



dti

A PRACTICAL GUIDE TO
CLUSTER DEVELOPMENT



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A Practical Guide to Cluster Development

A Report to the Department of Trade and Industry
and the English RDAs by Ecotec Research & Consulting

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Foreword



Lord Sainsbury

In a globalised and technologically advanced world, businesses are increasingly gathering together to generate competitive advantage. This phenomenon – *clustering* – can be seen around the world.

Everyone will be aware of the IT cluster in Silicon Valley or the financial services cluster in the City of London. These are the famous examples, but clustering occurs throughout the UK. DTI's cluster map, produced in 2001, showed that there were clusters throughout the UK: aerospace in the North West, textiles in the East Midlands, and IT around the M4 to name but three. Clustering is happening in the UK, and the aim of this guide is to help make our clusters even more successful.

Much has been written on the benefits of clustering, and a great deal of effort has gone into mapping clusters, but there has been surprisingly little work that bringing together the material on the critical success factors for cluster development. This document aims to fill that gap.

It draws on analysis and evaluation material to set out how local policymakers can help clusters to flourish. The approaches in the document cannot guarantee success but the policy actions set out in this document constitute best practice, and should provide a firm evidence-based platform for local cluster strategies.

I am especially pleased that in developing this document, DTI has worked closely with the Regional Development Agencies and with colleagues at the Mersey Partnership. This is because effective cluster policies have to be delivered regionally and locally. I hope that the RDAs will find this document a valuable addition to their cluster agendas, and that they will share it with their partners in business and local government in order to design policies that will help UK clusters flourish.

A handwritten signature in black ink, appearing to read 'Sainsbury', with a horizontal line underneath.

1. Introduction

A Practical Guide to Cluster Development is an evidence-based guide targeted at those engaged in the delivery of cluster policy at the local level. It is intended to provide a valuable information source on 'what works' and 'what doesn't'.

It is based on a thorough analysis of the effectiveness of cluster interventions, and the evidence paper that sets out this assessment is available at www.dti.gov.uk/economics.

The report is split into two sections:

- **Section A** provides advice on how to design and measure a cluster strategy.
- **Section B** sets out examples of the type of interventions that can encourage the successful development of clusters.

"The key issue is to know when to intervene and when to let go. Sometimes there can be too much administration in cluster development – technology is rapidly changing and not always conducive to committee structures."

(Practitioner Observation, 2002)

This guide starts from the perspective that policy intervention cannot create cluster from scratch but that it can help existing clusters to develop. It also starts from the proposition that the cluster being considered by practitioners have already been identified. Consequently it does not dwell on the question of 'what is a cluster'. This guide therefore focuses on what makes for an effective cluster

and how practitioners can influence this. Interventions can at best facilitate and animate the successful operation of clusters, and have to be based on rationales that seek to overcome market failures and constraints.

What are clusters?

Clusters are groups of inter-related industries. They have two key elements. Firstly, firms in the cluster must be linked. Secondly, groups of inter-linked companies locate in close proximity to one other. Put another way clusters are:

"Geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions (for example universities, standards agencies, and trade associations) in particular fields that compete but also co-operate."

(Porter, 1998)

The links between firms are both vertical, through buying and selling chains for example, and horizontal, through complementary products and services, the use of similar specialised inputs, technologies or institutions, and other linkages for example. Most of these linkages

involve social relationships or networks that produce benefits for the firms involved.

Co-location encourages the formation of contacts between firms and can enhance the value creating benefits arising from networks. The geographic area covered by clusters can vary dramatically. There may even be multiple operating scales, with regional, national and even international dimensions to some clusters.

Why focus on clusters?

Clustering can bring a wide range of benefits to both business and the wider economy. These include:

- Increased levels of expertise. This provides sourcing companies with a greater depth to their supply chain and allows for the potential of inter-firm learning and co-operation.
- The ability of firms to draw together complementary skills in order to bid for large pieces of work that as individual units they would be unable to compete for.
- The potential for economies of scale to be realised by further specialising production within each firm, by joint purchasing of common raw materials to attract bulk discounts or by joint marketing.
- Strengthening social and other informal links, leading to the creation of new ideas and new businesses.
- Improved information flows within a cluster, for example, enabling finance providers to judge who the good entrepreneurs are and business people to find who provides good support services.
- Enabling the development of an

infrastructure of professional, legal, financial and other specialist services.

Clustering is one of the key drivers of economic growth in localities, cities and regions. However, adopting a cluster approach is not the only way of encouraging regional economic growth. Informal networking, developing supply chains and improving workforce skills all have a part to play in improving competitiveness and creating growth.

What factors underpin a successful cluster?

All clusters are different but a number of common features stand out as underpinning the development of successful clusters throughout the world¹. Common factors range from 'softer' elements of cluster working such as networks and institutional development, through 'harder' aspects, such as physical infrastructure or the presence of large firms, to more intangible elements, such as the presence of leadership or an entrepreneurial culture. A number of other factors that have contributed to the development of successful clusters can also be identified, such as access to markets, to finance or to specialist services.

Figure 1 [below] illustrates the relative importance of common success factors across a wide range of different clusters in different locations and over different time periods.

From the evidence base three factors can be identified that are critical for the development of successful clusters:

- Critical success factors;
- Contributing success factors; and
- Complementary success factors.

The three 'critical success 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.

Four other factors also are seen to contribute to successful cluster development, but do not figure as prominently in the evidence:

- An adequate physical infrastructure;
- The presence of large firms;
- A strong entrepreneurial culture; and
- Access to sources of finance.

Finally, a range of other factors have complemented the development of successful clusters in different

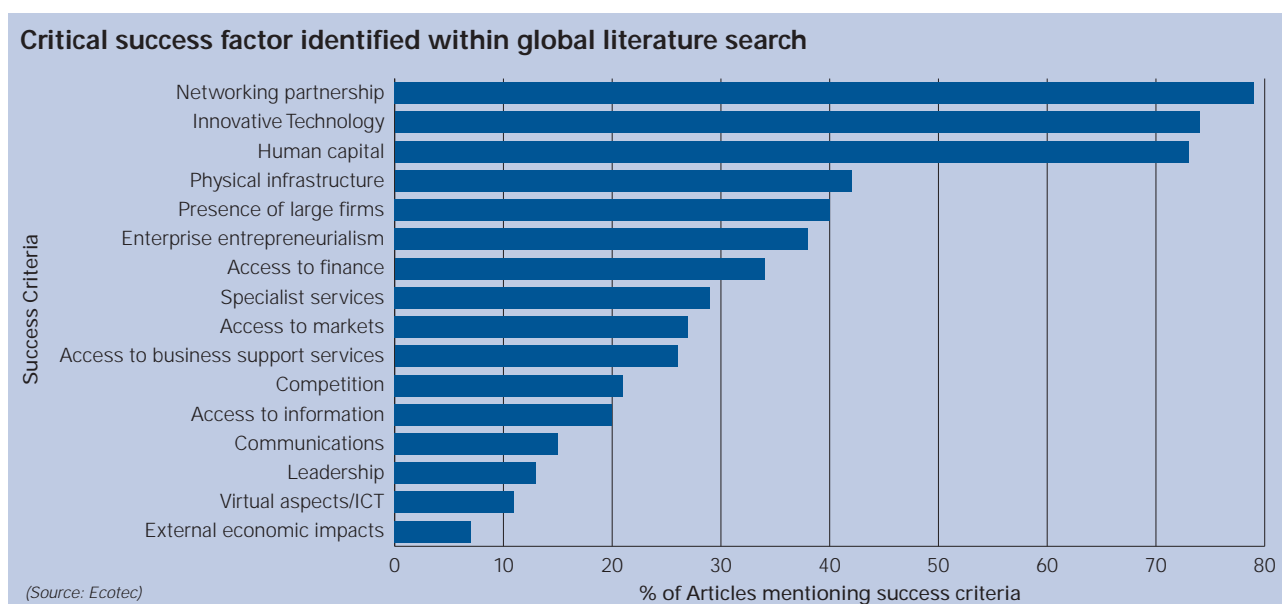
circumstances. These complementary factors – such as advice may help individual businesses, but are not explicitly cluster focussed.

It is important to stress at this early stage that the evidence did not identify causality between any of these factors and the development of successful clusters, merely that these factors were present to a greater or lesser extent in successful clusters. All of the cases studied had, though, benefited to a greater or lesser extent from interventions designed to overcome issues of market failure or development constraints.

Who should be involved?

The main players in cluster development must be the firms that are involved. 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. Educational

Figure 1: Critical success factors in cluster development



institutions also have a role to play and have proved to be important catalysts in cluster development in some cases. Universities may play an educational role but can also be key players in promoting R&D and innovation within the cluster.

Other players include financial intermediaries, such as venture capital firms, and business service organisations with expertise relevant to the cluster. All these bodies can help to strengthen the development of a cluster and can play a legitimate role in its development. Finally local authorities, Regional Development Agencies (RDAs) and other economic development bodies may all have an interest in facilitating the development of clusters through supportive policy interventions.



Section A: Cluster Strategy

Section A sets out approaches to developing a cluster strategy.

Chapter 2 illustrates the type of factors that need to be considered when developing cluster strategies.

Chapter 3 addresses measurement issues.

2. Developing cluster-based strategies

This section briefly introduces the touchstones of cluster strategy formulation. It explores the principle components for a strategy promoting cluster development.

Key aspects to cluster strategies

The key aspects of cluster-based strategies are illustrated in the diagram below and consist of:

1. **Mobilisation:** Building interest and participation.
2. **Diagnosis:** Identifying and defining the cluster then identifying the strengths and weaknesses of the cluster.
3. **Collaborative Strategy:** Identifying the actions required to promote the development of the cluster,

in association with the main stakeholders in the cluster.

4. **Implementation:** Implementing those actions.

Once a cluster strategy has begun to be implemented a fifth aspect comes into play:

Assessment: Monitoring and evaluating the results and reviewing the content of the strategy.

It is important to remember that these steps do not have to be sequential – the

Figure 2: Developing a strategy for cluster development

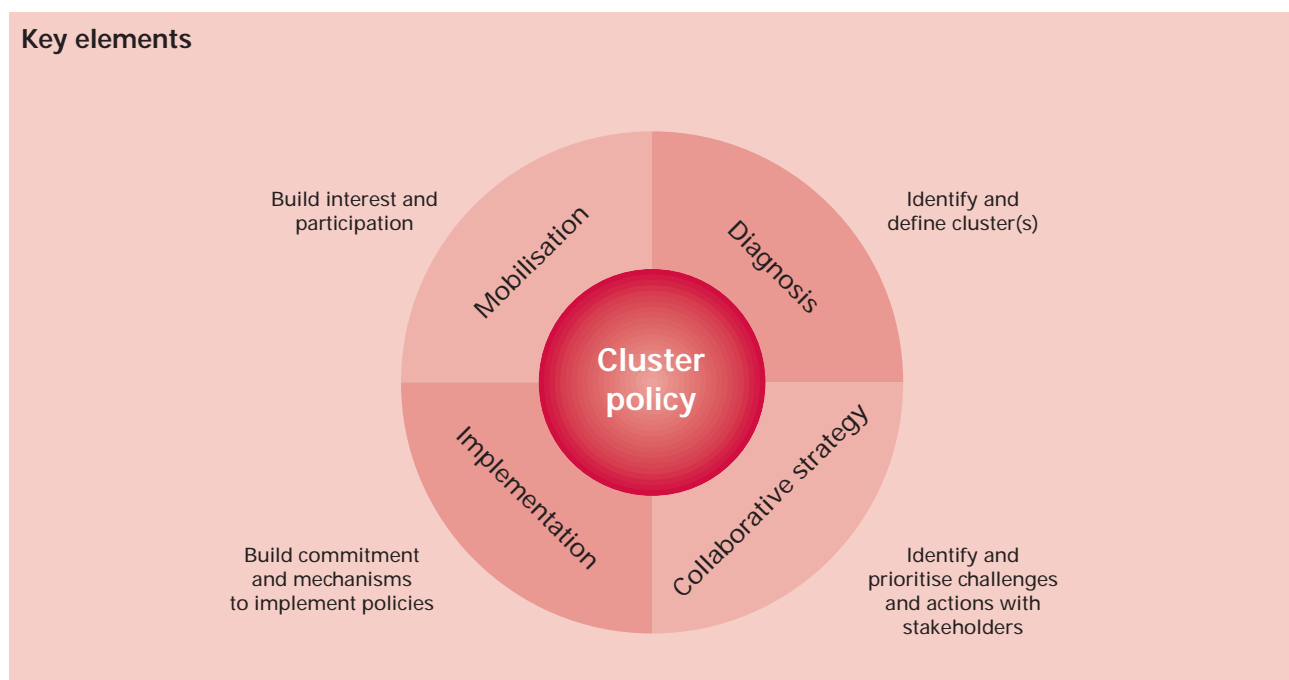
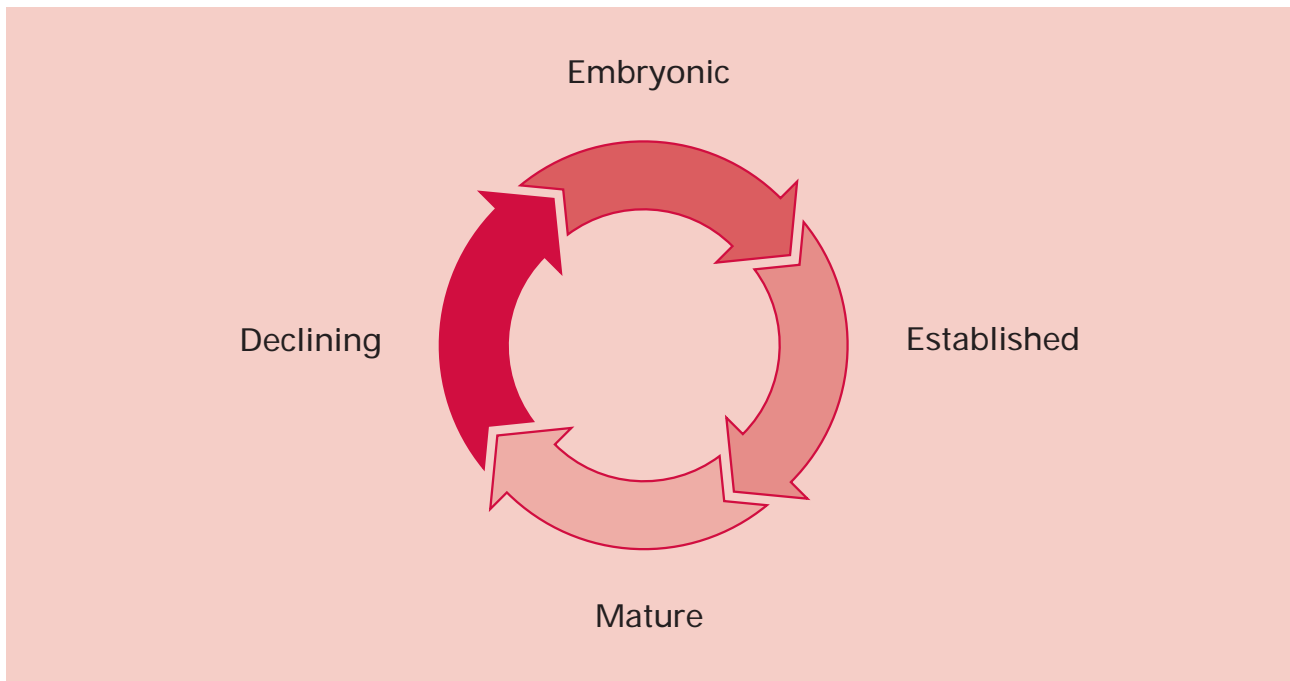


