enterprises in the area of life sciences.

Expected results
To support the foundation of Life Science enterprises and enable the implementation of research results in the area of Life Sciences.

Costs
The total investment sum is about €47 M.

REPRODUCIBILITY

Requirements
- Moral support concerning licensing procedures as well as financial support by politics.
- A lot of know-how in the cluster

Time
From November 1993 (establishment of an advisory committee) to july 2002 (official opening).

Sector specificity
Only biotech sector.

RESULTS

Results
More than 3000 job created from 1995.

Deviations from stated objectives
Support through Bavarian government with funds, licences etc.

Other actors involved
The partners are the State of Bavaria (76%), Planegg local authorities (6%), the administrative district of Munich (6%), the city of Freising (6%), and the administrative district of Freising (6%).

DUNDEE (UK) - DUNDEE UNIVERSITY INCUBATOR (SUPPORT INFRASTRUCTURES AND CO-LOCATION SERVICES)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Company Development Incubator Manager, Research and Innovation Services, University of Dundee

Contents
Assessment of academic spin out proposition, market research, development funding applications, business planning, building the management team, raising finance, transferring technology to company and locating company in University Incubator and incubating over formative 2 to 3 years.

Intended recipients
Founding academic inventor/entrepreneur and University.

Expected results
A target of 4 spin out companies each financial year.

Costs
Approx. £80,000 p.a. met by University of Dundee.

REPRODUCIBILITY

Requirements
- High growth tech spin out company propositions
- University IP Section establishes IP position and protection strategy
- University Incubator established
- A supportive environment
- Access to funds

Time
On case by case basis. Once established at the Incubator, the spin out company is supported for the initial 2 years with a review period in 3rd year.

Sector specificity
Technology R&D specific, inclusive of biotech.

RESULTS

Results
- On average 3 spin out companies pa, in total 22 since 1986, 14 in the last 6 years
- Incubator: 12 units of 6,400 lettable space available. 67% full after 2 years and anticipated 85% occupancy target to be reached in 3rd year of operation

Deviations from stated objectives
- Success or failure depends on strong personal relationships/networks developed by founders
- Accessing initial financial resources
- Successful pursuit of TR&D

Other actors involved
- Local Enterprise Company (SET) for commercialisation awards.
- Scottish Enterprise for Proof of Concept funding for technology development projects.
- Scottish Executive for R&D
- Technology Fund and business angels

DUNDEE (UK) - DUNDEE TECHNOPOLE (SUPPORT INFRASTRUCTURES AND CO-LOCATION SERVICES)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
- Dundee City Developments Ltd (DCD)
- University of Dundee

Contents
- Dundee Technopole is a business park located near the main campus of the University of Dundee. It aims to provide accommodation for technology-based SMEs seeking to benefit from physical proximity to the University
- An "Innovation Portal" has been set up to provide support services

Intended recipients
University Spin-outs, other technology start-ups, from Dundee or from outside Dundee.

Expected results
Creating a technology community of growth companies with access to the expertise of the University, attracting technology R&D companies.

Costs
€7.5m for the infrastructure to date.

REPRODUCIBILITY

Requirements
Acquisition by city public authority of large "brown field "site, buildings clearance, site servicing.

Time
- Ongoing for about 10 years
- Typical duration of incubator lease is about 1-2 years

Sector specificity
Not only biotech but all high tech sectors.

RESULTS

Results
- Incubator 1 was taken over entirely by a University of Dundee's spin-outs, Cyclacel, later replaced by another University of Dundee spin-out, CXR biosciences
- Incubator 2 is currently occupied by various Dundee University spin-outs, and the Innovation Portal

Deviations from stated objectives
Success factors: Flexibility of property options offered to companies; Proximity to University life science research centres.

Other actors involved
Technopole has been developed with the use of ERDF funding.

MI-TO BIOTECH (IT) - BIOINDUSTRY PARK DEL CANAVESE (SUPPORT INFRASTRUCTURES AND CO-LOCATION SERVICES)

OBJECTIVES AND CHARACTERISTICS

Actors in charge

BIPCA has among its shareholders the most important local public institutions and private companies.

Contents

Bioindustry Park Canavese promotes and develops research in biotech and life sciences by hosting enterprises and offering research facilities, scientific and support services.

Intended recipients

The park is dedicated to national and international SMEs interested in setting up research and experimental production.

Expected results

To make the local biotech sector grow by providing low cost premises in a specialized environment, high qualified business services (technology transfer, IPR protection, services for the creation of new companies) and a set of international relationships with actors involved in biotech across Europe.

Costs

BiPCa is a joint stock company with over 5.6 million Euro of registered capital. In 2004, its overall turnover was 3.91 Euro, from leasing, provision of services, research and development and divulging technology.

REPRODUCIBILITY

Requirements

- A clear engagement of institutions and universities, in parallel with the commitment of the private sector
- Entrepreneurial management with returns on medium-along period
- Strategy of enterprise's attraction and creation
- Global networking and vision

Time

- 1995-1998: creation
- 1998-nowadays: implementation and growth

Sector specificity

Biotechnology

RESULTS

Results

- A high number of companies and research centres operational in BIPCA
- 25 patent filed by organization settled in the Park.
- More than 200 SMEs met for technology transfer activities
- Incubation of new start ups
- A number of projects/activities carried out in the field of TT, networking

Deviations from stated objectives

Minimal

Other actors involved

Shareholders, University located inside the Park EU and Piedmont Region for financing.

MI-TO BIOTECH (IT) - LIMA I-TECH PLAT (SUPPORT INFRASTRUCTURES AND CO-LOCATION SERVICES)

OBJECTIVES AND CHARACTERISTICS

Actors in charge

Piedmont Region, Bioindusty Park del Canavese

Contents

The goal is to transform the laboratory LIMA of Bioindustry Park in a "multiple purpose" platform where different actors, technologies and know how are gathered with the aim of generating new expertise, know how and projects to be put at disposal of the research system.

