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Research- and innovation-driven clusters and science parks: how to build synergies

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Executive Summary

Since the turn of the millenium globalisation has compelled governments to develop new policy instruments, such as research- and innovation-driven clusters, to improve the competitiveness of businesses, cities and regions. Although the now about 30 years old model on which science parks is based is different to clusters, the objective is roughly the same. Both are policy driven (in contrast with 'marshallian' industrial districts or Porter's clusters) and in some areas they maintain close relations. As government supported innovation-driven clusters are more recent (and may have stolen some of the limelight) science parks must seek to re-position themselves with respect to clusters, especially through developing synergies in areas such as: providing them with a track record of failures and successes; relying on them for strengthening their impact on the local/regional economic fabric; taking advantage of public-funded programmes for clusters; and most of all satisfying the specific needs of cluster businesses (real estate and services).

A large number of countries, in particular in Europe (and the European Union itself), have implemented programmes in support of research- and innovation-driven clusters as part of their set of RTDI[1] policies, and this has taken place over about the last decade in a context of accelerating globalisation. For those who have followed the history of the science park phenomenon from its beginning, the arguments for supporting clusters sound familiar: creating synergies between HE and research and business; improving the competitiveness of businesses through innovation; and increasing the attractiveness of the territories concerned.

The key question therefore facing science parks and their management teams is how to re-position themselves and take advantage of cluster policies.

It is worth briefly restating what makes clusters and science parks distinctive:

- Clusters, in their standard definition, are networks of companies in the same sector or inter-related sectors (such as *filières*) which are in a situation of 'co-opetition' and develop synergies for improving their competitiveness on the global market; clusters have long been born from business needs and have remained informal or loosely organised.
- Science parks offer serviced land and buildings together with various services (in particular linkage to R&D organisations) to innovative and high-tech companies, in general irrespective of sectors; the creation of science parks is in a huge majority of

[1] Research, technological development and innovation

cases the result of a decision taken by local, and in some cases, national authorities (few of them result from a private business initiative).

However, in so far as public authorities are increasingly developing pro-active cluster support policies with a focus on RTDI, this distinction has become blurred and 'new'clusters tend today to be as much driven by political ambition and public policies as have been science parks over the past 30 years.

From business-driven clusters to policy-driven clusters

Historically, clusters were born from the accumulation of companies operating in the same sector or in inter-related sectors as indicated above. The best-known European example of successful 'natural' business-driven clusters is that of the Italian "industrial districts" which developed from the 1920's in the centre-north of Italy, and later in the north-east, before spreading throughout Italy from the 1950's, albeit with differences in their specific dynamics.

The conceptual history of the phenomenon can however be traced to the end of the 19th century, to Alfred Marshall (Principles of Political Economy, 1890). One century later it was made popular by Michael Porter who revisited the idea using the term "clusters" (The Competitive Advantage of Nations, 1990).

Marshall, like Porter, identified concentrations of specific industries in particular locations using statistical methods. Studying these concentrations Marshall observed that "industrial districts enjoy the same economies of scale that only giant companies normally get": specialised suppliers arrive; skilled workers know where to come to ply their trade; everyone involved benefits from the spillovers of specialised knowledge. Looking at the same phenomenon across a range of countries Porter developed his (at least initially, with a national focus) 'diamond' approach: strategy, structure and rivalry of firms; demand conditions; related supporting industries; 'specialised' factor conditions (skilled labour, capital, infrastructure) which he sees as difficult to duplicate in another places since they involve heavy and sustained investment.

Marshall had no interest in public policies for clusters. Porter's attitude in respect of policy is ambiguous because he attempts a transition from comparative to competitive advantage. On the one hand, he is supportive of local, regional and national initiatives informed by cluster theory. On the other, he takes pains to differentiate cluster strategy from industrial policy, which he deems as bad, because it distorts competition in favour of a particular location and/or it entails picking winners. Cluster theory is therefore not (directly) about 'market share' but about 'dynamic improvement' (through continuous innovation), which has (more horizontal) implications for public policy.