Figure 3: The stages of the cluster lifecycle



first two aspects, of mobilisation and diagnosis, might easily be reversed for instance. The different steps are also often highly iterative in nature. The crucial element is to develop an integrated approach in collaboration with the firms and institutions involved in the cluster. Through discussions and joint working with those involved, internal strengths and weaknesses can be identified and external threats and opportunities highlighted. The cluster strategy can then identify where interventions are appropriate and how these will be targeted.

“All interventions are inter-linked. There is a need for a cohesive package of support, the nature of which needs to be governed by demand. There also needs to be an emphasis on coherent policy intervention”

(Practitioner Observation, 2002)

Clusters have a recognisable lifecycle

Clusters are dynamic and have a recognisable life cycle. The interventions that are appropriate at an early stage in the lifecycle of a cluster are likely to differ from those appropriate at later stages. The lifecycle is often described in different ways but can be represented simply as a cyclical process containing four stages:

- **Embryonic clusters** – those at the early stages of growth.
- **Established clusters** – those perceived as having room for further growth.
- **Mature clusters** – those that are stable or will find further growth difficult.
- **Declining clusters** – those have reached their peak and are failing or declining – clusters at this stage are sometime able to reinvent themselves and enter the cycle again.

Moving between different stages may be simply a function of the industry life cycle reflecting the product cycle for a particular cluster. As the technology and product base of the cluster matures so innovation is required to maintain successful performance. In some cases a shift may occur, to a new form of working or into new market areas, to prevent a cluster's decline and so establish the cycle again. In practice clusters are likely to develop, to bud and to mutate in more complex ways than the simplistic representation presented here.

“Industrial regions need some kind of boost or intervention, they are like organisms that have living and dead parts and go through an evolutionary process.”

(Practitioner Observation, 2002)

Recent research suggests that different interventions are likely to be appropriate at different stages of the cluster lifecycle. Throughout the guide we have drawn attention to particular actions that may be appropriate at different stages of the cluster lifecycle. In embryonic clusters government and intermediary brokers can be important in encouraging collaboration and acting as information brokers, a role that may not be needed at a later stage. Encouraging openness and innovation in mature or declining clusters is essential to avoid the danger of regional lock-in. Not only does this help to maintain the competitiveness of traditional clusters but is also the starting point for promoting the development of new industries.

“Put simply, our argument is that the processes of starting and sustaining a cluster have different economics. Starting a cluster involves first, building the economic fundamentals for an industry or technology, and second, finding the spark of entrepreneurship to get it going. The forces underlying the emergence of a cluster differ from those needed to insure its continued growth. While increasing returns and external effects can keep a cluster going, the initial spark is more difficult to obtain and more risky to pursue.

(Bresnahan et al, 2002)

Other evidence suggests that certain types of intervention remain appropriate throughout the life cycle of a cluster but the intensity required will change as will the manner in which it is delivered, taking into account the context of the cluster and the range of institutions present.

Developing cluster strategy

Cluster practitioners will need to take into account the nature of the cluster, its stage of development and the context in which it is set. This is achieved through good diagnosis and working with cluster firms and institutions. It is essential that in developing cluster strategies practitioners take into account of the location specific characteristics of the clusters that they are working with.

In developing cluster strategies and actions practitioners should be creative and be wary of simply transplanting lessons from other contexts without regard for their own circumstances. Facilitating cluster based

firms and organisations to instigate their own actions may also prove to be as effective as direct intervention. Although the tools are familiar the precise shape and weight attached to each will vary.

“Practitioners should not pursue ‘one size fits all’ policies.”

(D’Oetreppe, 2003)

“Firms form a critical link with each other, to the extent that for a successful cluster to exist, these players will have to be in some form of working partnership.”

(Practitioner Observation, 2002)

Cluster strategies should also distinguish between interventions that are cluster-specific and those that are not, but which would contribute to the development of the cluster. For example, infrastructure improvements are rarely cluster specific. In contrast, interventions supporting access to finance might be highly specific to a particular cluster.

Cluster development can be facilitated through integrated strategies. A good example is that of Baden-Württemberg, set out below. Overall, the evidence suggests that policy interventions that are well-designed can be an effective support to the development of successful clusters.

Profile 1²: Integrated approaches to cluster development

Since the ‘Innovation offensive’ (or innovation push) in 1992 Baden-Württemberg has sought to create the

infrastructure to encourage clusters in new technology industries (especially in the fields of biotechnology, telemedia and health). This has involved a number of policies implemented by the Land in an attempt to create the necessary institutional thickness for cluster development. This has included:

- The promotion of new technology areas.
- The setting up of biotechnology parks and agencies, software centres, traffic infrastructure technologies, data highways, and science cities (Wissenschaftsstädte).
- The establishment of technology transfer centres (in partnership with local authorities).
- Technology centres’ support of business start-ups.
- The establishment of ‘New Business Associations’ aimed at young entrepreneurs.
- Technology aid schemes to support small firms (less than 20 employees).
- Joint research projects between SMEs, technology transfer centres and other firms.

The success of the Baden-Württemberg clusters has been ascribed to, among other things:

- Vertical linkages along the value chain.
- High levels of regional sourcing.
- Strong supplier linkages between local SMEs and large companies.
- Flexible, high-quality production, which allowed firms to avoid price-based competition.
- A political culture of pragmatism and consensus.

- Widespread vocational training.
- The existence of technological aid schemes to subsidise product development.
- Publicly provided low-interest loans to SMEs and start-ups.
- The existence of technology centres, and usually situated next to a Fachhochschule.
- Wide distribution of innovation consultancy offices run by the Chambers of Commerce.
- Baden-Württemberg's positive image as a region for reliability, quality and innovation.

Summary

The range of potential interventions is extensive, as this guide will demonstrate, but not all will be appropriate to any single cluster, nor to any single region. Appropriate interventions will also change over time. Strategies, and so interventions, must be dynamic and focused on need. On balance, cluster managers should also be cautious about intervening too heavily, the market should lead and interventions should be designed to facilitate the operation of market forces.

“Policy intervention should be minimal and only to protect the growth of the cluster, the market should be the driving force.”

(Practitioner Observation, 2002)

3. Measuring Cluster Development

The previous section outlined the importance of developing responsive cluster strategies. This section stresses the importance of measuring cluster development.

Having good quantitative feedback is a vital part of the strategy review process, as well as informing the development of the strategy itself. However, from the work undertaken, and reported in the accompanying Evidence Paper, there is little evidence of the use of consistent indicators by which to measure the development of clusters. This section sets out an approach to indicator selection. It begins by looking at the use of indicators as a decision support tool and then considers a potential monitoring framework.

Why do we measure clusters?

It is clear that establishing a set of metrics that are capable of tracking the performance of a cluster over time and space is important for:

- Assessing the impact of cluster measures; and
- Benchmarking performance.

Understanding the different elements of clusters and their respective performance is an important step in identifying where clusters might be strong or weak and where subsequent intervention might be appropriate. This involves quantitative and qualitative analysis. Quantitative analysis might include statistical or numerical analysis on variables such as employment or output. Qualitative analysis might include discussion with businesses in the

cluster over the innovative content of projects, or an assessment of the 'softer' dimensions of the cluster.

Measuring the success of interventions

Policy makers will want to know whether interventions adopted to improve cluster performance have achieved their intended goals. They will also want to know why interventions have not been successful. This can help to identify whether a particular policy approach is effective, whether it is efficient and whether it is appropriate. Measuring success can be undertaken in an absolute sense, i.e. has the intervention achieved the aims it has set itself, but might also be considered relative to other possible actions, or similar approaches adopted in other locations. Regular monitoring will also help to ensure that the intervention is being implemented as planned and having the intended effects, acting as an early warning of any potential difficulties.

Measuring the success of different interventions contributes to the monitoring and evaluation of cluster development policies as a whole. It is important to understand whether success or failure is due to the interventions adopted or to outside factors beyond the control of policy makers.

Box 1: Measurement aims:

Cluster measurement may seek to identify three key things:

The appropriateness of interventions: assessing whether the policy or intervention is relevant with regard to the technical, social or economic problems it is meant to solve.

The effectiveness of interventions: the fact that expected effects have been obtained and that objectives have been achieved. Calculated by relating an output, result or impact indicator to a quantified objective.

The efficiency of interventions: the fact that the effects were obtained at reasonable cost. An efficiency indicator is usually obtained by dividing the budgetary inputs by the quantity of effects obtained.

What should be measured?

Ideally a measurement programme should capture both the effects of the interventions being undertaken and the development of the cluster overall. For the latter it should take into consideration the different aspects of cluster development and seek to understand how each element is developing over time.

Clusters are multi-faceted and measurement should recognise this. There is little point in measuring one or two dimensions of a cluster, as this will miss important aspects of performance. In practice those aspects that are cited as the most important in cluster development, such as networks and the development of

social capital, are currently not being measured on a regular or consistent basis. Most measures focus on the economic performance of the cluster. This captures the outcomes but can not provide information on what is happening to the drivers of cluster success.

The different dimensions of clusters can be broadly classified under one of four headings which broadly encapsulate the following three 'drivers':

- Networks and partnerships – the extent of social capital.
- Innovation and R&D – the extent of innovation and R&D capacity.
- Skills – the availability and quality of the workforce within the cluster.
- Economy and enterprise – the level of employment, number of firms and their performance and the outcomes.

As a principle the success of a particular intervention should be assessed on the basis of what it is intended to achieve, and assess how this contributes to the overall performance of the cluster itself. Measuring the performance of clusters is based upon improvements in the performance of the constituent parts of the cluster, and establishing the effect that cluster policies have had upon this. It is common practice to seek to:

- identify the outcomes of any intervention;
- the results achieved by this; and potentially,
- the impact that this has had on the development of the cluster as a whole.

When deciding which indicators to use ensuring their relevance to the action in

hand is not the only consideration. We should also consider whether they have a wider relevance. Indicators that are unique to a particular cluster or context will not always be useful in trying to measure relative performance compared to similar clusters elsewhere in the UK or abroad. Examples of unique indicators can include the absolute increase in research funds received by an individual university. A better measure might be to measure the overall level of research expenditure in the cluster as a whole.

The science of measuring clusters remains in its infancy. So it will not be possible to definitively measure the performance of a particular cluster. However, it is possible to aim for is an understanding of the results of particular interventions on the identified cluster and its component firms.