Intended recipients

Companies and University groups.

Expected results

- 32 aid grant/contracts activated in 18 months
- 2 Contracts with senior consultants
- Get in touch with 20 entrepreneurs for analysis
- 11 self sufficient research projects
- 10 Research Centres involved in science research ad TT
- Ideally 5 patents

Costs

Around 2.140.000€ financed up to 67% by Piedmont Region.

REPRODUCIBILITY

Requirements

- LIMA that was already build as a multidisciplinary laboratory
- University with R&D results
- Know how in TT and evaluation of research results
- Know how in R&D in Biotech

Time

- Starting procedure: 6 months
- Duration: 18 months

Sector specificity

A technology platform mainly on biotech but also with interests in nanotechnology.

RESULTS

Results

For the moment the expected results have been achieved.

Deviations from stated objectives

The strong initial selection process generated a panel of mainly good projects.

Other actors involved

- IRCC Candiolo: project development
- Naples University: project development
- Turin University: project development
- Insubria University

SOUTH- PLAIN NEUROBIOLOGICAL KNOWLEDGE CENTER (HU) CREATING AND OPERATING AN INCUBATOR FOR SPIN- OFFS

OBJECTIVES AND CHARACTERISTICS

Actors in charge

DNT management

Contents

Laboratories and offices, a 40 m2 room for seminars, lectures, workshops and business negotiations, and a further 72 m2 area for SMEs. Participants pay only the overheads for renting the laboratories and offices; other partner enterprises pay both renting fees and overheads.

Intended recipients

Spin- offs established amongst the consortium partners.

Expected results

The generated spin- offs will move in the incubator building and successfully operate within the Research Center and Incubator Building.

Costs

253.000.000 HUF

REPRODUCIBILITY

Requirements

Adequate infrastructure, financial sources, willingness on behalf of the spin-offs to operate within the incubator.

Time

The building process took 12 months.

Sector specificity

Creating and operating an incubator is not sector specific.

RESULTS

Results

The expected result has been achieved. The generated spin- offs moved in the incubator building and successfully operate within the Research Center and Incubator Building. Furthermore other enterprises are renting facilities.

Deviations from stated objectives

No deviation so far.

Other actors involved

- Other actors involved are the generated spin- offs to which the university contributed
- Egis Pharmaceuticals, one of the most significant pharma in Hungary, contributes research laboratories to the multifunctional building.

SOUTH- PLAIN NEUROBIOLOGICAL KNOWLEDGE CENTER (HU) FOSTERING THE SUPPORT INFRASTRUCTURE

OBJECTIVES AND CHARACTERISTICS

Actors in charge

DNT marketing management

Contents

- The DNT Research and Incubator Building (RCIB) opened in the hearth of the university campus with the aim to enhance the support infrastructure based on already existing resources in collaboration with private companies
- It provides a scientific and laboratory background for the full scale activities of drug R&D, from discovery to preclinical studies

Intended recipients

Members of the consortium, external industrial actors.

Expected results

The Research Centre and Incubator Building is set up.

Costs

253.000.000 HUF, in charge of the consortium partners.

REPRODUCIBILITY

Requirements

- Existence of an adequate building
- Presence of financial sources
- A common will for the development

Time

The building process took 12 months.

Sector specificity

The action is related to the biotech sector.

RESULTS

Results

The Research Centre and Incubator Building has been set up accomplishing the aim to create a research centre for the scientists and a incubator for the spin-off enterprises.

Deviations from stated objectives

- Delay in time management because of delays with the contracting mechanisms with managing authority.
- The consortium provides space for enterprises that can be partners on a long term run

Other actors involved

JSW Hungary Ltd. And Musgenex Ltd, with a view to provide the background for testing the research results.

CAMBRIDGE (UK)
PARTNERING WITH CAMBRIDGE COMPANIES (SUPPORT TO COLLABORATION)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
ERBI

Contents
ERBI runs an increasingly large partnering meeting. The conference is 3 days long, the third dedicated to partnering, with requests being processed onsite until the actual partnering day.

Intended recipients
Biotechnology companies, pharmas, business and tech-service providers.

Expected results
- A higher number of meetings taking place
- Measures such as number of deals are hard to quantify: many deals are the result of meetings across 3 or 4 partnering and companies often keep this information confidential

Costs
Costs for the ERBI partnering day are estimated at € 40000. Costs will vary significantly with software used, promotion, venue etc.

REPRODUCIBILITY

Requirements
- A reasonably sized cluster or effort by clusters situated closely
- An experienced event management team.

Time
A 12 month planning period is needed from inception to actual event. A Partnering Manager should work part time for most of the year and full time as the meeting comes nearer.

Sector specificity
Sector specific.

RESULTS

Results
The 2007 meeting should increase above 600 partnering meetings.

Deviations from stated objectives
The removal of any restriction to who can make partnering request - initially only biotechs and pharmas and after business service providers.

Other actors involved
ERBI works with EBD for partnering software, with the national trade organisation UKTI as well as overseas organisations.

MI-TO BIOTECH (IT)
BIOFORUM – IRC PARTNERING EVENT (SUPPORT TO COLLABORATION)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
- Chamber of Commerce of Milan, CESTEC
- IRC Lombardy region
- ITER (Innovation: Technologies, Experience and Research)

Contents
Bioforum is an Expo-Conference within biotechnologies that brings together science and business. Companies, research centres and universities have the opportunity to set up one-to-one meetings with potential technology and commercial partners coming from all over the world.

Intended recipients
The practice is devoted to Italian biotech firms and international biotech actors interested in the Italian biotech industry.

Expected results
The aims of Bioforum are:
- To be a meeting place for science and business
- To enable successful contacts and meetings with a view to cooperation
- Increased international awareness and interest for the Italian biotech industry

Costs
Approximately 30000 Euro.