Turning to public policy at the European scale, the European Commission set up a European Cluster Observatory (http://www.clusterobservatory.eu) in 2007 which identified European clusters on the basis of statistical data (mainly employment data). At first glance this implies that the European institutions have adopted Marshallian/Porterian policy logics with an emphasis on 'natural' clusters.

However, the situation is not so straightforward since the rationale given for setting up the Observatory was that: "clusters may embody the characteristics of the modern innovation process ... as reduced scale innovation systems", moreover, clusters are "drivers of prosperity in a global economy", and "individual regions may get more specialised in specific clusters", etc. – The assumption being that clusters deserve to be supported by public policies (EU, national, local and regional). This led to the publication of a policy blueprint: the 'European Cluster Memorandum' (www.proinno-europe.eu/NWEV/uploaded_documents/Cluster_**Memorandum**.pdf).

National programmes supporting innovative clusters

In parallel, a number of European countries have, over the past decade, implemented national programmes aimed at supporting innovative clusters, i.e. not the original Italian-style or Marshallian industrial districts, but (Porter-informed) clusters with a clear objective of supporting innovation – and thereby enhancing the competitiveness of both companies and "territories".

France and Belgium are developing 'Competitiveness clusters', Germany has developed 'BioRegios' and 'Kompetenzenetze' (longer established than the 'Competitiveness clusters'), Finland and Norway are developing 'Centres of Expertise', Greece and Portugal are developing 'Innovation Poles' and Italy is developing 'Technological Districts' besides its well-known 'Industrial Districts'. The European Union is supporting Europe-wide networks of innovation-driven clusters.

All these programmes include various public policy instruments (grants, tax breaks, soft loans, public-funded equity funds, access to public-funded research programmes, etc.). Moreover, the 'sectoral' dimension of the 'new' clusters is less pronounced than in the past. Of course, there are clusters in the automotive or aerospace sectors, etc., but more and more clusters are science-based and rely on 'transversal' technologies – biotechnologies, nanotechnologies, computing grids, ... – which are used in a wide range of sectors.

What is very interesting in this public policy driven process is that the European Cluster Observatory cluster map does not exactly (far from it) coincide with the cluster maps of the various national programmes. One reason is surely that these programmes support 'innovative' clusters, which means that they are more focused on new and/or 'transversal' technologies (such as those cited above) than on shoes, clothing, or household goods. Another reason is that clusters 'picked' by public-supported programmes may have been so on a 'voluntarist' basis.

As a first conclusion, this is not very different from what happened with many of the science parks set up and developed during the 1980's and 1990's.

In addition, some national cluster programmes are now being evaluated. This is the case of the French 'Competitiveness clusters'. The political decision on the programme was taken in 2005. The first clusters were selected through a call for proposals in 2006. These were added to in 2007 and there are now about 70 clusters. They are currently (2008) undergoing an evaluation process which covers the programme as well as each of the individual clusters. As it is surely difficult to assess the results of a programme on the basis of just 2 years of policy action, the reason for the evaluation would in part appear to be that public authorities are conscious that the selection process was insufficiently selective.

Second conclusion: this sounds familiar to those who were involved in the multiplication of science parks which occurred through the 1980's and the first half of the 1990's. For certain types of public policy, history, indeed, appears to repeat itself.

From science parks to clusters ...

Interestingly again, there is today a significant number of government supported innovative clusters which at least 'coincide' with pre-existing science parks, and some which rely on them.

Let us take three examples:

- The Italian Technological District of Trieste focused on biotechnologies for health partly relies on the Area Ricerche Science Park (one of the longest established and most successful Italian science parks) and on what has been achieved through it
- The French competitiveness cluster "Atlantic Biothérapies" largely relies on the Nantes science park or technopole, known as "Nantes Atlanpole"
- The German BioRegio of the Rhein Neckar Triangle is in large part the fruit of the creation two decades ago of the TechnologiePark Heidelberg and of its successful activities/achievements

Or from clusters to science parks ?