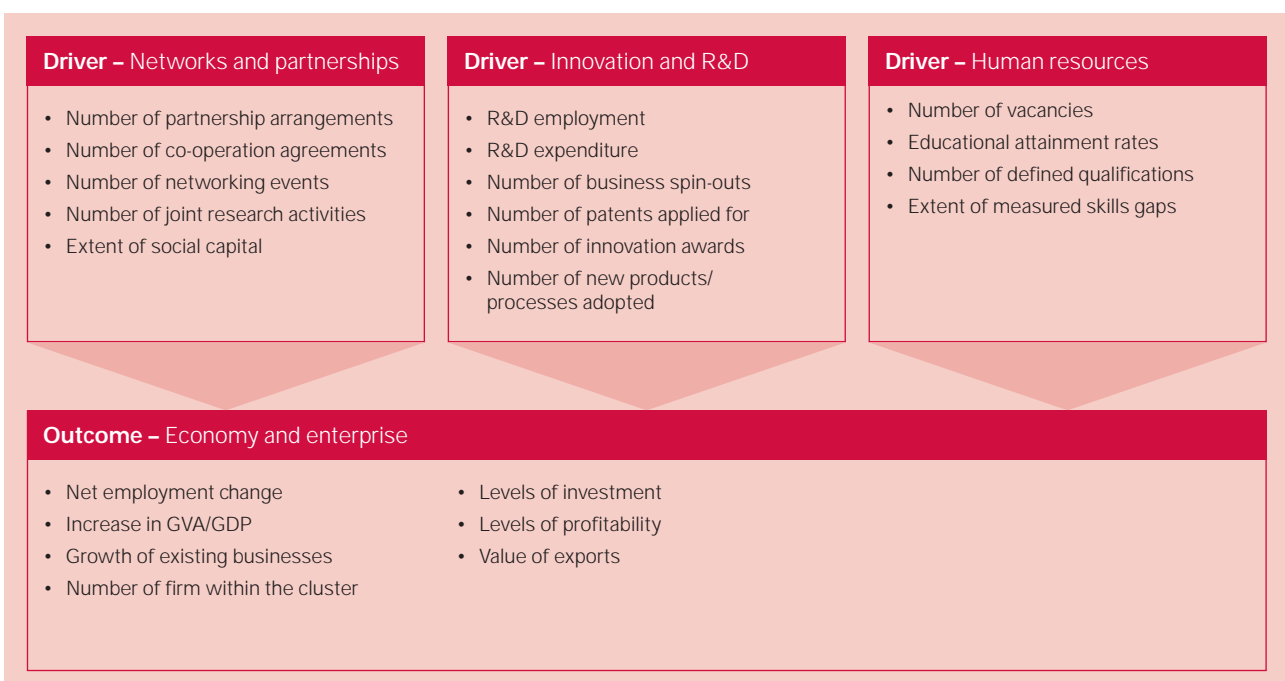
What types of indicators might we use?

The choice of what indicators to use will depend on:

- The nature of the cluster;
- The nature of the interventions adopted; and
- The overall policy objective.

We have already suggested that when measuring the development of clusters we should distinguish between the different dimensions of clusters. The choice of indicators should reflect this approach. Some possible indicators of success are suggested in Figure 4 below. These are neither definitive nor exhaustive but provide an illustration of potential indicators by which the development of clusters can be measured.

Figure 4: An illustrative monitoring framework



Where does the information come from?

In general, there are three potential sources of information which might be drawn on to assess the development of clusters:

- Official statistical data sets.
- Commissioned survey work.
- Qualitative understanding based on discussions with cluster members.

Each of these have their own strengths and weaknesses and choosing appropriate indicators might be influenced by what information can be readily accessed. The measurement of some indicators is complicated by the manner in which statistics are collected. The pros and cons of different measures should be carefully assessed before indicators are ascribed to particular actions.

Overall a mix of the three sources referred to above will provide the fullest understanding of the development of clusters and the effects that this is having on the performance of a wider economy. There will of course be a trade off between the resources expended and the depth of understanding achieved.

There is some albeit limited evidence that practitioners are using more sophisticated methods of cluster development such as business profiling (an analysis of companies by product), supply chain analysis and input/output analysis. Where this latter analysis can be refined down to the regional level it can provide key data on linkages between sectors.

Over what timescale should measurement take place and targets be set?

Clusters take a long time to develop; most successful clusters have a history stretching back several decades. In deciding upon an appropriate monitoring framework it is important that we ensure that the indicator mix identified is capable of providing information on a regular basis to assist understanding of progress towards more long-term targets. Ideally, a monitoring framework will set out a number of indicators capable of being measured every year, coupled with some to be measured only every few years. Different aspects of cluster development will also require different monitoring schedules and this can be built into the framework just described. For example interventions supporting innovation may take some years to come to fruition, whilst initial partnership building initiatives might have a shorter timeframe.

A framework that identified indicators and targets capable of being monitored and reviewed on 1 year, 2 year, 5 year and 10 year cycles can provide an informative mix that is responsive to change. This will also allow for different sets of data to be collected depended upon statistical reporting cycles and the frequency with which surveys can be undertaken.

Establishing targets

Establishing targets for particular indicators is an important aspect of cluster development initiatives. It is important not only to know the direction we wish to head, how far we have to go and how long this is likely to take us.

Targets should be:

- **specific** to the initiative in hand;
- **measurable** using identified data sets;
- **achievable** by the initiative in question with the resources available;
- **realistic**, given the existing state of play; and
- **timebound**, in that there is an agreed data by which they will be achieved.

Learning from experience

The aim of measuring cluster development is so that we can learn from our experience in order to improve the actions that we are taking. Unsuccessful actions should be ended, successful actions continued, replicated where relevant or discontinued where no longer appropriate. New actions should be adopted where information suggests that weaknesses are emerging or opportunities present and things should be left well alone where no actions are needed.

Monitoring and evaluation is part of the policy cycle and information gained from measuring cluster development should be fed back into the policy process to inform future policy development. This requirement may itself influence the timeframe adopted for the monitoring of cluster development.



Section B: 'What works': Policy Action to Support Clusters

Section B sets out the factors that are associated with cluster success, and the types of policy interventions that can be deployed.

Chapter 4 sets out the critical success factors.

Chapter 5 looks at contributory success factors.

Chapter 6 discusses complementary factors.

4. Critical success factors

This chapter sets out the most critical success factors. These are the issues, identified by the research, which should be at the heart of any cluster strategy. The chapter explores why they are important, and sets out possible policy approaches.

The evidence suggests that there are three critical success factors that underpin cluster success (box 3).

Box 3: Critical factors for successful cluster development

Our research has highlighted three cluster attributes that appear central to successful clusters:

- Networks and partnerships.
- Strong skills base.
- Innovation and R&D capacity.

The presence of networks and partnerships

Networks that generate formal and informal flows of knowledge and information throughout a cluster provide the gel that binds success over time. Access to tacit knowledge can support collective learning and more competitive performance. Networks can be the means through which many cluster-development activities are delivered.

“The key to growth for many small firms within a cluster is its ability to gain strength through co-operation and collaboration utilising formal and informal networks.”

(OECD, 1996)

Successful clusters tend to have strongly embedded networks and relationship systems. Trust and inter-personal relationships are highly developed, providing the cluster with a strong degree of social capital. Developing these relationships takes time. Networks may be supported through strong institutional structures, or through shared cultural values and a common purpose.

The value of informal networks, based on social relations and even job-moves, is that it enables a transfer of knowledge around the cluster. Such ‘untraded’ means of information dissemination such as informal collaboration and extensive contact networks can create a ‘knowledge community’.

“It might seem that, given their desire for secrecy, racing car firms would be better off locating outside of this region but the reverse is the case – they have more to gain by tapping into the deep but rapidly circulating stream of knowledge.”

(Pinch and Henry, 1999)

“It is important to try to get businesses to work together when there is a clear logic for them doing so. Developing a willingness to cooperate among businesses and a profile for the cluster takes years.”

(Practitioner Observation, 2002)

The sharing of knowledge through networks and partnerships can be achieved through face-to-face contacts or through remote technologies, such as the web. Technology has advanced significantly in this respect and cluster practitioners are using interactive cluster portals to facilitate networking, share information about the cluster as well as using them for actual business to business interactions. The key is that a flow of knowledge occurs and in more sophisticated networks that active collaboration is encouraged.

“If the cluster is large³ it is impossible to talk to individual firms because there are too many. Promotion of networking is therefore important so word gets around.”

(Practitioner Observation, 2002)

Networks can vary in size from a handful of companies working together on

collaborative ideas to associations with a hundred or more members. Size is less important than the fact that they serve a purpose and there are benefits to membership. Some networks are highly specialised whilst others cover many different topics.

Networks and partnerships are a part of the industrial landscape in some clusters, such as those in Northern Italy, developing naturally through social and cultural relationships. In other places they have been developed by firms within a cluster, or by public sector intervention, often in response to an identified weaknesses.

Where networks and partnerships are weakly developed there is a case for initiatives that really push the idea of clustering forward and place it in the minds of SME managers. Showing SMEs the direct benefits of clustering and the opportunities that they would miss out on is the best way to secure involvement and support. Example one provides an illustration of a working network that has been stimulated by the public sector – practitioners can look on the web site to see how companies in the Scottish Food and Drink Industry are encouraged to work together.

Example 1⁴: Developing networks: Scottish Food and Drink

The Scottish Food & Drink Cluster is a good example of a whole industry pulling together to help itself. Each of its individual companies aims to develop themselves through shared experiences and innovation. With help from Scottish Enterprise and Highlands and Islands

Enterprise Scottish Food and Drink has helped Scottish food and drink companies to:

- access key market information;
- gain new listings with UK retailers;
- build the skills of their workforce; and
- develop new products.

Scottish Food and Drink is now a recognisable brand, is supported through the public agencies and has a strong information-based website. It has a published strategy, developed with food and drink companies and organises a series of regional forums offering an opportunity for related companies to meet and make contact.

Communities of Practice

Cluster networks need to be more than simply opportunities to meet. Networks will ideally form 'communities of practice', with many such networks present in each cluster, associated with different interests. What causes one company or interest to join a cluster will not be the same for everyone and their needs are likely to shift in time. It is likely that networks will continuously form and reform as membership and needs change.

The development of communities of practice can help companies to share ideas, trade or innovate with new ideas. They can also operate across clusters (for training purposes for instance). Communities of interest are likely to be a feature of clusters of the future and indeed many RDAs and industries are taking steps to encourage this process – through the creation of virtual enterprise networks or centres of industrial collaboration (see for example 5 and the actions of Yorkshire Forward below).

Networking and Institutional Development Policies

Making linkages

Fostering linkages between the members of a cluster is one of the most important elements of any cluster development strategy. In many instances networks are formed naturally by cluster-based firms. This may simply be about bringing firms and others together and allowing an internal dynamic to be established, or it might involve practical actions to foster collaboration and joint working. This can involve developing new institutional structures or formats, which are able to take these roles forward.

Often networks form naturally within clusters in response to needs identified by member firms, or on the initiative of one or two key individuals. What is critical is that all members gain something from their participation. In this respect networks tend to work best when they develop organically and from the bottom up.

Example 2⁵: Developing new institutional structures

In some cases a whole host of networks and other institutions have been established as clusters have developed, an often natural phenomenon in maturing clusters. In Cambridge for example:

- The Cambridge Network was established by local business leaders to increase networking between local IT firms and to raise their international profile;
- an academic-business alliance,

Cambridge Futures has also been established, with private sector funding, to explore different scenarios for accommodating anticipated growth in the Cambridgeshire area; and

- The Greater Cambridgeshire Partnership was established in 1998 between local business, government and the university for a similar purpose.

In other instances grants are made available to firms that wish to organise networks, although sometimes more active facilitation/assistance is involved.

Example 3⁶: Bringing firms together

The state of Oregon, like other US states, built upon earlier experience in Denmark to develop a network programme. This was designed to encourage firms to join together into networks. The elements of the network programme were:

- Network brokers – the key to each network, brokers acted as facilitators for networking events, as well as acting to bring firms together. To support the scheme Oregon also designed a broker training programme.
- Multipliers – well-placed individuals familiar with local firms that can pass on information of opportunities for collaboration to network brokers.
- Incentives – support to compensate small firms for some of the costs of network participation.
- Information campaigns – the use of media, brochures and newsletters to publicise the potential value of networks.

Finland developed the same approach but also extended it to promote international co-operation between German and Finnish firms⁷. For several firms the experience has been positive and increased the competitiveness of firms through lower costs, extended market, the application of new management procedures and so on. However, experience in Finland, and other countries that have undertaken such partnership development projects, has also shown that in some cases co-operation has ceased as soon as government funding has ended. It seems that successful partnership working needs to have a business rationale behind it if it is to succeed over the longer-term without public resources.

Networks and partnerships can support new product development, such as through the sharing of information between research institutes, between research bodies and firms or simply between firms. Once a network is established other wider benefits may begin to be realised. Networks provide a means of building trust and understanding, as well as spreading knowledge and intelligence. They are facilitative in nature, providing a forum for participants to assess the potential for joint working and collaboration in a given area.

Example 4: Engaging firms

There are many ways of engaging firms in networks. Scottish Enterprise used the following means of engaging businesses in its identified tourism cluster:

1. A 'Leadership Group' comprised of industry champions and key stakeholders was established.

2. Facilitators then worked with firms to undertake some background profiling and scoping of the sector.
3. Meetings were undertaken to discuss potential strategic objectives and also to prioritise actions. At this stage painting a compelling 'vision' or shared understanding for the cluster was important.
4. These actions were used to develop 'Action Groups' that drew up action and business plans for the sector. One of the responsibilities of the leadership group was to review and support the process as a whole.