REPRODUCIBILITY

Requirements
Biotech companies interested in partnering opportunities. International actors interested in the Italian biotech industry. An event planner and sponsors. Online internet portal.

Time
- Bioforum 3rd edition in 2007 (two days)
- It takes approximately 4 months to organize the event
- 4th edition planned for 2008: 1-2 October 2008

Sector specificity
Biotechnology

RESULTS

Results
- Bioforum 2006 results: more than 360 partnering meetings, among 418 requests.
- The partnering meetings were held between 140 companies and research agencies interested in the Italian biotech industry. 40% of the participants were from abroad.

Deviations from stated objectives
None

Other actors involved
- Lombardy Region
- Province of Milan

THE VACCINE THERAPY CLUSTER (HU)
MANAGING INTELLECTUAL RIGHTS (SUPPORT TO COLLABORATION)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Cluster management

Contents
The leading company of the cluster claimed all the rights (patents) of the results in the cooperation but as a reward everybody who was involved in the development will get 2% of the income.

Intended recipients
Actors on the biotech market.

Expected results
To tackle the intellectual property right problems.

Costs
The cost arisen was the process of claiming the patent.

REPRODUCIBILITY

Requirements
- The cluster requires the presence of competences in the area of intellectual property
- The leading company is in charge of visioning and getting the cluster out of the early development phase to business development

Time
It is hard to determine how much time is required for the action to start as it depends on the time in which research result are achieved and the process of claiming a patent can start.

Sector specificity
Not only biotech but all high tech sectors

RESULTS

Results
The patent is the intellectual property of the leading company. The partners have agreed on that if the clinical trials are over and production can start, which means a marketable product, all the partners will be entitled to a certain amount of income.

Deviations from stated objectives
The partners understood that the patent is worth less than when incorporated in a product, and could agree on the above mentioned arrangements.

DUNDEE (UK) - TRANSLATIONAL MEDICINE RESEARCH COLLABORATION
(SUPPORT TO RESEARCH ACTIVITIES)

OBJECTIVES AND CHARACTERISTICS

Actors in charge
Universities of Edinburgh, Aberdeen, Dundee and Glasgow, Wyeth Pharmaceutical Co, Scottish Enterprise and NHS Scotland

Contents
The TMRC is a public-private venture to research, develop and clinically test bio-markers creating IP for commercial exploitation.

Intended recipients
To directly benefit the actors in charge by improving on their technology and IP revenue, and patients through better medicines and earlier diagnosis

Expected results
The TMRC is expected to bridge the gap between pre clinical and clinical studies.

Costs
A total of about € 50m investment. Wyeth plans to invest an estimated € 33m in the first five years, Scottish Enterprise will invest up to € 17.5m.
Additional € 1.2m in projects with CXR Bioscience Ltd.

REPRODUCIBILITY

Requirements
- Defined roles and well established processes
- Presence of scientific centres of excellence
- Complementary skills
- Availability of finance
- Shared IP and umbrella agreements

Time
Project started in 2006, ongoing 5 years renewable commitment.

Sector specificity
Life Sciences specifically biotech.

RESULTS

Results
More than $15m invested into 28 research (out of 80 project proposals submitted), central laboratory now functional, 89 jobs created in the first instance, rising to as many as 120 over five years.

Deviations from stated objectives
Recent partnership with biotech (CXR) so as to bring further funding, diversity and possible royalties into TMRC.

Other actors involved
A number of specialist biotech firms.

GENOPOLE (FR) - HELP FOR THE RESEARCHER RETURNS (SUPPORT TO RESEARCH ACTIVITIES)

OBJECTIVES AND CHARACTERISTICS

Actors in charge

Genopole

Contents

- Return grants: to help young who, after having performed postdoc training abroad, wish to be hosted in Genopole
- Establishment grants: ATIGE, to offer young researchers to establish and develop a research group in Genopole
- Call for proposals for the laboratories and companies of Genopole
- Reception of foreign researchers from Emerging countries.

Intended recipients

Researchers from laboratories and academia.

Expected results

Researchers stay in France, attractiveness for researchers, contact with foreign laboratories.

Costs

- €53,000 during one-year for a researcher (renewable one time); Genopole is supported by Regional Council
- ATIGE: €230,000 for 3 years; Genopole is supported by Regional Council

REPRODUCIBILITY

Requirements

Strong links between biocluster & SMEs, international network with French researchers.

Time

- Very quickly because of the good international contacts. No limit for the duration
- Duration of an ATIGE allocation: 3 years

Sector specificity

Concern only sectorial laboratories, but could be adapted to others.

RESULTS

Results

- 42 post-docs researchers (every researcher has stayed by now)
- 11 ATIGE since 2001
- Contacts established with foreign laboratories.

Deviations from stated objectives

No important deviation.

Other actors involved

Genopole is here partner of a website (http://www.science-odyssee.org/) which allows foreign researchers to keep in touch with local information.

BIO TECH REGION MUNICH (DE) - TECHNOLOGY TRANSFER (TECHNOLOGY TRANSFER & ENTREPRENEURIAL COACHING)

OBJECTIVES AND CHARACTERISTICS

Actors in charge

- Fraunhofer Patentstelle für die DeutscheUniversities
- Max-Planck Innovation GmbH
- Ascenion
- Munich Business Plan Competition
- Munich Business Angels Network

Contents

Services aiming at creating innovation in technology-orientated companies.

Intended recipients

Inventors, start-ups, companies.

Expected results

Creating innovations in technology-orientated companies is the objective of the Fraunhofer Patent Center.

REPRODUCIBILITY

Requirements

Incubator, a strong scientific and industrial base.

Time

Max Planck Innovation began its professional support of spin-offs from the Max Plank Society in 1990.