In contrast, we can provide the case of a cluster which has no linkage to a supporting science or technology park, and which is clearly a handicap in development terms. Close to Pau (Region Aquitaine, Southwestern France), there is a cluster specialised in aeronautics (linked to EADS/Airbus), with an organisational architecture very similar to the Italian industrial district model. It presents all the statistical characteristics of a cluster with a high proportion of the labour force employed in aeronautical manufacturing (mechanical engineering and production, plastics) through sub-contracting SMEs. It also presents the 'qualitative' characteristics of a cluster in relation to: density of business relations, relations of trust between firms, complementarities between activities.

The cluster's major SMEs are formal members of the competitiveness cluster "Aerospace Valley", but in practise they do not gain any benefit from this membership because the cluster's headquarters is located in Toulouse where there are universities and research centres (distance: 200 km). The Pau cluster's R&D activities are insufficiently developed, which is a challenge in the medium-term especially in a context of a falling US dollar with respect to the Euro, which makes innovation all the more crucial.

When the first aeronautics companies located in the area, local authorities committed themselves to dedicating a specific zone to them which would be marketed as "Aéropôle". The brand was indeed created, but the substance did not follow. The local authorities granted accommodation on the zone to every type of business, including large-scale retail, which has created a conflictual situation with the aeronautics industry as the latter considers that its proximity to retail outlets has a negative impact on its image, and clients.

As a consequence, what is badly needed today is a technology park with selection criteria and a small team dedicated to supporting technology transfer and innovation projects to the benefit of the industry and companies, establishing networks with research, developing services for technological and market intelligence (supporting diversification). Such an initiative would probably prevent some companies re-locating all or part of their activities to Morocco or Mexico (a favourite location today for sub-contractors in the aeronautical construction sector).

Is there a convergence between the cluster and the science park phenomenon ?

Today, research- and innovation-driven clusters and science parks do have a lot in common:

- They provide high-level services to their members (in the case of clusters) or tenants (in the case of science parks) including: first of all stimulation of university-industry collaboration and technology transfer; support to start-ups and academic spin-outs; access to finance (equity, debt, mezzanine); access to high-level intellectual property consultancy; etc. – and the provision of these services is in general supported by publicly-funded programmes
- They provide or facilitate access to international networks (business, R&D, finance)
- They offer high quality serviced land and buildings for sale or rent directly to companies (in the case of science parks) or indirectly (in the case of clusters, through their relationship with local authorities)

Science parks can also constitute a vehicle or vector for attracting cluster-related companies through providing appropriate serviced land and premises (taking into account market needs), and thereby accelerating specific concentrations of businesses and having a 'snowball effect' to the benefit of the cluster.

Moreover, the governance model is roughly the same in that it is based on the 'Triple Helix' concept which promotes partnerships between public authorities (mainly local and regional), higher education and research, and business. These governance models face similar operational challenges, in particular:

- a significant level of complexity in the management environment: context of multi-level governance involving different levels of public administration;
- the need for an organisational driving force or catalyst, whatever it is, public or private;
- the increasingly obvious need to involve financial organisations (banks, equity and venture-capital funds, business angels networks) in the governance system.

However, if one goes into detail, there are some differences. The science park governance model can be considered stable, although it may sometimes be complex due to the variety of organisations involved; the main reason is that there are 'bricks and mortar' and land to manage and this requires a clear distribution of roles and responsibilities, balanced accounts, etc. Concerning clusters, there are mainly networks of stakeholders to manage and this requires a more sophisticated governance approach.

In other words, science parks have shareholders (or possibly a single shareholder), while cluster managing organisations have only stakeholders. Notwithstanding, and this is again a point of convergence between both models, the managing organisations of science parks need to involve stakeholders in order to achieve their objectives.

Questions for science parks

Public policies in support of research- and innovation-driven clusters raise two types of questions for science parks:

- a more theoretical one: are cluster support policies only a new fashion which 'rejuvenates' the science park concept – or do they introduce substantial change?
- a more practical one: what would an appropriate 'positioning strategy', in areas where 'new' cluster(s) are being developed, look like ?