Networking with a purpose

Networks should not be encouraged for their own sake; they are a means to an end and not an end in themselves. Unless they fulfil some need they will not survive. It is 'networking with a purpose' that delivers the real benefits in terms of cluster success. This is true whether the networks have sought to deliver common skills or training needs, joint marketing or R&D. In terms of policy intervention care needs to be taken in support of such networks in that there is a clear drive to take them forward. If this isn't present the network will collapse soon after the initial intervention.

Example 5: Developing a physical focal point

In England, South East England Development Agency (SEEDA) has developed its Enterprise Hub network partly to assist in networking between firms. A prominent Business Champion, supported by a group of ambitious entrepreneurs, leads each Hub. University

and Network Brokers support the Hub, with a team of experts to advise small businesses on innovation, product design, business finance, IT & e-commerce.

The Enterprise Hub Network aims to set up 30 new Hubs across the South East of England. Each Hub will provide:

- Incubator space for new businesses.
- Strong links with venture capitalists.
- An affiliated university research department.
- A Business Club for networking.
- Web based tax & accounts advice.
- Business mentoring.

What makes effective networks

In considering what types of network are most effective three elements stand out:

- networks need to be capable of spreading good practice;
- networks need to extend beyond the cluster; and
- networks should be international.

These points link back to concept of 'networking with a purpose'.

Example 6⁸: Developing international networks

Officials of the Carolina Hosiery Association, along with community college technology centre staff, the director of the North Carolina technology agency and the Governor's economic advisor travelled to Castel Goffredo and Carpi in northern Italy. Not only did the trip lead to the establishment of links to machine builders in Brescia and the development of export

networks it also led to a revamp of the local technological centre, through offering additional research and training activities and the formation of an R&D network between hosiery firms and North Carolina State University.

This is not say that all networks should have these characteristics, merely that these are the features of networks in more successful clusters. It may form a longer-term aspiration. The message is that inwardly-focused networking may support the development of a local cluster identity but it will not serve as well to boost the competitive position of firms within the cluster over the longer-term.

“Make sure you belong to a network with high aspirations to expand beyond the region.”

(Practitioner Observation, 2002)

The role of networking bodies

Institutions such as universities and trade associations can play a key part in nurturing the development of the cluster. In the best cases network organisations can facilitate and animate whole cluster development strategies. Sector bodies can play a key role in terms of networking and have the advantages of being market-led and company focused. However this can mean that other dimensions of cluster development can be neglected and practitioners should consider whether such bodies are providing a service for members or the sector's needs as a whole – these can be two very different things. Be aware also that sector groups can act as a barrier to cluster development as clusters cut across traditional sector

definitions – for instance some clusters may be defined by common technologies.

Example 7^o: Institutional arrangements for promoting innovation

Many successful clusters are supported by a range of institutional organisations, some are focussed on that cluster, others have a more general remit. Analysical Biotechnology Clusters in Massachusetts identified the following as amongst the key agents:

- Massachusetts Biotechnology Council: trade association representing biotechnology firms.
- Massachusetts Department of Economic Development: has a key role in business and trade development, improving the business climate (R&D tax credits, investment tax credits).
- Massachusetts Technology Collaborative: state-founded, independent body to foster technology-intensive enterprises.
- Massachusetts Institute of Technology: leading centre for biotechnology research and commercialisation; campus incubators and technology park; MIT Entrepreneurship Centre trains scientists in entrepreneurship; MIT Technology Licensing Office, identifies technologies suitable for start-ups, introduces technology to potential investors (usually venture capitalists).
- Whitehead Institute of Biomedical Research: an independent research and teaching institution.

The case study of networking bodies in Massachusetts (Profile 3) are probably some of the most well known in the world.

Profile 3¹⁰: The Massachusetts Technology Collaborative (MTC)

The Massachusetts Technology (MTC) Collaborative was established in 1994 at the request of the state legislature to support economic development in the innovation economy through activities that support the growth of technology industries. MTC's Innovation Initiative meets this goal in two ways:

- by sponsoring projects in collaboration with technology industry clusters, or with regions of the state that are developing such clusters; and
- by sponsoring projects that cultivate a climate of innovation in the Commonwealth.

The MTC cluster initiative sponsors projects which strengthen innovation within 9 key clusters (representing about a quarter of all jobs in the state). It fosters the exchange of ideas for new cutting edge activities amongst stage agencies, private companies/clusters and educational institutions. One such project involved the creation of Mass MEDIC, a trade association for Massachusetts based medical device companies, and Berkshire Connect, aimed at bringing high speed Internet access to the most western part of the state. In addition, MTC owns, manages and develops its Westborough headquarters as the Massachusetts Technology Park. The use

of the 36-acre campus reflects MTC's mission to promote partnerships among industrial, educational, and governmental sectors. The George Kariotis Center serves as MTC's administrative headquarters. The Karl Weiss Education and Conference Center is used by UMass for its Center for Professional Education¹¹. MTC's Innovation Center houses the Renewable Energy Trust¹² and the Innovation Initiative¹³. The campus includes a 70,000 square foot state-of-the-art fabrication facility, currently leased by Kopin Corporation¹⁴, a Massachusetts-based manufacturer of high resolution flat panel displays.

Networking and partnership at different stages of the lifecycle

At the embryonic stage of the cluster lifecycle the establishment, creation and nurturing of networks and partnerships appears important. As the cluster matures then 'networking with a purpose' becomes more commonplace and encouraging inter-company working (business to business interactions) can be an important role for the cluster practitioner. Practitioners can assist declining clusters to form partnerships or networks to respond to challenging market conditions or potential threats.

In South Yorkshire the focus has been on transforming a declining or mature industry by focusing efforts on an Advanced Manufacturing Research Centre a Centre of Excellence for aerospace manufacturing which will be the focus of a new Advanced Manufacturing Park. The purpose of the initiative is to focus on individual sub-sector strengths within the sub-region and improve joint working

and expertise in a particular area. This is in part a response to the continuing decline of the sector as whole in light of competitive and other pressures.

In the long run, establishing inter-relations between firms helps tie together the economic fabric and increases the potential for firms to adapt to new markets and changed economic conditions.

Box 4¹⁵: Lessons learned from a decade of networks

- Firms will and do co-operate.
- Networks can be accelerated by brokers.
- Incentive grants are of limited value, networks so started rarely survive beyond the life of the grant.
- Social capital has been vastly under-rated.
- Learning is a sufficient benefit for companies to network.

The presence of a strong skill base

There is a consensus across the literature that successful clusters are those that been able to access and nurture a strong skills base, both in terms of higher level and management skills and a suitably qualified labour force more generally. This is seen as a key factor in attracting and retaining companies as well as contributing to the successful development of companies within a cluster. The quality and quantity of the available labour force is thus a critical component in the development of successful clusters.

As a cultural, media and financial world capital, New York offers the growing multimedia industry a teeming pool of young designers, artists, writers and programmers well positioned to exploit the dynamic diffusion of personal computers and the Internet. The cluster flourished because of the ample pool of young designers, artists and writers who are fluent in digital technology. New York's compactness also facilitates the use of support services of regional actors in research, education, economic, promotional and technology transfer. Access to artistic and editorial talent are also important factors in the cluster's success¹⁶.

The skills mix and composition is important

Successful clusters require a range of appropriate skills and abilities. The sorts of business skills that are sought within successful clusters included those associated with global businesses such as strategic management skills for business leaders, entrepreneurship for graduates, management and production techniques, leadership skills, mentoring/coaching and personal development skills.

Demand and supply side considerations

The quality and availability of training can also be a factor contributing to the development of successful clusters. This can apply to the existing workforce as well as to new and potential entrants to the labour market. The capacity of the available training infrastructure to respond to employer needs and provide relevant training is a key factor. The cluster can have an influence on the provider side in terms of encouraging appropriate provision that is flexible and meets with the needs of employers.

Example 8¹⁷: Informed training and education

The Northeast Oklahoma Manufacturers Council (NEOMC) in Okmulgee, Oklahoma, was created by the technical branch of the Oklahoma State University, Manufacturing Extension Partnership, and 30 companies in 1993 in response to skill and employment needs of local companies. It has successfully established internship programs and a summer academy that introduces young people to high-tech manufacturing as a potential career. Other activities undertaken subsequently include helping members secure contract opportunities through the use of a resource matrix and training members to develop e-commerce and e-business capabilities. (www.ocevnet.org/neomc¹⁸).

Clusters offer opportunities for focusing human resource development provision in ways that are particularly beneficial for firm development. This may be through the provision of specialist advice, guidance and information services (for individuals and companies), grants/support for training for companies, or through the development of specialist centres for delivering training and development activities. Cluster managers should engage with local business leaders, education providers and their Learning and Skills Council(s) in the development of effective skills policies. Cluster managers should also be aware that employers are likely to be given a much greater input in the design, content, and assessment of qualifications following the publication of the National Skills Strategy.

When developing activities in this area practitioners should take every opportunity to draw different companies and groups of employees together through promoting joint provision of training solutions. This will both support the development of networks themselves and contribute to the development of communities of practice or purposeful alliances.

Many practitioners and authors highlight the importance of higher education and business collaboration (see Clusters: Higher Education and Business Collaborating for Success¹⁹ for a series of good practice examples). Creating strong links between Higher Education Institutions (HEIs) and businesses is an essential part of improving economic performance, and HEIs have an increasingly important role to play in increasing the competitiveness of regional economies.

Example 9²⁰: Influencing the scope of local training provision.

British Aerospace has developed an aerospace focused engineering and science degree in Ayrshire to enhance the pool of skilled labour for the local companies in the sector. Ireland and Canada also have national aerospace training initiatives. Oxford Brookes University have developed innovative training courses to meet the skills needs of their local biotechnology, e-publishing and motor-sports clusters.

Providing advice and guidance

Some successful initiatives are not focused on providing training but on increasing awareness of what is already

available and influencing provision amongst educational providers. Profile 4 provides an example of a web-service operating in California which acts as a comprehensive information portal. It was established through research and the establishment of an institutional structure, demonstrating the depth of work sometimes required for seemingly simple results.

Profile 4: SkillsNet™

SkillsNet™ is a Californian initiative striving to address common multimedia workforce issues by providing support, training, and an adequate database of information for digital employees. SkillsNet™ 's on-line forum, <http://www.skillsnet.net>, aims to encourage various sectors to communicate and collaborate. The common goal is to support the development of a skilled workforce for vital multimedia occupations in the digital economy of the 21st Century. SkillsNet™ provides:

- Advice on the nature of the multimedia industry.
- Types of jobs that are available in the cluster.
- Types of training courses (including a database of 158 different courses).
- A 'job-seekers' guide to gaining employment in the industry.

SkillsNet™ was established through the following steps:

- The undertaking of **LMI research** in partnership with stakeholders focused on:

- identifying common needs;
- developing skills strategies;
- setting priorities; and
- building support for action.
- The establishment of an **Industry Skills Council**, composed of industry leaders, to guide implementation.
- The use of the results of the LMI research, to communicate industry needs to education and training providers who can supply workforce development.
- The development of a regional employer-training consortia, building on the results of the research and contacts and networks established during the research²¹.

The research did not yield many examples of advice and guidance projects focused on key clusters. However, there is some evidence to suggest that advice and guidance activities are particularly important within declining clusters (see Profile 5).

Profile 5²²: Steel Redundancies

When a cluster is declining skills interventions and retraining are often essential responses. Within the steel industry in the UK this has taken the form an initiative called the Rapid Response Service. This was set up as a range of local partnership, bringing together Jobcentre Plus with the local LSC, Business Link and the Regional Development Agency. Typically these initiatives take the form of:

- The identification of individuals' transferable skills and re-training needs, funding for additional training,

and early access to a range of standard Jobcentre Plus provision (for instance Work Based Learning for Adults).

- Assistance and advice offered by benefits processing staff offered on-site.
- On-site redundancy roadshows, which include local training providers and colleges, who explain options available to the affected workforce.
- Advice to people considering establishing their own businesses, including business planning and accessing funding as well as training.
- A range of learning to workers affected by the redundancies (typically offered by local LSC's).

Training for new entrants

A focus on new entrants to the labour force can prove positive in stimulating interest in a particular cluster. This may be particularly appropriate for mature clusters that are finding it difficult to attract labour. Interventions targeting youth (apprenticeships) and educational (including HE and FE) awareness schemes (employer schools links, schools initiatives (science education and technical skills projects), graduate fairs or other graduate retention measures (such as placements) can all be appropriate.

Young people's high-level qualifications may mask poor communication, teamwork and problem-solving skills²³, reinforcing the need to improve the links between work and training. Common examples include employers and education providers working together to develop curricula and courses involving industry placements. The example provided in Example 8 is a good example of this approach.

Training for re-entrants

Support for re-entrants to the labour force and those currently out of work may also assist in broadening the available labour force. Interventions can include training schemes for the unemployed that specifically focus on opportunities in identified clusters. Interventions in this area may combine social inclusion and cluster development objectives.

Example 10 provides a good example of community based cluster focused training centre.

Example 10²⁴: Automotive and Pharmaceutical Cluster Training: Partnership for Learning (PFL) Merseyside

Partnership for Learning operates as a registered charity and with partnership from private, public and community. It is a self-sustaining, commercial business that aims to help regenerate Merseyside by helping to provide a route to highly skilled, well-paid employment for local people and success in business for their employers. It provides vocational training for 40 major clients in the Northwest including companies such as Jaguar, Evans Vaccines, Eli Lilly and Glaxo Smith Kline.