Sector specificity

Technology-oriented companies.

RESULTS

Results

Max Planck Innovation currently oversees more than 1,000 inventions and has shareholdings in 17 companies. Each year, additional 120 to 140 projects are taken on. Since 1979 managed about 2,600 inventions, has closed more than 1,500 license agreements and, since 1990, coached 46 spin-offs. The total proceeds for inventors, the Max Planck Institutes and the Max Planck Society currently amounts to about €200 M.

Deviations from stated objectives

Its track record places Max Planck Innovation in the world's 'premier league' of technology transfer institutions.

Other actors involved

- Bavarian State Ministry for Economic Affairs, Infrastructure, Transport and Technology
- All research institutes and universities within the cluster

DUNDEE (UK) - COMMERCIALISATION AWARDS (TECHNOLOGY TRANSFER & ENTREPRENEURIAL COACHING)

OBJECTIVES AND CHARACTERISTICS

Actors in charge

Scottish Enterprise Tayside (SET), universities in the region

Contents

Technology transfer from research into early stage invention and financial and project support for projects arising from Dundee universities research.

Intended recipients

Academic teams. Each project team involves an academic research leader and technical operations member.

Expected results

The objective of the action is to create value from research discoveries through initiating the commercialisation process.

Costs

A non-recoverable grant of €25,000 for each project. This cost is matched in kind or cash by the supporting university to pay for consumables and other direct costs.

REPRODUCIBILITY

Requirements

- Each project proposing a novel development of a research discovery in which the universities have scientific competence and background research
- The lab work being carried out with the universities
- The project being feasible in terms of the time and financial resource constraints of the reward

Time

Each award provides for a 12 month period of project support.

Sector specificity

The programme is available to support projects in the life sciences and in the digital media sectors.

RESULTS

Results

Licensing of IP, development of two biotech R&D spin-outs. The projects have proved most helpful in enabling the clarification of potential R&D candidates, protection of IP, and testing of associated research teams.

Other actors involved

None

MI-TO BIOTECH (IT) - DISCOVERY INITIATIVE (TECHNOLOGY TRANSFER & ENTREPRENEURIAL COACHING)

OBJECTIVES AND CHARACTERISTICS

Actors in charge

Piemont Region, Bioindustry Park and Eporgen Venture

Contents

Discovery identifies and select innovative entrepreneurial ideas in biotech sector with a view to install them into the Bioindustry Park Bioincubator. After the selection, ideas are presented to Eporgen Venture, a local seed capital company.

Intended recipients

Researchers

Expected results

Attract research projects/ideas of scientists in order to select the most interesting and to start entrepreneurial activities in the Biotech sector.

Costs

- €2,700,00 ERSF through Piedmont Region
- €300,00 promotion + coaching/selection
- €3,000,000 private seed capital

REPRODUCIBILITY

Requirements

- An incubator/science park
- Local business angels and investors
- A clear commitment by public authorities
- University with R&D results

Time

The action is available for 6 years, with 3 "rounds" of 2 years each.

Sector specificity

Discovery is strongly sector specific.

RESULTS

Results

- First round: mid 2004 - mid 2005: 8 universities visited, 200 scientists encountered, 100 EoI generated, 23 ideas received, 6 selected and 5 transformed in new companies.
- Six start-ups have been set up in the first edition. Of the 6 companies, 3 are from other Italian regions.
- For the second edition, 2 new companies have already been created

Deviations from stated objectives

None

Other actors involved

- Arthur D Little, Index Ventures, Genève, Merlin Biosciences, London
- Rothschild Partnership, Paris
- ERDS for financing

MI-TO BIOTECH (IT) - DIADI - TESINA (TECHNOLOGY TRANSFER & ENTREPRENEURIAL COACHING)

OBJECTIVES AND CHARACTERISTICS

Actors in charge

Biondustry Park del Canavese

Contents

- The project was intended to fill the existing gap between the scientific discovery and its exploitation
- Tesina's aim is to transfer Technologies/technological innovations in to entrepreneurial contexts or in the foundation for new start ups

Intended recipients

The action was devoted to the researchers of the University of Turin.

Expected results

- The plan picks out a first innovations' group, tutors the object and the presentation to enterprises for activity of technological transfer
- In the event in which one is in presence of one it upgrades them entrepreneurial idea will be activated the opportune synergies
- Organisation of 3 informative seminars in the University of Turin
- Construction of 1 web site for the diffusion and visibility of the results
- Selection of 8 technology transfer projects to evaluate and develop
- Create value for 5 TT projects

Costs

Around € 280,00 financed up to 65% by ERSF.

REPRODUCIBILITY

Requirements

- University with R&D results
- Know how in TT and evaluation of result
- Know how in R&D in Biotech

Time

Years 2004-2006.

Sector specificity

Focused on life sciences and biotechnology.

RESULTS

Results

- Three seminar organized
- One web site online
- Technology transfer activities realized on 5 projects

Deviations from stated objectives

No

Other actors involved

- University of Torino: R&D results
- Tecnorete: promotion
- Piedmont Region/ERSF: financing

MI-TO BIOTECH (IT) - DIADI 2000 - LISTEN (TECHNOLOGY TRANSFER & ENTREPRENEURIAL COACHING)

OBJECTIVES AND CHARACTERISTICS

Actors in charge

Bioindustry Park del Canavese

Contents

The objective is to create a set of novel TT services to be offered to regional biotech companies in particular through the realisation of platforms that were aimed to:

- Cross the expertise of the research centres on the territory with the technologies present in the companies
- Inform SMEs about crucial subjects like financing, innovation management, intellectual property

Intended recipients

Companies of the Piedmont region, university of Turin, university of Western Piedmont and research centres (CNR).