In respect of the first question, which is not in fact not 100% theoretical, it is clear that clusters do not have a primary focus on property development. A cluster is expected to have a regional impact, although its geographical boundaries are not necessarily 'fixed' in the same way as a science park. It can be said *cum grano salis* that, with the advent of cluster policy, the old debate on the impact of science parks at regional level, beyond their physical borders, has returned.

In answer to this question, science parks should consider cluster policies as an opportunity for strengthening their own impact on the whole local/regional economic fabric in two areas (depending on the sectors or range of sectors concerned by research- and innovation-driven cluster(s) in the area): first, by supplying high technology services, and second, by supporting innovation in so-called 'traditional' sectors such as food, automotive, textiles, etc.

The 'positioning' of science parks with respect to clusters

In respect of the second question, a first point is that, in a lot of cases, the governance systems of clusters and science parks in the same geographical area are at least inter-related, and in some cases they are almost identical. They will therefore have a certain number of common stakeholders.

As a result, there are two scenarios for the positioning of science parks:

- if the research-/innovation-driven cluster(s) is (are) very sector-focused, science parks have to position themselves as the driving force for the development of leading-edge technologies and the support to spin-outs from universities and research;
- if the research-/innovation-driven cluster(s) is (are) operating in the field of 'transversal' technologies with impact on a wide range of sectors, science parks have to focus on their property development dimension, concentrating on providing industrial property in the upper segment of the market.

In any case, science park management teams need to develop strategies aimed at building synergies through complementarities, taking advantage of publicly-funded programmes for cluster support policies, and drawing on the comparative advantage that science parks offer, i.e. they are the ideal test bed for best practices in university-business relationship due to their long experience in this field.

Their comparative advantage is the second point that needs to be emphasised: science parks have a 30-year or so track record including tremendous success stories, but also of failures (failure being as useful to analyse and to draw lessons from as success). The long experience of science parks is highly valuable for cluster initiatives such as the aeronautics cluster close to Pau, which was described above, and which are 'natural' business-driven clusters. Such clusters, whose companies may be insufficiently RTDI active, are faced with the challenge of globalisation and the linked/consequent imperatives of competitiveness and innovation, need to make a leap forward: the science park model may help them to do this.

For 'innovative clusters', supported by national programmes, the experience of science parks is equally valuable, although for different reasons. Both are policy-driven and may have been affected by an excess of 'voluntarism'. Innovative clusters could/should in consequence draw on the strengths and weaknesses and on the unsuccessful as well as successful lessons offered by science parks created without there being a solid tradition of high-technology and R&D activities in their area.

A third and last point: back to the basics, or to the science park mantra, i.e. real estate and local service provision to tenants. Science parks have to prove their ability to satisfy the specific demands and requirements of cluster-related companies. These will differ according to the sectors and sub-sectors and the typology of companies involved. The needs of start-ups in the biotechnologies sector surely differ from the needs of sub-contractors operating in the aeronautical sector (flight mechanics) in terms of space and equipment needed, etc.; the former will prefer to rent while the latter will probably prefer to buy their own premises. The same can be said regarding networking services.

If science park management teams operating in a cluster environment prove successful in adapting to specific cluster demands and needs, they will make their science park the strongest engine for achieving the cluster's objectives.

A last and conclusive example will illustrate this hypothesis. Montpellier (France) has a strong research-driven cluster in the field of agro-biotechnologies, known as "Agropolis International". Two decades ago a science park branded as "Agropolis science park" was created which, in spite of its name, was not managed by "Agropolis International", but by the local authority alone. This science park has proved a partial failure: while it is now full, the local authority has accepted to accommodate a number of companies and organisations as tenants which are neither innovative nor in the agro-biotech sector, nor even in the agro-food sector.

With the success of the research-driven cluster and the development of spin-offs from research, it has become necessary to create a dedicated incubator which can today boast a 3-year track record, and a decision has recently been taken to re-create a dedicated science park, taking account of the past failure, and associating in its management "Agropolis International" and the local authority.