The aim of the centre is (a) to deliver training that enhances the education and skills opportunities of the local communities, and (b) to support businesses with demand-led training solutions. To this end it provides community based and SME focused training for re-skilling and up-skilling.

The centre was established under the premise that employers and local economies cannot thrive if they act in isolation from each other.

Broadening the skills base

A cluster may require a broader or deeper skills base than is currently present.

Interventions may focus on ongoing skills development raising skill levels of existing employees through lifelong learning (including key skills), transferable skills and employee development initiatives. ICT/e-commerce training for on-line booking was common within the service sector whilst CAD training and lean manufacturing techniques have commonly been promoted in manufacturing based clusters. Again having employers at the heart of these initiatives can help to give them credibility within the sector. Example 11 highlights good practice in working with the cluster to develop the skills base available to firms within the cluster.

Example 11²⁵: Improving Higher-Level Skills

The BioPharm Skills Task Force was funded by SEEDA and aimed at the continuing education needs of scientists and managers in industry. The programme is aimed at employees within the biopharm industries who are encouraged to broaden their education. It comprises of three main elements:

- Investment in resource centres to provide to provide information, up-skilling, retraining, careers advice and teaching.
- Benchmarking of opportunities to attract the right people.

- The establishment of a BioPharm Skills Unit dealing directly with individual companies to analyse skills needs and source appropriate providers and work with training providers to develop their capacity (to train).

Management development

Skills development should also consider the needs of managers and owners within a cluster. Strategic management skills for business leaders, entrepreneurship for graduates, training in management and production techniques and in leadership skills have all proved successful in promoting company development. These skills are especially useful when they are tailored to a particular cluster's needs.

Developing skills centres

In some clusters there is a pressure to develop new training infrastructure, through which appropriate training can be delivered. This is not essential, existing infrastructure may simply need to be redirected, but it can provide a valuable focus. In North Carolina the Hosiery Technology Centre is located at the Catawba Valley Community College, but is independent of the state college system. Rosenfeld reports that it successfully trains production workers and repair people, educates mill managers and facilitates inter-firm collaboration²⁶.

A specialist centre need not be a physical building but could be a virtual centre that organises individuals and teams from various educational institutions to support the needs of identified clusters. Box 5 identifies some of the key characteristics of skills centres which are associated with cluster development.

Box 5²⁷: Characteristics of Cluster Skills Centres

- Cluster-based not technology based.
- Emphasises industry specific knowledge.
- Provides crucial links to industry associations.
- Uses business not equipment as its context.
- Functions as an information repository and information portal.
- Stresses staff and curricula in budget, not bricks and mortar.
- Shares curricula and information region-wide and trains faculty from other places.
- Has lead responsibility for cluster needs assessments.
- Works with cluster associations on skill standards and certification.
- Provides out-reach to socially excluded populations.

Skills interventions at various stages of the lifecycle

Skills development and initiatives for 'new entrants' to a cluster can be a valuable component in supporting the development of embryonic clusters. Whilst established and mature firms can come together to address skills issues through joint provision this is less likely at an early stage of the lifecycle.

Nevertheless, there is evidence that skill shortages can occur at all stages of the cluster lifecycle. However, the mechanism chosen to support skills development may change over the cycle.

Innovation and R&D capacity

The evidence shows that product development and well-developed research structures, together with other forms of innovation, are vital for a dynamic cluster. Innovation maintains the cluster at the forefront of the market whilst a strong R&D base can provide the ideas and products for future development. The promotion of innovation and R&D are two separate activities, although inter-related. Innovation generally refers to product or process development whilst R&D refers to the development of new knowledge. In the best cases successful innovation is the outcome of the R&D process.

Innovation can be incremental, as existing products and processes are gradually built upon, or may be more radical, with the introduction of a wholly new product or approach. Successful clusters are inherently innovative and practitioners can support the innovation process through encouraging networking and the sharing of ideas. Where networks extend outside of the cluster this can also be beneficial as often innovative ideas are ones that work well in one setting and are being applied for the first time to another area. The benefits of information and intelligence services in this area are often worthwhile exploring.

Catalysts for research and innovation

Research institutes including universities, non-profit foundations and for-profit R&D can play an important role as catalysts for research and innovation. They can be the base for developing new ideas and applications but can also play a critical role in nurturing high technology entrepreneurialism. In this respect

public and private research facilities can be key drivers within the cluster.

Example 12²⁸: Public or private research institutes as key drivers of cluster development

The role of research institutes as drivers of cluster development has been emphasised by the experiences of places like Silicon Valley in the USA and Cambridge in the UK where universities have been important components in the development of the cluster. In the Cambridge cluster estimates of the proportion of new firms that have spun out of the university are up to 31% of new firms. 42 out of 50 firms in one survey reported free technological advice from University based staff, through formal or informal networks, with 14 reporting these as critical to the success of the firm.

But a university base is neither necessary nor sufficient

R&D institutions are not essential for strong and successful clusters. There are numerous examples of clusters that perform strongly and are highly innovative but have no base in R&D.

Example 13²⁹: Innovation where a university base is not present

Universities need not be present for the development of successful clusters. The centre of the US furniture industry is located in Mississippi. This has developed over time from spin-offs from Futorian Furniture; the original furniture-making firm located in the area. There are now more than 200 companies based

within this cluster, plus suppliers and support services, and companies compete fiercely in terms of designs and innovations. Yet the social fabric of the community is very strong and ideas travel quickly through social contacts and worker mobility.

Innovation and Research and Development Policies

Support for R&D can take many forms, including the use of R&D tax credits (rarely cluster specific), funding for basic or applied research, technology transfer schemes, the development of specialised research facilities or simply supporting the development of research networks, linking firms, research institutes and other interested parties together. It is important that the role of R&D activity is viewed in the context of the cluster as a whole and that an integrated strategy that includes this element is developed around the cluster. Encouraging multi-firm networks can be crucial elements in this regard (see Example 23 for some approaches).

Promoting R&D and innovation through research infrastructure

The establishment of science and technology parks to attract research-orientated businesses is a common feature in many innovative clusters. In example 14 we highlight an example that has been referred to by various practitioners as an illustration of university collaboration on R&D policies with effective and tangible links to the private sector.

Example 14³⁰: The North Carolina Research Triangle

The 7,000-acre Research Triangle Park (RTP) is the largest research park in the United States, and is home to over 140 organisations. RTP has around 42,000 full-time employees entering the Park each day. Recognised internationally as a centre for cutting-edge research and development, the Park is owned and developed by the private, not-for-profit Research Triangle Foundation. The Research Triangle itself is named for the Triangle formed by the three universities: Duke University at Durham, the University of North Carolina at Chapel Hill, and North Carolina State University in Raleigh. Companies like Glaxo SmithKline Inc., IBM, Covance, Cisco Systems, Inc., Sony/Ericsson, Eisai Inc. and Nortel Networks thrive and grow in a campus-like setting that lends itself to interactive research.

Of course sometimes it is not sufficient to simply establish a science or technology park. To promote research and innovation there must exist strong linkages between researchers and local firms. Many organisations now provide an integrated support service for firms that wish to make use of it, nurturing small firms, acting as technology transfer bodies and promoting university-firm linkages.

Example 15³¹: St. John's Innovation Centre, Cambridge

Located on the Innovation Park developed by St Johns College, University of Cambridge, the Innovation

Centre provides business support and accommodation for early stage knowledge based companies. The Centre was opened in 1987, and as well as providing business advice to tenants, offers them flexible accommodation in leasing terms and the possibility to share communal facilities including conference rooms and a restaurant. The Centre differentiates itself from other property developments by:

- Providing high quality free advice to tenants on business issues.
- Supporting tenants and non tenants by engaging in local programmes with University Departments and Government Bodies to help promote the creation of wealth in the sub region.
- Helping entrepreneurs access funding through organisations such as GEIF, CVG and mensalQcapital.
- Acting as a catalyst in promoting technology locally, regionally, nationally and internationally, including hosting the East of England Innovation Relay Centre (EEIRC).

Whilst there are now many examples across the UK, the SE case study highlighted in Example 15 is one such well established centre that has sought to exploit commercial opportunities through 'hands-on' business support.

University research laboratories can provide a fertile source of technology and expertise for industry. Unlocking this potential can be a challenge. As a result many universities have established Industry Liaison Offices who undertake audits of potential commercial applications within their departments and

simplify the commercialisation process (Example 16). In some circumstances, barriers to commercialising research are more fundamental and may need national action. In France, for example, researchers were prevented from establishing businesses whilst they held public research posts. This reduced the number of researchers willing to try to commercialise their ideas. New legislation was introduced in 1999 to overcome this barrier and researchers in fields such as biotechnology now have the right to establish profit making businesses whilst retaining their research posts for up to six years.

Example 16³²: Commercialising University Research

The University of Oxford has established ISIS Innovation, a wholly-owned technology transfer company. This is intended to assist University researchers who wish to commercialise their ideas. The University assigns its intellectual property to ISIS and ISIS evaluates, protects and markets the intellectual property. ISIS has assisted in the formation of 28 spin-off companies since 1997 and files an average of 1 patent application each week. Managing over 300 patent applications, ISIS seeks to license technologies to companies to develop and sell technology-based products.

Out of any royalty return ISIS receives 30% in recognition of its role in marketing and patenting the invention and the University receives the remaining 70%. The University's share is then distributed between the University

and the researcher in accordance with a published IP policy, generating incentives to commercialise research. The researcher receives 90% of the first £30,000 received by the University and their share declines in pre-determined bands thereafter.

“Innovation and the ability to change have always been major drivers of the Massachusetts economy, with universities producing technology and talent and investment in research and development two of the principal drivers in creation of technology.”

(D'Otreppe, 2003)

Promoting technology transfer

Current thinking suggests that the UK needs to move faster in terms of translating its good record of scientific research into commercial ideas³³.

Many networks and intervention systems are designed to encourage technology transfer. Mention has already been made of the dissemination or multi-firm participation requirements of some grant regimes. Institutional structures have also been established to promote technology transfer through formal or informal means. Perhaps the most well-known example of institutions that promote technology transfer is the Steinbeis-Stiftung in Germany.

Example 17³⁴: Technology Transfer in Baden-Württemberg

The Steinbeis-Stiftung für Wirtschaftsförderung in Baden-Württemberg consists of a network of

220 technology centres. These centres enable SMEs to develop their technological expertise, products and product quality through collaborative projects. One of the most important roles of the transfer centers has been to introduce companies to new technologies and products. Technological aid schemes subsidise 25% of innovative product developments in order to reduce financial risks. They are complemented by publicly provided low-interest loans for SME and start-ups. The state-owned Credit Bank of Baden-Württemberg works close conjunction with local banks (Sparkassen), which are located close to the SMEs. Innovation consultancy offices run by the Chambers of Commerce are well distributed over the whole state, such that even firms in rural areas are able to profit from access to knowledge. The network promotes the diffusion of incentives for new technologies.

Questions are now being raised as to the efficacy of the existing structures as the patterns of use of the transfer centres change. The emphasis is shifting away from transfer and consultation projects towards individual project development. Technology transfer faces new challenges including the restructuring of the regional economy; the internationalisation of products and processes and an increasing demand for collaborative R&D activities from many companies.

Collaboration is the key

When supporting innovation and R&D practitioners should avoid promoting activities within a single company or institution if they are aiming to strengthen the cluster. This is unlikely to provide benefits to the wider cluster or support the development of the cluster itself. Instead practitioners should take every opportunity to promote joint working and the sharing of information, such as through joint research projects, so contributing to the development of networks with a purpose. Once again multi-firm approaches such as those highlighted in Example 23 can be helpful in achieving this.

Innovation and cluster Lifecycles

New ideas need to permeate throughout the lifecycle. For instance reinvention and innovation policy is a critical part of many declining clusters. Support for product and process improvements would appear to be important for established and mature clusters as well as supporting SMEs to prepare for new markets.

5. Contributory factors and policies for success

In this section we examine those factors that were identified as being important contributors to the successful development of clusters.

They are not as frequently cited as the critical factors discussed in the previous section but, nonetheless, provide an important basis on which cluster strategies can build.

Box 6: Contributory factors for successful cluster development

In addition to the three critical success factors set out in the previous chapter the research³⁵ also highlighted that there are some other contributory aspects for cluster development, particularly:

- The presence of large firms.
- Adequate infrastructure.
- Entrepreneurial spirit.
- Access to finance.

In the following section we look at each of these areas in more detail and provide some examples of approaches that have been reported as successful in promoting these factors.

The presence of large firms

Large firms are often present in successful clusters. The much desired anchor firms are large sources of technology, markets and expertise. Large firms act as miniature innovation systems in their own right, supplying incubation space to employees,

financing their own start ups, providing technical expertise, product specifications and initial markets. Large firms also provide a steady flow of trained people which small innovating firms can hire, and can share expertise with the supply chain (example 18).

Large firms can play a catalytic role in a number of respects:

- They create a critical mass of experienced managers and workers.
- They can provide a customer and supplier base.
- They provide ideal conditions for high technology firms to grow and develop.
- They have multiplier effects in terms of a region's local economy for materials and services (these can range from university graduates to office supply services to raw materials' production).