Expected results

- Tools for the companies to lean out on the local, regional, national and international markets, evaluating their role in the interaction with the partners
- Tutoring of the companies to improve their performances

Costs

€ 80,000 year

REPRODUCIBILITY

Requirements

- A set of different capabilities, and needs
- Lack of networking between these different institutions

Time

Available for 3 years.

Sector specificity

Only biotech sector.

RESULTS

Results

- A web based platform of services to the SMEs
- Chances for personal meeting among enterprises and focus groups
- A back-office with functions of information provider and management of the web based "biotech job" service

Deviations from stated objectives

Better results could have been achieved through a deeper commitment of different actors.

Other actors involved

- IT providers
- Arthur d Little: consultant

MI-TO BIOTECH (IT) BIOINIZIATIVA (TECHNOLOGY TRANSFER & ENTREPRENEURIAL COACHING)

OBJECTIVES AND CHARACTERISTICS

Actors in charge

- Lombardy Region - Assolombarda (the Lombardy Industrial Association)
- Finlombarda (Financial Development Agency of the Lombardy Region)

Contents

- Create connection between research actors, institutions and the economic and financial system
- Develop services for enterprise creation in biotech

Intended recipients

Public or private researching groups based in Lombardy.

Expected results

To favour the correct evaluation of the research results within the region and their "translation" into innovations for the creation of new companies.

Costs

- Connection between actors of the research system
- € 125,000 - Lombardy region - € 125,000 - Cariplo Foundation
- Project evaluation and selection: € 1,000,000 - Lombardy region

REPRODUCIBILITY

Requirements

- Institutions and organizations able to support the implementation of the model
- Specific structures and organizations
- Adequate tax and territorial policies

Time

Approximately 3,5 years.

Sector specificity

High specificity to biotech sector.

RESULTS

Results

- A data base of projects with possible entrepreneurial and industrial implications
- 94 research projects with high potential for being "translated" into new companies selected
- 5 spin-off established

Deviations from stated objectives

Results above the expectations due to:

- Analytic and user friendly tools allowing researchers a self-evaluation of their capabilities and specialists to gather the real worth of each project
- Public and financial institutes available to collaborate

Other actors involved

- Assotec scarl: operating management
- IReR/Minerva project: financial supporter
- Cariplo Foundation: financial supporter
- CNR institutes
- Universities
- IRCCS
- Assobiotec

SOUTH MORAVIAN INNOVATION CENTRE (CZ) CETI CLUSTER (TECHNOLOGY TRANSFER & ENTREPRENEURIAL COACHING)

OBJECTIVES AND CHARACTERISTICS

Actors in charge

- CETI Cluster (Mr. Kubala, Mr. Chladek) - coordinator
- 10 companies from the region, 2 universities and research institutes

Contents

Mediation of summer internship possibilities for university students in cluster companies and vice-versa, promotion of cluster companies to the students.

Intended recipients

- Students - Enterprises - Universities

Expected results

- More than 30 students trained
- Training period: 2-3 months

Costs

- Cluster: Coordination, administration
- Companies: Salaries in total: € 100,000 (one student is approximately € 1,000 per month, each student stays approximately 3 months, totally 30 students participated)

REPRODUCIBILITY

Requirements

- Universities interested in the programme
- Students willing to increase their knowledge.
- Cluster: promotion, coordination, administration.
- Companies willing to accept students for internship

Time

- 2 months - facilitation of this idea within the cluster
- 2 months - advertisement, interviews of students and formal application and registration to labour authorities
- 3 months - training at companies and institutes
- 1 month - feedback and evaluation
- 1 month - lessons learned and plans for next year

Sector specificity

Biotech, Bioinformatics, Advanced materials.

RESULTS

Results

- Very positive reaction from companies
- Active participation of students
- Impulses for student career planning
- Impulses for diploma or doctorate thesis
- Company scholarship for "tested" students

Deviations from stated objectives

Met expectations.

Other actors involved

- South Moravian Region – City of Brno - CzechInvest -
- South Moravian Innovation Centre - Regional Development Agency of South Moravia

SOUTH- PLAIN NEUROBIOLOGICAL KNOWLEDGE CENTER (HU)
FOSTERING TECH- TRANSFER (TECHNOLOGY TRANSFER)

OBJECTIVES AND CHARACTERISTICS

Actors in charge

Cluster management, particularly governing board of the consortium

Contents

- The partners set up an amount for market research, recommendation of services and information materials when planning the budget, as useful tools for fostering tech - transfer
- SKNC has et up two enterprises (Vitadel Ltd. And Provit Ltd.) to foster the industrial utilization of the research results

Intended recipients

Industrial actors.

Expected results

To sell the research results to industrial actors.

Costs

Approximately 1,500,000 HUF, provided by the University of Szeged (25%) and consortium partners (75%).

REPRODUCIBILITY

Requirements

The attitude of the researchers needs to be changed. The presence of an industrial approach and the willingness to cooperate amongst the researchers are required.

Time

After the basic build- up of infrastructure the action is continuous.

Sector specificity

Not only biotech but all high tech sectors.

RESULTS

Results

- The tocopherol is first compound sold by Provit Ltd.
- Both spin- offs' main activities involve the practical use and the marketing of the novel methods and services elaborated by the research workers at SNKC.

Deviations from stated objectives

- The impact factor is 300 instead of 200, 2 new doctors instead of 0, 10 PhD's instead of 5, etc.)
- The spin- offs proved to be more successful than expected and the industrial actors more involved than planned

SOUTH- PLAIN NEUROBIOLOGICAL KNOWLEDGE CENTER (HU)
FOSTERING SPIN- OFFS (TECHNOLOGY TRANSFER)

OBJECTIVES AND CHARACTERISTICS

Actors in charge

DNT management

Contents

- There has been monthly seminars called "The entrepreneur Mind Speaks…"- Lecture series for researchers, to bring researchers closer to business and to foster them to establish new enterprises
- Lectures have been recorded on tape as to be reusable

Intended recipients

Researchers and employees of the SKNC in the first place, but all enquirers as well.

Expected results

The expected results were:

- A new approach
- System approach
- Generating spin- offs

Costs

- 1,500,000 HUF
- The presenters has held the seminars free of charge, whilst they had to pay for renting the seminar room. The price also includes the recording activity.

REPRODUCIBILITY

Requirements

- The researchers need to have a willingness to cooperate
- The researchers need to accept the management's activities
- The management needs to have the adequate expertise

Time

The activity can be continuous.

Sector specificity

Not only biotech but all high tech sectors.

RESULTS

Results

Four spin- offs have been established out of which two within the SKNC (Vtadel Ltd. And Provit Ltd.) and the other connected to SKNC (Musgenex Ltd. and Biospiral 2006 Ltd. Partnership).

Deviations from stated objectives

So far, no deviations occurred.

Other actors involved

Other actors involved were the presenters.

Milan Chamber of Commerce - Innovhub

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Keywords
Technology transfer - Innovation support - Funding opportunities - Biotech clusters

Profile
Milan Chamber of Commerce (with about 300,000 associated companies) is an independent local public body fostering the development of enterprises within the global economy. Innovation is a tool for competitiveness: given the excellence of the Italian biotech sector in the Milan area, its support has become a priority for the Chamber.
Innovhub is the Milan Chamber of Commerce Special Agency for innovation supporting the creation of an environment favourable to an entrepreneurial innovation culture and the provision of new services to support innovation in companies. In particular providing support to companies in their innovation related activities:

- Promotion of European research and business cooperation:
  1. targeted information about opportunities for funding
  2. technological Audit
  3. technical assistance in projects' drafting and management
  4. partner search;
- Support to technology transfer:
  1. promotion of technology profiles
  2. organisation of targeted meetings and partnering events
  3. patenting and prior art service;
- Networking for biotech clusters: co-ordination of the Europe-INNOVA biotech cluster network to foster exchange of experiences and good practices, providing policy recommendation messages for biocluster development and facilitating identification of partners in the field.

MIP - Politecnico di Milano

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Keywords
Innovation - Management - Strategy - High tech industries

Profile
MIP is the Business School of Politecnico di Milano. MIP was created 28 years ago out of a partnership between the Politecnico di Milano and some leading businesses and institutions operating in Italy, and:

- It has as its objective the Innovation in Business Management and Public Administration
- It reports to the Management Engineering Department of the Politecnico di Milano, where most of its faculty come from and with which it forms the School of Management
- By taking advantage of the cooperation between the academic elements, the businesses and the institutions, it wants to promote high-level activities in the post-graduate and/or post-working experience training fields and to monitor the demands of qualified skills.

The mission of MIP is twofold: 1. training and doing applied research covering all aspects of management, with a particular focus on technology as a vital tool for corporate innovation and management; 2. promoting growth of the global corporate system, by creating an international network, and, more importantly, through the work of the School of Management of the Politecnico di Milano - with the aim of becoming a major international managerial training centre.
In 2007, the School of Management of Politecnico di Milano was EQUIS accredited. EQUIS (European Quality Improvement System) granted by the European Foundation for Management Development (EFMD) is the leading international system of quality assessment, improvement, and accreditation of higher education institutions in management and business administration.
MIP is also accredited by ASFOR, the Italian Association for Management Education Development.

Bioindustry Park del Canavese SpA (BiPCa)

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Keywords
Incubator - Management assistance - Scouting programmes - Communication and event

Profile
Bioindustry Park (BiPCa) is a Science & Technology Park located in Canavese near Turin in the north-west of Italy. BiPCA is a private organization with public majority Mission of the Park is to promote and develop biotechnological research, hosting companies operating research, development and pilot production in the life science sector.
The Park offers a complete set of support services to R&D and development activities, not only offering research facilities and scientific services, sound project management and results evaluation.
BIPCA is the owner of the Laboratories for Advanced Methodologies (LIMA) that provides state of the art services and performs exploitation of scientific results life sciences fields. LIMA, thanks to its solid cooperation with the University in Torino and CNR ISPA, is also a permanent training site for graduates and researchers.
A University Center in Imaging technologies (CEIP) managed by University of Torino is also active in the Park. A specialised incubator complete the system offering to business idea a positive environment where to growth.
BIPCA is also acting a system integrator for the development of a local regional cluster and has a strong network at local, national and international level: it can rely on partnerships with italian Universities, research centers and research consortium, with CNR (National Research Council), with ADEBAG (Grenoble-Rhône-Alpes) in France, BioAlps in Western Switzerland and Center of technology of New Jeresy, Rad Biomed 7Tel aviv) Toscanalifesciences (Siena - Italy) and Bilbao Science Park (Spain) for bioincubation. Bioindustry is also member of APSTI, CEBR (Council of European Bioregions) and partner in EU projects (e.g. NetBioclue and Passport).

ARETA International

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Keywords
Monoclonal antibodies - Recombinant protenis - Diagnostic Kits

Profile
Areta International is a private biotech company founded at the end of 1999 whose mission is the continuous improvement and steady innovation of methods and technologies to design and produce innovative therapeutics (as cells for cell therapy, monoclonal antibodies, rec proteins) and diagnostic tools.
The company has based its business model on the Quality System through the ISO 9001:2000 certification and it is organized in two divisions, ARETA SERVICES (GMP and R&D) and ARETA RESEARCH (Research and Codevelopment of biodrugs)
GMP: contract process development and manufacturing, safety and quality control tests, filling and media fill. Furthermore Areta can help its customers in defining the strategy for process development optimization and quality in biotech projects.
Regarding manufacturing technology, the strategy is based on disposable high surface to volume ratio bioreactors that are characterized by high containment, ideal for safety and GMP compliance, while requiring relatively small lab space and limited staff.
R&D: customized generation and production of monoclonal antibodies specific to different antigens recombinant protein expression and set up of immunological and cell-based tests for characterization and quality control of drug candidates.
ARETA RESEARCH
This division aims through the participation in National and European Research Projects and ad hoc contracts with research centres, to co-develop new potential biodrugs in the field of advanced therapies.
The organization is flexible and project focused. Staff mainly consist of University and Ph.D. graduates.