The advantages of an 'anchor' based cluster for practitioners is that:

- They can focus public resources.
- They can stimulate networking.
- They can facilitate industrial restructuring.
- Large firms can sometimes marshal the resources to assist other companies (in terms of offering valuable personnel support or helping to nurture the cluster for instance).

- They can result in cost savings (localisation economies) in terms of local suppliers, labour, technology and infrastructure.

Example 18³⁶: Business mentoring

The DTI and PILOT Business to Business Mentoring (B2B)³⁷ programme began in October 2000 with 20 mentors from the leading oil and gas majors matched with 20 SME mentees. The primary aim of the programme was to build closer industry relationships providing the opportunity for participants to work with companies from the opposite end of the supply chain, learn about their paired organisation, and access the network of companies who played their part in the whole programme. The initiative has been useful as process of joint learning between large companies and SME's, improving communications and understanding each other's workings and constraints.

Large firms as catalysts

Large firms have acted as a catalyst for the development of clusters and subsequently as driving forces in the ongoing development of a cluster. In many instances they have stimulated the entry and growth of related firms into an area, and so supported the development of a critical mass of activity. Making connections locally therefore can be advantageous for firms. In the UK, the Society of British Aerospace Companies reports that firms within Aerospace clusters typically serve one or two of the aerospace majors, often located in close proximity. Such companies, it reports, benefit from a pool of local labour, trained and accustomed to working to the required high standards.

Profile 6³⁸: Cluster Origins in Japan

In Japan the Komatsu machinery cluster evolved from the Komatsu Construction Company. The machinery cluster evolved from a historical network of support and related companies in the textile (silk in particular). Nakajima Aircraft and Fuji Heavy industries sparked the development of the auto cluster in Ota. Original Equipment Manufacturers in Ota provided continuous demand for parts, services and products. The existence of a large assembler has provided a vertically structured sub-contracting system. Following the development of the aircraft and automobile industries in the first half of the 20th century, the area attracted a number of new entrants and spin off's in the 1950's and 1960's. The cluster is presently structured hierarchically with more than 70 firms operating as first-tier, second tier and third tier suppliers for Fuji Heavy Industries. Whilst this remains the core assembler, many of Ota's part manufacturers also trade with other auto assemblers within the region and beyond.

The proximity of suppliers and other supporting firms can assist innovation and reduce transaction costs. A virtuous circle can be established as new firms are attracted to an area by the existing cluster of firms, or are established by ex-employees of the original large companies.

Profile 7³⁹: Origins of the Arizona Software Cluster

In the 1950s large companies such as General Electric and Motorola established significant plants in the Phoenix area to take advantage of the weather, proximity to good universities and their students, low land costs and low costs of labour. As these firms grew so did an associated cluster of inter-related information technology and semiconductor firms, acting as a magnet for information technology professionals. In turn further large firms have located in the area and others have been established from engineers who previously worked for one of the larger firms. Today Arizona is one of the pre-eminent locations for software development. The exposure of workers in these large firms, and associated university students, to state of the art technology and cutting-edge research has contributed to furthering Arizona's competitive position in this area.

Large firms as innovators

Large firms can play a key role in diffusing knowledge and technology to SMEs, nurturing future entrepreneurs and inspiring spin-outs. They can be important in terms of stimulating innovation sales and exports and provide a critical 'route to market' for SMEs, both directly and as a base for access to world markets. Where firms do not take forward innovative ideas themselves then employees sometimes choose to start-up their own businesses to fill a perceived gap in the market. This has, for instance, been recognised as an important feature in the ongoing success of the British Motorsports cluster.

Large firms and the lifecycle

Large firms tend to be a feature of mature and declining clusters. In this instance common interventions for practitioners include the development of new markets, management development interventions, supply chain development and product and process improvements. Large firms are also likely to form a focal point for other wider cluster actions, such as supporting skills development strategies, including supporting management development in cluster firms. Where a large firm forms the focus for an embryonic cluster, the interventions are likely to be different once again, focusing on efforts to embed the firm, promote supply chain linkages and support potential spin outs.

Managing the supply chain

Research has highlighted several examples of where supply chain development has been an important element in building the relationship between large firms and local companies. These include supply chain linkages with overseas companies or OEMs e.g. supplier certification, building better buyer/supplier links such as sub-contracting linkages and strategic alliances.

Facilitating links with key manufacturers (Tier 1 suppliers), between suppliers or assisting companies find new market opportunities can be a key role for the cluster practitioner. Essentially the practitioner will increasingly act as an *animateur*, managing relationships (through the development of a traded network for instance) rather than intervening directly.

Example 19⁴⁰: Supply chain development in France

'Mechanic Valley' in Midi Pyrénées is structured around the aerospace, automotive and machine tools sectors in Aveyron, Corrèze and Lot and comprised of some 210 businesses and 14,000 employees. The area is one of DATAR's⁴¹ 11 cluster development projects in the region. The policy in this instance has been developed to encourage diversification and restructuring through supply chain development. Large firms (such as the Aerospace company Ratier in Figeac) have been encouraged to develop within 'industrial districts' and rely on the local skills base of SMEs. The French experience shows that in addition to spatial planning strategies can be used to help foster inter-firms links and to embed firms into the local economy. Particularly successful policies designed to encourage cluster development in the Midi- Pyrénées has included:

- the development of business incubators (pépinières) providing logistical services (such as fax, photocopying and high speed network connections) and low cost office and workshop space;
- exoneration from property tax for three years, which frees new businesses from one element of the tax burden;
- low levels of (local authority) property tax, which make one commune more attractive to businesses than another;
- the establishment of an 'Economic Development Service', which can range from simple information

provision to companies wanting to move to the area to the organisation of meetings and networks with outside companies and potential finance providers; and

- partial financing of development and information units in certain areas. These units have different objectives (assistance, putting together project proposals or grant aid bids, market potential studies, communication tools to promote the advantages and skill base of the local area).

Promoting inward investment

Promoting inward investment can contribute to cluster development strategies. 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 to build a whole cluster by this process.

Practitioners have a range of instruments available as part of their inward investment are equally effective and do not vary significantly from those adopted as part of more general inward investment strategies. They include the provision of financial support, tailored training packages, the construction of suitable facilities and supporting infrastructure as well as more generic advice. Of

course the inward investor may not be the only beneficiary of such advice and support, other firms within a cluster may also benefit.

“Developing training courses to counter potential skills gaps can be an important part of attracting inward investment. Enterprise Ayrshire has developed a training project funded through the European Social Fund to match up inward investors with people who have the appropriate skills and attitudes to meet the needs of potential employers.”

(Practitioner Observation, 2002)

Equally, dedicated business parks will not only benefit potential inward investors but they can provide one more reason to locate in an area, demonstrating a serious commitment on the part of the region to an identified cluster, and potentially raising the profile of a region in a particular field.

But image and promotion stand out

One activity that does stand out as being significantly more important in attracting cluster related inward investment is the development of a positive image for an area through marketing and promotion. Regions that become ‘known’ for certain clusters are more likely to attract inward investors that are related to that cluster than those that are not known. The development of a ‘brand’ or an image for an area can thus be a crucial part of any cluster development strategy.

Example 20⁴²: Marketing the region

The Arizona Department of Commerce markets the state globally to promote inward investment; provide resource assistance for growing Arizona companies as well as those considering Arizona as a new location. It offers a comprehensive portfolio of services – a one-stop shop – for businesses including the following, the details of which are all set out clearly on its website.

- Business Services (Including advice, venture capital and export assistance).
- Real Estate Data (property availability).
- Information on the economy/research and business operating environment (taxes, labour market data etc).
- Industrial Reports.
- A Comprehensive List of State Incentive and Programmes.
- Energy programmes.
- Innovation and technology advice (Events and networking, Supporting Technology Organisations, Incubators & Research Parks, Technology Assistance Programs).
- A detailed range of small business initiatives and workforce development initiatives.

Physical infrastructure

Communication links, physical infrastructure and sites and premises have previously been identified as key factors in the development of successful clusters. The role of a modern and robust physical infrastructure, including the

provision of facilities for companies and employees as well as good transport and communication links, is an important consideration for cluster managers.

Good physical infrastructure has the potential to reduce transport costs, improve access to raw materials and improve access to skilled labour. Proximity to customers and suppliers is a key feature on the success of many clusters and good transport infrastructure can improve this position. In contrast poor or congested transport and communication links can act as a brake on the development of a cluster.

Example 21⁴³: Adequate infrastructure is essential

Infrastructure can facilitate development

The development of the M4, M3 and M25, the high-speed rail link to Paddington and access to Heathrow have been vital factors in the growth of the ITCE (Information, Technology, Communications and Electronics) industry in the M4 Corridor. The supporting infrastructure has opened up international communications and underpinned the area's complement of high profile inward investors.

But insufficient capacity can act as a potential brake on development

The successful development of the software cluster in Arizona is causing difficulties in infrastructure capacity. Arizona firms believe that they are at a distinct disadvantage compared to other regions with research reported that, 'it takes longer to surf the web from Phoenix than from other parts of the Country'. This is primarily because the growth

in Web use is outpacing the expansion and upgrading of existing infrastructure.

The availability of adequate business infrastructure (suitable premises and adequate land supply) is also essential features in the development of successful clusters. This is particularly the case where specialised premises or incubator facilities may be required.

Infrastructure policy interventions

Ensuring there is room to grow

Cluster development strategies should consider the adequacy of available facilities for the development of identified clusters. The availability of sites and premises for potential investors and for the expansion of existing businesses is an important component of maintaining the long-term success of a cluster. This can involve supporting the provision of a suitable supply of sites and premises, taking into account any particular needs of specific clusters. Science, technology and business parks may all be appropriate developments, as might manufacturing and distribution parks, in that they can encourage opportunities for joint working. Equally, specialised space such as incubator and 'grow-on' space might be provided. In other cases it can be sufficient to ensure an adequate supply of land or premises in areas that reflect cluster dynamics.

Example 22⁴⁴: Incubators

Incubators simplify the experience of running a business for new start-ups, offering a sheltered environment in which to grow. From experience UKBI⁴⁵ (UK Business Incubation) suggests that

four practical steps are required when developing incubators:

- **The development of ideas.** Minimising physical and organisational barriers and allowing entrepreneurs the freedom to innovate.
- **Nurturing the idea.** Supporting the innovator through providing time and resources to develop the idea.
- **Formalising the development.** Creating a business unit.
- **Creation of the new company.** Defining company structures, producing a business plan and budget. Supporting and assisting the new business with investment, finance, marketing and sales, law, recruitment, ICT and facilities.

A number of incubators are directly related to assisting the development of particular clusters. The **Babraham Bioincubator** in Cambridge opened in 1998 and offers combined laboratory and office accommodation for start up and early stage bioventures. The Bioincubator offers wide-ranging business, technical and scientific mentoring to create a supportive environment that reduces burn-rate during the crucial early stages of a new bioventure's existence. A key entry requirement is that all companies must be developing technology that maps onto the functional genomics research programmes of the Babraham Institute.

Developing science and technology parks on their own is no guarantee of success. A review of Italian experience found that there is no sound evidence that such public policy initiatives have had much of a positive impact on the economic performance of firms and

that recent initiatives in the development of technology firms have yet to produce desired effects. The reasons why some science and technology parks are successful and others less so are not well documented. Increasingly though Parks are offering a much wider range of services to resident companies (see Examples 5 and 15 for instance) and are based on feasibility studies that identify target sectors. For example in Los Angeles, plans to develop former military bases as science and technology parks have used cluster analysis to identify potential target markets. The analysis for the former Cabrillo base in Long Beach reduced the initial list of potential clusters to two, based on direct assessment of clusters, wider regional strategies and promoting a match for California State University Long Beach: the major investor in the project⁴⁶.

Planning policy can play a key role too

Land use policies have a recognised influence on cluster development. In the best cases planning has supported and facilitated cluster growth for strategic reasons, but too often the planning system has not offered the support that it might. The planning system can also be valuable in so far as it preserves amenity values and alleviates congestion. Cluster managers should be aware that the regional dimension of planning and the interlinkage with regional economic development is important.

Transport and communications

The role of transport and communications infrastructure in promoting cluster development is less frequently considered. There is little evidence of cluster specific initiatives most investment programmes are, at best, cluster-informed in so far that they take into account the needs of

identified clusters, amongst other considerations. However, some cluster specific concerns have contributed to significant investment eg Massconnect and Berkshire Connect (see Profile 3, p.27) or the raising of the profile of an issue, as identified in the case of Arizona above.

When developing cluster-based strategies consideration should be given to the nature of existing transport and communications infrastructure and whether this is adequate to facilitate and support the development of the cluster as proposed. This is illustrated by the earlier Example 21 that highlights the importance of transport and communications to the growth of Information Technology, Communications and Electronics Sectors in the Thames Valley.

Entrepreneurial spirit

The presence of an entrepreneurial spirit is an important influence in the development of successful clusters. This is generally reflected in growth companies, business start-ups and spin-outs from existing companies or research institutes. It can occur within a wide degree of contexts within a cluster – within large or small firms, within technology transfer organisations, or within the ‘culture’ of a sector or responsiveness of the public institutions (with a ‘can do’ mentality). Equally an ability to adapt to market changes has been a factor for the continuing success of SMEs within successful clusters.