ERBI

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Keywords
Biotech support - Networking - Cooperation

Profile
ERBI's objective is to facilitate and accelerate the growth of biotech in Cambridge and the East of England. core activities include:
Hosting networking events: organisation of both an annual bio partnering large event and regular networking meetings for the local biocommunity
Special Interest Groups: being run for ERBI full members including business development, clinical development, corporate governance, facilities management, finance etc.
Training: Provision of training courses on topics like security interviewing skills, and a portfolio of management training courses to biotech SME's in the region.
Partnering and member promotion: strong focus on facilitating partnering, collaborations and strategic alliances. Frequently hosting high profile delegations from overseas and constant attendance to international Bio events.
Publications: quarterly newsletter, and regular surveys of trends in the regional biotech industry, as well as contributing articles to biotech journals and newspapers.
Regional and national initiatives
We are currently involved in an EEDA funded project aimed at developing a finance and regulatory service for regional biotechs, and we are members of the steering group of the East of England Stem Cell Network. We also provide consultancy to national and international government departments

University of Dundee

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Keywords
University of Dundee College of Life Sciences - BioDundee Update translational medical research

Profile
The University of Dundee is one of Europe's foremost universities for life sciences research. The University's College of Life Sciences has over 750 staff and research students. Its external funding exceeds £48 million per annum. The College is leading the Scottish Universities Life Sciences Alliance (SULSA) in the application of translational biology where discoveries on cancer, diabetes, cardiovascular disease, neuroscience and tropical diseases inform the development of new diagnostic tests, drugs and treatments. The University also accommodates the core research laboratory of the Translational Medical Research Collaboration which is a unique partnership involving the clinical academic centres of four Scottish universities, the NHS Scotland, Scottish Enterprise and Wyeth, a leading global pharmaceutical company. The University is one of the sponsors of BioDundee which is a public/private partnership involving the life sciences sector in the Dundee area. BioDundee, which was established in 1998 to support the local growth of the life sciences sector, organises the BioDundee Annual Conference, training and networking events; produces a monthly e-news letter and the printed quarterly BioDundee Update which has a global circulation.

Chambre de Commerce et Industrie de l'Essonne

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Keywords
Innovation support - Business ventures - Competitive intelligence

Profile
Essonne, a French department located in 20 km of Paris, is considered as the innovation land. 8 research institutes (INSERM, CNRS, CEA…), 11 schools and universities and two worldwide clusters are located in Essonne: SYSTEM@TIC (ICT) and MEDICEN (health) are based in Essonne.
The Chamber of Commerce and Industry of Essonne represents more than 32 000 companies with a significant number of high tech and innovative companies focused on key sectors like biotechnology, ICT, optics etc.
The CCI Essonne supports the economic development of the area through a complete range of services supporting the growth of the companies: business venture, innovation, international aspects (export, mission) and safety and quality norms.
The CCI Essonne is strongly focused on innovation. The innovation and technological development departement supports the business venture thanks to the management of 3 nurseries/incubators (Genopole, Innov'valley and Innovapole), the technological development towards the technological transfer, the cooperation with research institutes, the business intelligence and all the IPR issues. This departement also supports the research of funding for companies (public and private) with individual consulting.
The European Projects Office integrated into the Innovation and Technological Development departement offers to the SMEs and the research institutes information and consulting during all the different steps of a European project: information about the EU opportunities, audit (technology and strategy), partner/project identification, co-writing of the proposal and project management skills).

GENOPTICS

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Keywords
Biosecurity - Bioarrays - SPR Imaging

Profile
GenOptics started its operation in July 2001, exploiting the conclusive results of long-term research on SPRi (Surface Plasmon Resonance Imaging) conducted by the Institute of Optics (Orsay, France) and by the French Atomic Energy Commission (C.E.A, Grenoble, France). The same year, in recognition of outstanding innovation, the company received several awards from the French Research Ministry and from regional high technology development agencies such as Genopole and Optics Valley.
GenOptics addresses the biosecurity and life science research (biomarkers) market segments in developing bioarrays leading to subsequent applications in upstream diagnostic and drug discovery process.
GenOptics developed two instruments commercially available, the SPRi-PlexTM and the SPRi-Lab+TM which, combined with the SPRi-biochipsTM disposable, allow label free, real time, and parallel monitoring of hundreds of biomolecular interactions at a time. Today the SPRi technology has been validated in over 25 research laboratories in France and abroad.
The company is composed of 8 employees including 4 PhD, 2 Engineer and 1 technician. A substantial part of the company's activity and resources is devoted to R&D activities directed towards improvements aimed at better responding our customers' needs for complete solutions. This is achieved through the development of more efficient hardware and software solutions as well as that of new applications in connection with proteomics. The company has identified and is implementing key cooperation and partnerships with academic and private companies' labs.

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Keywords
High technology - Comprehensive support - Management assistance - Networking

Profile
The Heidelberg Technology Park, conceived as a biology park, is a science park that makes up part of the Ruprecht-Karls-University campus. Covering an area of 50,000 m², with more than 75 resident companies and nearly 1,300 employees, it is amongst the most important biotechnology sites in Germany and amongst the leading worldwide. Around 200 associated members strengthen the development of this biotechnology cluster in the metropolitan region of Rhine-Neckar. It is a place where effective joint projects can be realized through the cooperation of national research centers and international companies. A knowledge-based environment where science can forge links with business, and research can gain new perspectives through international cooperation.
Since its creation in 1985, the Heidelberg Technology Park, with its mix of bio, medical, information, communication and environmental technologies, as well as environmental business, has grown into an important entity, giving fresh impetus to scientific research and business. Heidelberg University and renowned research institutes such as the European Molecular Biology Laboratory (EMBL), the German Cancer Research Center (DKFZ), the Center for Molecular Biology (ZMBH) as well as the University of Heidelberg's Biochemistry Center (BZH) and the Max Planck Institute for Medical Research and Cell Biology make up a fertile concentration of life sciences.
The Heidelberg Technology Park GmbH promotes the rapid growth of this cutting-edge technology site through comprehensive support services and by working closely with companies and research institutes, both current and prospective. The city of Heidelberg and the Rhine-Neckar Chamber of Commerce and Industry are shareholders.

GründerRegio M

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Keywords
Innovation support - Business strategy - Start up consultancy

Profile
GruenderRegio M, Munich, is an association formed in 1998 to foster innovation through knowledge-based spin-offs and start-up companies linked to higher education institutions. GruenderRegio M has focused its activities on guiding potential young entrepreneurs from academia towards a successful business career. Its mission is to establish a sustainable culture of entrepreneurship in the Munich region through promotion of an infra-structure reducing costs and time involved when setting up a company, increasing motivation to start a business and raising the number of university start-ups.
GruenderRegio M is an umbrella organisation of about 30 essential key players and institutions in education, finance and business in the Region of Munich, such as universities, research institutions, business and company associations. Consultants, venture capital and finance organisations, incubators and technology centres, the Chamber of Commerce and the City of Munich, and creates added value by combining its members' competencies and knowledge to support innovation and knowledge-based start-ups.

BIOTECHVALLEY.nu

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Keywords
Biotechnology - Production - Process development - Quality - Regulatory - SME - Fermentation

Profile
The strategic vision of Biotechvalley is: "Biotechvalley should be an internationally renowned partner when working with increasing the effectiveness of development and production of drugs and biotechnology products. Biotechvalley works in close collaboration with business, academia / schools and society"
Biotechvalley is based on a foundation formed by major Swedish pharmaceutical and biotech companies. Furthermore, about 40 companies form the core network, supporting Biotechvalley financially and through participation in the actitivities. In addition, Biotechvalley is supported by the public system at municipalities, county council and national level.
The three main components that Biotechvalley are working with are:

1. Business development or value chain coaching; where the combined resources of Biotechvalleys network is utilised in order to shorten the time from "idea to market"
2. Competence development; demand driven education suitable for industrial process needs and incorporating quality systems
3. Process development; practical implementation at the Biotechvalley laboratory facilities

Østjysk Innovation

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Keywords
Biotech - Medical Technologies - Diagnostic - Pharmaceutical

Profile
Østjysk Innovation (ØI) - East Jutland Innovation - is one of the seven approved national innovation centres in Denmark. We invest state funds and our own capital in the earliest phase of a new company's existence - i.e. at the stage where no other private investors are willing to take a risk or have the patience to invest. Our initial investments are up to approximately DKK 1.5 million (about € 200,000).
Since 1999, we have been involved in investing in approximately 100 new companies, and currently have an active portfolio of about 50 companies.
By means of our investments, our special skills and our networks, we aim to boost their development to the stage where they can hold their own in tough market conditions and ultimately develop into new growth companies. About 25% of these new companies are involved in the biotechnology industry and a similar proportion work with medicotechnology.

South Moravian Innovation Centre

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Keywords
Innovation - incubator - Business consultancy - Regional development

Profile
The South Moravian Innovation Centre was established as an association of legal entities in 2003. Its founders are the South Moravian Regional authority, the Statutory City of Brno, Masaryk University and Brno University of Technology. In February 2005 the group was joined by Mendel University of Agriculture and Forestry and University of Veterinary and Pharmaceutical Sciences in Brno.
The South Moravian Innovation Centre creates a complex infrastructure for innovative enterprise in the South Moravian region and supports innovative companies, science, research and development and students with original ideas. The services provided by the South Moravian Innovation Centre are based on four key pillars – finances, consultancy, contacts, premises.
One of the main activities of the Centre is operating technology incubators in Brno which concentrates several support tools for starting entrepreneurs in one place, reduces the risk for start-ups and assists them to achieve the level they could engage self-dependently in commercial-economic activities and compete on the market. The South Moravian Innovation Centre was the coordinator and currently serves as the implementing agency of the Regional Innovation Strategy of the South Moravian Region.

South Great Plain Regional Development

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Keywords
Regional development - Planning and project management

Profile
The South Great Plain Regional Development Agency Public Company takes part in the preparation of the regional development plans, co-ordinates the regional programs, and helps the appropriation of decentralised support arriving from the National Government and the European Union. The most important activities of the Agency are:

- Planning – The preparation of the Regional Development Program of the Plan Europe for the 2007-2013 Planning Period is managed by the Planning Department of the Agency. This work, involving experts, social and economic participants of the Region, contains the development sponsored by European and Hungarian resources as well.
- Project-developing activity – Since 2004 the Agency helps the implementation of ideas connected to development of the Region. In those cases, when the Agency does not manage the current proposal.
- Managing of Regional Programmes – The Agency within the National Development Plan participates as an Intermediary Body at handling and consideration of the tenders connected with EU Structural Funds. Besides that the Agency is managing several decentralised national programmes, such as the Regional Operational Program from 2007-2013. The Agency takes care about the handling, decision-preparation and monitoring of the tenders – regarding to the decentralised supports for regional development - arriving to the Southern Great Plan Region.
- Regional project management – Since the beginning the Agency has been playing a very active role in taking part and managing European projects in different fields with the aim of strengthening the cooperation with EU members in order to gain new experiences and broaden the knowledge basis of the region.

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