Successful clusters will contain many individuals with entrepreneurial spirit who are flexible and willing to try new ideas. They may exploit new opportunities or technologies, bring innovations to the marketplace or take

significant calculated risks⁴⁷. There are few examples of policies to encourage a culture of entrepreneurialism within the cluster literature or amongst practitioners. That is not to say one should not encourage entrepreneurialism, just that there is little knowledge about the application and effectiveness of such approaches at the moment. Levels of entrepreneurialism appear to be used as an indicator reflecting the overall health of a cluster – with low rates of entrepreneurialism often being cited (through low business registrations for instance) as a cause for concern.

Access to finance

The ability to access finance contributes to the successful development of clusters through supporting the growth and expansion of cluster-related activities. This includes access to venture capital, specialist resources and financing (e.g. for inward investment), public and private R&D funding, business angels and investor networks.

The availability of venture capital is important as it can reshape the role of public risk funding establishing new kinds of investment syndicates where the public sector carries the technology risk and a venture capitalist the commercial risk of the enterprise

(Paija, 2000).

Proximity to intermediaries such as banks, venture capital firms, trading houses (which broker and organise exports) and other financial institutions is viewed as a positive benefit for the development of clusters. In part this reflects the flexibility

of financial institutions to respond to the changing needs of the cluster, particularly the emergence of new markets. It can be helpful for practitioners to build relationships with the investment community (either informally or through formal partnerships). For instance some business angels or venture capitalists specialise in certain sectors and can provide useful sources of specialist finance and support.

Different sources of finance will be used by different companies depending upon their particular circumstances. A study of the biotechnology sector in Oxfordshire, highlights the importance of business angels, Oxford University, venture capital, private investment, parent company investment and DTI support (such as through SMART Awards). None of these are cluster-specific.

Finance policies

Providing information and advice

At its simplest cluster managers can support firms through providing advice on potential sources of funding. In fact this is the form of support most commonly offered and may involve cluster managers establishing mechanisms to bring potential investors and companies together. This can be done through web-enabled databases or through facilitating contacts with local providers (see for example the links to finance providers identified in Examples 5 and 15).

Access to types of finance

Financing policies can also be used to attempt to encourage particular types of activity that are regarded as a strong

foundation for future growth. 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 three 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. Special rules apply to using such funds and these should be fully understood in advance. Financial support might also be used to encourage firms to collaborate – for instance on a new product or process. There are signs that some funds established through programmes such as the Structural Funds, are being targeted on identified clusters, for example in South Yorkshire an Invest for Growth 2 Scheme will support companies that can demonstrate that they are part of four high growth clusters within South Yorkshire.

Promoting collaboration and networking

In some cases cluster development is being promoted as a side effect of more general financial support policies. For example, support for R&D activities can be made conditional on joint working between companies.

Example 23: Promoting clusters through finance policies

In many instances funding bodies make co-operative working a condition of grant support. This can be seen, for example, in the EU's multi-annual Research and Technological Development Framework Programmes. In the USA the National Science Foundation links its grants for Engineering Research Centres not only to advanced engineering research but also to documented technology transfer to local business, educational and journalism communities.

(Pavlik, 1999)

Tailored solutions

More significantly, cluster strategies might include developing specialist financial services to overcome identified cases of market failure. This is often the case where the financial markets fail to support firms regarded as high risk or seeking relatively modest levels of capital. To support successful clusters financial support mechanisms must either be tailored to the particular needs and opportunities of the cluster, such as bringing cluster firms together with Venture Capital providers, or must be packaged together with other cluster development actions.

Example 24⁴⁸: Supporting access to finance in the Netherlands

In addition to regional authorities the national government takes an interest in stimulating regional economic policies for its aim to promote high tech

entrepreneurship and to turn the Netherlands into a leading ICT region in Europe. For that reason the Ministry of Economic Affairs launched the so-called Twinning policy in 1998, which involves: creating Twinning centres which offer office accommodation, facilities (such as telecom infrastructure) and business coaching to promising ICT start-ups; establishing funds for financial participation in start-ups and young firms on a public-private basis; and offering a network of (inter)national contacts which can be used by start-ups for advice and for networking with suppliers, distributors and so on. Twinning was established in 1998 as an initiative from Hans Wijers, a former Minister of Economic Affairs (1994-1998), and Roel Pieper, a leading businessman. Since its establishment, Twinning has invested in almost 60 ICT businesses, 35 of which are still active and are working on their futures with Twinning support. Twinning stimulates ICT entrepreneurship in the Netherlands by providing risk capital and placing its network at the disposal of start-up ventures, but the entrepreneur remains the pioneer and Twinning's objective is to earn a yield on invested funds. Twinning invests exclusively in ICT businesses, but the ICT focus is broadly interpreted as having a preference for enterprises that fit inside one of six identified focus areas.

6. Complementary measures and the policy environment

The previous sections have highlighted areas where interventions may help to support the development of clusters through focusing on those factors identified as critical or contributory to the development of clusters.

There are though a number of other factors that can also influence the development of successful clusters, as set out in the accompanying Evidence Paper. In the following section we outline some of these aspects. In particular we highlight:

- The role of traditional business support activities.
- The context in which the cluster operates.
- The role of a supportive policy environment.

Business support policy/ interventions

Support is often provided to businesses within a cluster in order to facilitate improvements in their performance. This support can take numerous forms. Common interventions include:

- Support for new business start-ups, spin-outs from companies or university research bodies, and business growth e.g. through advice, ICT support or grant assistance.
- Business advice and guidance e.g. on management and production techniques, training, business planning.
- Marketing, market intelligence and networking assistance e.g. directing

technological capabilities towards market needs.

Available evidence suggests that these interventions often have a limited impact on the successful development of clusters, although supportive of individual firms. This is often because of the manner in which these activities are delivered rather than any failings of the approach itself. To successfully contribute to cluster development business support activities must be tailored to the particular needs of the specific cluster.

Traditional business support measures do have their role in that they can promote the development of a strong firm base and the growth of new companies, contributing to a generally stronger economy. They can also be highly important in so far that they mean support the development of the seedbed for new clusters of the future, which cluster focused strategies might otherwise overlook. However, it is important for cluster managers to realise that business support measures on their own are not enough to promote the development of clusters.

Example 25⁴⁹: Promoting business start-ups

The Existenzgründungsinitiative Hannover Region (EIH) is run as a partnership between the city of Hannover, the Greater Hannover District Association, the Kreissparkasse and the Stadtparkasse. It acts as a one-stop shop for business start-ups offering advice on the different types of consultation and training on offer, sends potential business owners to the relevant experts and lends support to young firms in their initial stages. It has also opened a contact point to the Deutsche Ausgleichsbank in its premises, providing direct access to the bank's information on the internet. Konstadakopoulos reports that this approach has contributed to securing strong rates of start-ups in Hannover, comparable to Munich and only behind Hamburg, Düsseldorf and Frankfurt.

A supportive context

Leaders can be important

Successful clusters are often associated with strong leadership, either from individuals or institutions. Industry leaders can be crucial for removing obstacles, assisting in enhancing collaboration, developing a vision and acting as 'champions' for the future strategy of the cluster. Strong civic leadership can help to foster a 'collaborative advantage' too by raising mutual awareness of local strengths and a shared vision for business growth. Leaders are typically people committed to a local area, perceived as having a high degree of influence and able to cultivate interactions between cluster stakeholders.

Box 7⁵⁰: Two views on leadership

" The personalities involved are important – you must have strong leadership and exposure whenever you can. Other areas have not had people to 'run with it' "

" The presence of 'champions' in clusters is key. They motivate other members and can provide the energy and enthusiasm and continuity to the creation process."

Competition is a driving force

Clusters may develop where the presence of key customers stimulates the development of, and competitive advantages amongst, suppliers. Competition can inspire, motivate and stimulate a culture of innovation within successful clusters. In areas of intense competition rapid product development, new start-up firms and spin-off technologies can flourish supporting the development of dynamic clusters. Competition need not preclude collaboration and firms can, and do, actively engage in both. No evidence was found of interventions by practitioners directly supporting competition, although it may be seen as a by-product of interventions adopted for other objectives. The reason for including comment on it here is to stress that clusters thrive on competition and that dynamic clusters with a turn-over of businesses may be the stronger in the long-term.

Proximity to markets helps clusters develop

The prominence and existence of both internal (local and national) and external (global) markets is a feature of many successful clusters. Access to a wide population and dynamic markets are clearly advantageous features of some clusters. Local markets can help clusters develop and

in some cases gain first mover advantage. In other cases access to national or international markets has been important in securing the continued expansion of a cluster. Again cluster practitioners can only influence market access at the margins, but advice and information can help whilst infrastructural investments can bring benefits.

Quality of life

The 'quality of life' offered by a region can be a feature in the development of successful clusters. Other things being equal an attractive environment can offer advantages in attracting key workers and firms. This has been taken up as a marketing tool by many organisations promoting cluster development, as Example 26 illustrates in the case of Arizona. In France the development of local amenities such as sports facilities and green spaces in employment zones and residential areas have played a role in terms of regional image and have arguably been important in attracting both businesses and employees to a region.

Example 26: Trading on your strengths

Arizona is promoting itself as a centre for software development trading in the fact that US based high technology companies generally seek locations where community and quality of life features produce an enjoyable living environment for the highly educated, technical and professional employees. As the Department of Commerce states:

" Companies find it easy to recruit talented employees to Arizona. Arizona provides a quality of life unmatched by

any area of its size in the world. Residents enjoy a choice of lifestyles, excellent health care, and an affordable cost of living" ⁵¹.

A supportive policy environment

A supportive, co-operative policy environment is an important feature in the development of successful clusters. Porter highlights that many of the most significant influences on industrial development stem from the way in which national regulatory frameworks influence the demand for sophisticated products, the course of industrial innovation and levels of entrepreneurship. Indeed, in some cases the success of a cluster, such as the Aerospace cluster near Toulouse, France, can be traced almost directly to the role of policies pursued by the French state, and supported today by European level policies concerning competition, regulation and aerospace programmes.

The evolution of Ireland's ICT sector has been driven not only by market forces but by the conscious design and implementation of public policy in the context of EU framework and cohesion programmes and, over the last decade, social partnership.

(O' Donnell, 2000)

At a national level a stable macro-economic environment is a strongly positive factor, whilst at a regional level supportive policies are also valuable. The common feature is a strong commitment from local and regional government bodies to deliver growth and sustainability. For example, in the Midi

Pyrénées region government policy has driven cluster development in the region. Positive connections were also made between policy and cluster success within Baden-Württemberg and the tourism industries.

“Local policy makers can help share development vision and give strength to collective actions to enhance competitiveness of the SME. Regional and/or local governments support cluster development actively, concentrating on complementing rather than replacing the community's own efforts.”

(GFA Management 2001)

In developing a supportive policy environment practitioners should bear in mind that there is no ‘magic pill’ that will deliver successful clusters, rather a range of different actions that are needed, tailored to local circumstances. And in considering the range of actions that are appropriate attention should be paid to the manner in which interventions are delivered, just as much as to the interventions themselves. Measures that actively foster collaboration or joint working are more likely to strengthen the development of a cluster over time than those that do not.

Annex A: End notes

The Practical Guide has drawn upon a wide range of sources as part of the research process. These are fully listed in the accompanying *Evidence Paper*. The following references are cited in the text and are included here as end notes.

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Annex C: Glossary

Definitions

Clusters

Geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions (for example universities, standards agencies, and trade associations) in particular fields that compete but also co-operate (Porter 1998: 197).

Cluster Depth

This refers to the intensity of firms located in a particular geographical area. Where there is a large concentration of firms in a particular area the cluster is said to be 'deep' and conversely where there is a low concentration of firms the cluster is said to be 'shallow'.

Cluster Life Cycles

This refers to technological life cycles, which are extremely important to regional clusters. The emergence of new technologies may give rise to new clusters or create further opportunities for existing ones. New technologies may equally result in the demise or decline of an existing cluster (end of the life cycle) as new clusters emerge.

Cluster Stage of Development

While cluster depth refers to the number of firms, stage of development could be said to refer to the age of the cluster (how established it is). The stage of development of a cluster has been identified in 2 different ways. Within the literature there are 3 broad categories: embryonic, established and mature. Embryonic clusters are those newly defined, and growing but very possibly 'shallow'; established clusters are those that are growing or stable and most likely 'deep'; and, finally mature clusters are very possibly those that have reached or passed their peak, these clusters often require harsh interventionist policies to reverse their decline (although many are left to come to the end of their natural life cycle). Where-as in the practitioner interviews, clusters were referred to as growing, stable and declining. Broadly speaking growing equates to embryonic, stable to established and declining to mature. The associative terms are therefore used interchangeably.

Critical Success Factors	This is the policies and interventions used to facilitate the development of successful clusters. The critical success factors for successful cluster developments were identified through a mixture of literature reviews and interviews with cluster specialists. Through this research we have identified the success criteria, success measures and policy interventions that make up the critical success factors.
Geographical Clusters	Are those based in the same region, such as the media cluster in Oxford or the advanced engineering and metals cluster in South Yorkshire.
Industrial Clusters	These are clusters that are based around industry rather than geography. An example of an industrial cluster might be the biotechnology cluster in the UK and Germany.
Inter-Firm Collaboration	By facilitating the sharing of resources (human and financial) and the creation of trust, a network can lower the cost of doing business, create new business opportunities (through new markets and/or new products), and reduce the risk of doing business. The above explanation is the basis for inter-firm collaboration.
Institutional Infrastructure	The presence of institutional infrastructure is integral to the success of a successful cluster. Examples include the presence of university based research centres that support industry such as the aerospace manufacturing research centre based at Sheffield University.
Meta Evaluation	The term is used for evaluations designed to aggregate findings from a series of evaluations. It can also be used to denote the evaluation of an evaluation to judge its quality and/or assess the performance of the evaluators.
Policy Interventions	Policy interventions are the policies that are put into place in order to facilitate the development of clusters. Each policy intervention comes under a broader policy lever, these are discussed more fully in the Policy Interventions Glossary.

Regional innovation system

Success Measures	Success measures are the indicators used to measure the success of clusters. The indicators used to measure success are discussed in the Success Measures Glossary.
Success Criteria	This is the criterion used to determine successful clusters. The criterion used to identify success is highlighted in the Success Criteria Glossary.
Soft Infrastructure	Soft infrastructure relates to less tangible aspects such as education and training provision, quality of life infrastructure such as park, leisure and library services, business support, networking and financing services etc.
SMEs	This is the acronym for 'small and medium sized enterprises'. There is no definitive delineation between a small and medium sized business. As a general reference, small is often from 5 to 20 employees, medium from 20 up to 200. Businesses with fewer than 5 employees are usually called micro-enterprises. This is a guide only.

Inward investment

Generic Advice	Advice to companies prior to investment on soft factors. This could range from providing advice on schools and facilities to running management schools.
Marketing	Activities which raise the profile of the cluster nationally and internationally, in the eyes of companies and skilled workers. This could include direct marketing, branding of the region, niche product marketing and showcase events for specific industries.
Training	Developing links with schools and universities to ensure they produce people with the necessary qualifications to meet the needs of the cluster's workforce. Providing training courses at the cluster-wide level to ensure that skills gaps in companies are addressed. This might include training in management, change management or customer service skills.

Finance and Funding Advice	Giving advice to new businesses on how to attract the funding necessary for development, including technological development, product innovation and capital investment.
Infrastructure	Funding infrastructure that helps facilitate cluster development. This could include transport, IT, telecommunications, and housing infrastructure. Ensuring that the transport needs of the cluster are incorporated in transport strategies.
Construction of facilities for business	Assisting development of office, conference and workshop space through funding, site assembly, construction and relaxing of planning restrictions. Encourage clustering of businesses and sharing of workspaces in order to increase their interaction. Linking developments with transport facilities.
Finance	
Tax Concessions	Tax concessions to businesses encourage inward investment and provide companies with a competitive advantage. Concessions might include maintaining a low level of corporation tax and tax credits for particular industries. Tax concessions could also be linked to locating within a cluster or increased capital investment and R&D activity by companies.
Equity Investment	Examples include the DTI Regional Venture Capital Fund and technical investment by Business Angels.
Mezzanine	<p>Mezzanine fills the gap between senior secured debt and equity, ranking just below the senior debt in a default situation. Covenants are usually similar to those on senior debt, but tend to be more flexible.</p> <p>Users of mezzanine finance have traditionally paid for the capital in three ways. Firstly, there has been the coupon payment, which has usually paid about 400 basis points above LIBOR (London Inter-Bank Offering Rate). Secondly, an additional 400 basis points of interest payments – known as payment-in-kind (usually abbreviated to PIK) – is charged.</p>

This payment is receivable at the end of the mezzanine term, enabling a greater proportion of the cash flow to be reinvested in the ongoing business, rather than used to service the debt. The final element of payment comes in the form of equity warrants. This can represent up to six per cent of the amount lent. Mezzanine providers are looking for returns in the high teens and low twenties, but the warrant portion can push the returns beyond this.

Loans

Loans can be provided by the public sector or in a public-private partnership.

Financial Advice

Providing a professional financial advice service. This could include helping to formulate meaningful business plans, advising firms on the investment risk in particular technologies and matching financial investors to appropriate enterprises.

SME Grants

Providing grants to SMEs can encourage the formation of new businesses in clusters. Grants could cover feasibility work, environmental improvements, start-up costs and network brokerage costs. Examples include DTI Smart awards and SRB small grants schemes.

Regulation

Financial regulations can be used to create incentives for company formation and growth within clusters.

Skills

Social Inclusion Measures

Funding training schemes to provide members of excluded groups such as the unemployed and ethnic minorities with the skills required by companies within the cluster. Recruitment drives and marketing in deprived schools to promote a career in the cluster industries.

Entering the Workforce/ Recruitment

Measures aimed at encouraging people to work in the cluster industries. These could include: working with schools to encourage people to achieve relevant qualifications; provision of basic skills training; marketing of careers in the industry and attractive branding of relevant further education courses; and addressing issues such as high housing costs.

Advanced Skills	Providing training to employees to enable them to do their jobs more effectively and enhance their career prospects. Training is most commonly needed in media skills, IT, customer relations, and strategic management skills for business leaders. Relevant training can be provided by collaborating with higher education establishments.
Management Skills	Providing training to senior staff to enable them to perform a more effective management role. Training needs to cover leadership abilities, entrepreneurial and business development skills, staff management and cluster development techniques.
Workforce Development	Encouraging companies to commit themselves to a programme of life-long learning and personal development ensures that their employees remain competitive and that they are able to attract the best staff. Workforce development can include apprenticeships, work placements, and ongoing technical, IT, customer care, and management training.
Training Infrastructure Development	Improving existing training facilities available to businesses. This could include: establishing formal linkages between firms and higher education establishments, and vocational and technical training schools; the creation of national skills centres in particular sectors; and the creation of cluster skills centres.
R&D	
Product Development	Helping firms to improve their product development processes will make them more competitive. Measures could include: tax incentives, funding and assistance for product development and firms that collaborate; cluster-wide or national product development centres; and research into the links between supplier firms in order to establish the scope for collaboration.
Research	Encouraging firms in cluster to work with each other and with universities to carry out technological and product research. Where possible firms and universities should be encouraged to establish 'technopoles' (shared research facilities in the same location).

Applied Research	Encouraging firms, universities and research institutes to work together to ensure that research meets the practical needs of business.
Market Exploitation	Helping businesses in the cluster to target and access their markets. This could include assistance with: market research and consumer profiling; market segmentation analysis; development of a brand image for the industry; and niche marketing.
Corporate Intelligence	Helping companies to compile information on other firms within the industry. Companies need to be aware of: potential investors; local, regional, national and overseas competitors; and the extent of research and development outside the company.
Technology Transfer	Encouraging companies within the cluster to share technologies and products that enhance productivity. Businesses within the cluster should also be encouraged to share beneficial innovations, services and best practise. Firms should be encouraged to enter into formal partnerships with universities developing new technologies that have applications within their industry.
Business support	
New Business Start Up	Providing funding, advice, and ICT support for new businesses within the cluster.
High Growth Start Up	Providing funding, advice, and ICT support for new businesses within clusters in high-growth sectors.
Spin Outs	Encouraging the formation of new business start-ups based around the activities of university research departments and spin-off activities from existing companies.
SME Support (existing)	Providing support to existing SMEs. This could include: helping them establish networks and cluster processes; intellectual property issues; strategic thinking; business modelling; ICT support; advice on matching technological capabilities to market needs; and advice on new production and management techniques.

SME Support (new)	Providing support to new SMEs. This could include: helping them establish networks and cluster processes; intellectual property issues; strategic thinking; business modelling; ICT support; advice on matching technological capabilities to market needs; and advice on new production and management techniques.
Support for Large Firms	Encouraging larger firms to consider the needs of their suppliers and to engage in clustering behaviour in order to gain agglomeration benefits.
Supply Chain Development	Helping to build stronger linkages between all the companies in a supply chain. Developing linkages between foreign-owned large enterprises and SME clusters.
Business Advice	Providing advice to businesses on a range of issues including; funding sources; training; developing business plans; responding to market opportunities; and working with financial institutions.
Business Incubator Support (generic)	Business incubator support provides support (in terms of advice, finance, in-kind support with, e.g. low-cost premises etc.) to businesses during the incubation period, i.e. between start-up and achieving stable profitability.
Business Incubator Support (specific)	Business incubator support provides support (in terms of advice, finance, in-kind support with, e.g. low-cost premises etc.) to businesses during the incubation period, i.e. between start-up and achieving stable profitability. Specific business incubator support could help with, for example, provision of laboratory equipment for pharmaceutical business.
Export Support and International Trade	Helping companies within the cluster to expand their export markets. This could include; brokering contact with large companies overseas, direct marketing, branding of the cluster, niche product marketing and showcase events and fairs for specific industries
Marketing	Helping businesses in the cluster to access new markets. This could include assistance with: direct marketing, branding of the cluster, niche product marketing and showcase events and fairs.

Business Planning	Advising firms on how to produce genuine business development plans that will help ensure the success and growth of the company, rather than unworkable plans that are produced for the benefit of the bank or other investors.
Sales and Marketing	Assisting firms with developing their sales and marketing approach; or carrying out marketing activities on behalf of the cluster.
Finance	Providing financial assistance to businesses, e.g. in the form of tax concessions, equity investment, mezzanine or other loans.
Mentoring and Business Angels	Providing business advice and consultancy, either directly through the provision of public sector staff members or informally by setting up mentors within the existing business community.
	HR Development Assistance to business to develop their HR approach.

Institutional development/networks

International Networks	Forming links with companies overseas helps companies within the cluster to expand their markets and global influence, and to learn about new products and research. Links can be formed through: informal networking; formal networking; co-ordination of networking and information brokerage by central government and regional actors.
Networks Beyond the Cluster	Establishing links with other companies, supply chains, clusters and sectors on a regional or national basis. This can increase the breadth of suppliers and lead to increased technology transfer. Links can be formed through: informal networking; formal networking; co-ordination of networking and information brokerage by central government and regional actors.
Non-Profit Making or University Led	Collaborating with voluntary sector organisations and universities. Links with universities provide access to training facilities and research programmes.

Trade Associations or Professional Bodies	Creating or expanding trade associations and professional bodies can help to create more formal networks, facilitate the sharing of best practice and help businesses to influence government policy.
Strategic Alliances/ Trade Agreements	Establishing alliances between business and local and regional government helps provide a strategic approach to cluster and regional development. Establishing trade agreements between large companies and their suppliers can promote skill and technology transfer.
Company Led	Company-led networks provide the opportunity for a flagship business or anchor tenant in a cluster to lead business associations or networks and influence local public policy.
Centres of Excellence	Creating a centre for the research and commercial exploitation of new areas of knowledge. Involving universities, research institutes and business.
Good Practice	Good practice can be shared between companies through networks, workshops or the creation of formal information and measurement centres.
Marketing	Networks or business associations can provide overarching marketing on behalf of a cluster or sector.

Annex D: Consultees

Sector	Organisation	Name
Digital, Cultural and Creative	SEEDA	Peter Taylor
	Yorkshire Forward	Jim Farmery
	Comedia	Phil Wood
	Cultural Policy and Planning Research Unit, Nottingham Trent University	Professor Colin Mercer
	Bristol Cultural Development Partnership	Andrew Kelly
Business and Financial Services	Leeds Financial Services Initiative Ltd	John Ansbro
	Warwick Science Park Corporation of London	Bill Taylor
	Pro-Manchester	Malcolm Cooper
		John Barnacle
Barden Wuttenberg	Centre for Technology Research	Dr Gerhard Fuchs
	University Stuttgart	Dr Simone Strambach
Hi Tech	Centre for Automobile Industry Research	Dr Paul Nieuwenhuis
	Engineering Industries Association	Pat Young
	Yorkshire Forward	Bob Heywood
	EMTA	Dr Michael Sanderson
	EMDA	Graham Brown
Midi Pyrenees	ON-X	Gilles Surlaive
	Clairis	P Jullie
	Actigenix	Director of the start up
	Ariege Expansion	Xavier Bernard-Sans
	CIEU	Regis Guillaume
	ADIMAC	Bernard Lelong

Sector	Organisation	Name
Aerospace	Northwest Aerospace Alliance	Paul Hughes
	Sheffield University	Keith Ridgway
	Northwest Regional Development Agency	Iain Bentley
	West Of England Aerospace Forum	Howard Chesterton
	East and West Midlands Aerospace Alliance	Dr Andrew Mair
ICT	Advantage West Midlands	Stuart Webb
	SEEDA	Peter Taylor
	Regional Information Technology Association	Peter Verhoeven
	Birmingham University Computer Science Department	Padma Reddy
	Warwick Manufacturing Group, Warwick University	Dr Ian McCarthy
	Business Link	Dianne Williams
Tourism	Northwest Development Agency	James Berresford
	East of England Tourism Board	Gillian Artis
	Southwest Tourism Board	Gwyneth Leonard
	One Northeast	Lynne Del-Greco
	Northwest and Western Lancashire Business Link	Debbie Chinn
	Scottish Enterprise	Nicky Yule
South East	The Oxford Trust	Paul Bradstock
	Oxfordshire Biolink	Jonathan Reynolds
	Lugor Ltd	Dr Daryl Fernandes
Think Pieces	Toulouse University	Corrinne Siino
	Stuttgart University	Professor Rolf Sternberg
	Oxford Brookes University	Professor James Simmie
	ECORYS US	Etienne D'Otreppe

